

B. TECH. AUTOMOBILE ENGINEERING

(Duration: 4 Years)

REGULATION 2022 (in line with NEP 2020)

CURRICULUM and SYLLABUS

(Applicable for students admitted from 2024 onwards)

DEPARTMENT OF AUTOMOBILE ENGINEERING

SCHOOL OF ENGINEERING AND TECHNOLOGY

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE



MOTTO, VISION, MISSION AND VALUE STATEMENT OF INSTITUTE

Motto

To Make Every Man a Success and No Man a Failure.

Vision

To be an International Institute of Excellence, providing a conducive environment for education with a strong emphasis on innovation, quality, research and strategic partnership blended with values and commitment to society.

Mission

- To create an ecosystem for learning and world class research.
- To nurture a sense of creativity and innovation.
- To instill highest ethical standards and values with a sense of professionalism.
- To take up activities for the development of Society.
- To develop national and international collaboration and strategic partnership with industry and institutes of excellence.
- To enable graduates to become future leaders and innovators.

Value Statement

Integrity, Innovation, Internationalization

DEPARTMENT OF AUTOMOBILE ENGINEERING VISION

To enable the graduates to be successful in their career as an Automobile Engineer.

MISSION

- M1: To inculcate knowledge in Automobile Engineering
- M2: To impart skills and training on the advancements in Automobile Engineering such as Automotive Electronics, Autonomous Vehicles, etc.
- M3: To instill the highest ethical standards to be a Professional Automobile Engineer for social development.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- PEO-I : Employability/ Industry Ready: To provide in-depth knowledge in Automobile Engineering and awareness of latest development in allied fields of engineering to the students and make them industry ready engineers (T – shaped engineers).
- PEO-II : Research: To provide a range of specialized modules integrated within the structured learning environment for encouraging the students for higher studies and do research in automobile and related fields.
- **PEO-III** : **Entrepreneurship**: To develop a challenging environment that supports and encourages the students to become an entrepreneur.
- **PEO-IV** : **Individual and Team work:** To develop a culture that promotes individual and team work for carrying out innovative projects, assignments and research work in engineering sciences.
- **PEO-V** : Worldwide Recognition: A competitive degree structure is provided, that responds to time, need and technology.

PROGRAMME OUTCOMES (PO's)

Engineering Graduates will be able to:

- PO1 : Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2 : Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **PO3** : Design Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified

needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

- PO4 : Conduct Investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5 : Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO6 : The Engineer & Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7 : Environment & Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **PO8** : Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO9** : Individual & Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10 : Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11 : Project Management & Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

4

PO12 : Life-Long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES: (PSO's)

Graduates of B. Tech Automobile Engineering students will be able to

- **PSO1 : Design and Analysis:** Design, Analysis, Fabrication and Testing of vehicles, which enable the students to compete globally.
- **PSO2** Environment and Society: Carry out research in fuel economy, emission reductions, alternate fuels and solar vehicle for the benefit of the society and environment.

PEOs and POs:

B.Tech. Automobile Engineering Program Outcomes (POs) leading to the achievements of the objectives (PEOs) are summarised in the following table.

Programme				Pro	gramn	ne Ou	tcome	es (POs	5)					
Educational Objectives (PEOs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
I	2	1	2	2	2	2	1	1	3	1	2	3	2	3
II	3	2	2	1	2	1	2	2	2	1	1	2	3	2
	2	1	3	2	3	2	1	1	2	2	2	3	2	3
IV	3	2	2	1	2	1	2	2	1	1	2	2	3	2
V	2	1	2	2	2	1	1	1	2	1	2	2	2	3

		SI. No	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
		1	Matrices and Calculus	2.8	2.6	1.6	1.4	1.6	-	-	-	-	-	-	1.4	1.6	1.4
			Engineering Physics	3	3	1.4	1.4	1.8	-	-	-	2.6	-	-	2.2	1.4	2
		2	OR														
			Engineering Materials	3	2	1.4	-	-	-	1.6	-	-	-	-	2	1.6	1.6
		З	Professional Communication	-	-	-	-	-	-	-	1.4	0.4	2.8	1.8	2	1.2	1.4
		5															
			Programming Fundamentals using C Or Programming in Python	2.4	2.4	2.4	1.2	1	1.4	-	1.2	1	0.8	0.8	1.2	1.8	1.4
		4	OR			T	Γ	I	Γ	Γ	I	Γ	Γ	Γ			
			Engineering Graphics and Computer Aided Design	2.4	1.4	1.2	-	1.6	-	-	1.4	1.6	1.8	-	2	1	0.8
		5	Design Thinking	1.4	1.2	1.6	2	1.8	2.8	2.8	2	2.4	2.4	0.8	2	2.4	2.6
			Engineering Practices Lab	3	2	-	2	-	1	-	-	-	-	-	-	2.3	1.3
1	۲1	6	OR														
YEAR	ESTEF		Fab Lab for Core Engineering	1.4	1.4	1.6	1.6	1.4	-	-	-	-	-	-	1.4	1.6	1.6
	ž		Outreach (NCC) – Level I #	1	2	1	1	-	2	1	3	2	3	3	2	-	-
	SE	7	OR								1						
		7	Outreach (NSS, Y's Men, Rotaract) – Level I #	1	2	1	1	-	2	1	3	2	3	3	2	-	-
			Tamil	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
		8	Hindi	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
			Telugu	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-

	OR														
	French	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
	German	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
	Spanish	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
	Korean	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
	Mandarin	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
	Japanese	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
	OR		•	•	•		•	•	•	•	•	•		•	•
	Universal Human Values	1	1	1	1	1	2	2	3	2	2	3	1	-	-
9	Tamil Culture and Technology	-	-	-	-	-	1	1	2	3	-	-	-	-	-
	9	OR French German Spanish Korean Mandarin Japanese OR Universal Human Values 9 Tamil Culture and Technology	ORFrench-German-Spanish-Korean-Mandarin-Japanese-OR-Universal Human Values19Tamil Culture and Technology	ORFrench-German-German-Spanish-Korean-Mandarin-Japanese-OR-Universal Human Values19Tamil Culture and Technology	ORFrenchGermanGermanSpanishKoreanMandarinJapaneseORUniversal Human Values119Tamil Culture and Technology	ORFrenchGermanSpanishKoreanMandarinJapaneseORUniversal Human Values1119Tamil Culture and Technology	OR French - </td <td>OR French -<!--</td--><td>OR French - - - - 0.4 German - - - - 0.4 Spanish - - - - 0.4 Korean - - - - 0.4 Mandarin - - - - 0.4 Japanese - - - - 0.4 OR - - - - 0.4 Japanese 1 1 1 1 2 2 9 Tamil Culture and Technology - - - 1 1 1</td><td>OR French I<!--</td--><td>OR French T T T T 0.4 0.4 0.4 German T T T T T 0.4 0.4 0.4 Spanish T T T T T 0.4 0.4 0.4 Korean T T T T T 0.4 0.4 0.4 Mandarin T T T T T 0.4 0.4 0.4 OR Mandarin T T T T 0.4 0.4 0.4 OR OR T T T T T 0.4 0.4 0.4 OR OR T<</td><td>OR French I<!--</td--><td>OR French - - - - - 0.4 0.4 0.4 3 0.4 German - - - - - - - 0.4 0.4 0.4 3 0.4 Spanish - - - - - - - 0.4 0.4 0.4 3 0.4 Korean - - - - - - - 0.4 0.4 0.4 3 0.4 Mandarin - - - - - - - 0.4 0.4 0.4 3 0.4 Iapanese - - - - - - - 0.4 0.4 0.4 3 0.4 OR - - - - - - - - - - - - - - - - -</td><td>OR French T T T T O.4 O.4 O.4 3 O.4 O.6 German T T T T O.4 O.4 O.4 O.4 J O.4 O.4 J O.4 O.4 J O.4 O.4 J O.4 O.4 O.4 J O.4 O.4 J O.4 <tho.4< th=""> <tho.4< th=""></tho.4<></tho.4<></td><td>OR French I<!--</td--></td></td></td></td>	OR French - </td <td>OR French - - - - 0.4 German - - - - 0.4 Spanish - - - - 0.4 Korean - - - - 0.4 Mandarin - - - - 0.4 Japanese - - - - 0.4 OR - - - - 0.4 Japanese 1 1 1 1 2 2 9 Tamil Culture and Technology - - - 1 1 1</td> <td>OR French I<!--</td--><td>OR French T T T T 0.4 0.4 0.4 German T T T T T 0.4 0.4 0.4 Spanish T T T T T 0.4 0.4 0.4 Korean T T T T T 0.4 0.4 0.4 Mandarin T T T T T 0.4 0.4 0.4 OR Mandarin T T T T 0.4 0.4 0.4 OR OR T T T T T 0.4 0.4 0.4 OR OR T<</td><td>OR French I<!--</td--><td>OR French - - - - - 0.4 0.4 0.4 3 0.4 German - - - - - - - 0.4 0.4 0.4 3 0.4 Spanish - - - - - - - 0.4 0.4 0.4 3 0.4 Korean - - - - - - - 0.4 0.4 0.4 3 0.4 Mandarin - - - - - - - 0.4 0.4 0.4 3 0.4 Iapanese - - - - - - - 0.4 0.4 0.4 3 0.4 OR - - - - - - - - - - - - - - - - -</td><td>OR French T T T T O.4 O.4 O.4 3 O.4 O.6 German T T T T O.4 O.4 O.4 O.4 J O.4 O.4 J O.4 O.4 J O.4 O.4 J O.4 O.4 O.4 J O.4 O.4 J O.4 <tho.4< th=""> <tho.4< th=""></tho.4<></tho.4<></td><td>OR French I<!--</td--></td></td></td>	OR French - - - - 0.4 German - - - - 0.4 Spanish - - - - 0.4 Korean - - - - 0.4 Mandarin - - - - 0.4 Japanese - - - - 0.4 OR - - - - 0.4 Japanese 1 1 1 1 2 2 9 Tamil Culture and Technology - - - 1 1 1	OR French I </td <td>OR French T T T T 0.4 0.4 0.4 German T T T T T 0.4 0.4 0.4 Spanish T T T T T 0.4 0.4 0.4 Korean T T T T T 0.4 0.4 0.4 Mandarin T T T T T 0.4 0.4 0.4 OR Mandarin T T T T 0.4 0.4 0.4 OR OR T T T T T 0.4 0.4 0.4 OR OR T<</td> <td>OR French I<!--</td--><td>OR French - - - - - 0.4 0.4 0.4 3 0.4 German - - - - - - - 0.4 0.4 0.4 3 0.4 Spanish - - - - - - - 0.4 0.4 0.4 3 0.4 Korean - - - - - - - 0.4 0.4 0.4 3 0.4 Mandarin - - - - - - - 0.4 0.4 0.4 3 0.4 Iapanese - - - - - - - 0.4 0.4 0.4 3 0.4 OR - - - - - - - - - - - - - - - - -</td><td>OR French T T T T O.4 O.4 O.4 3 O.4 O.6 German T T T T O.4 O.4 O.4 O.4 J O.4 O.4 J O.4 O.4 J O.4 O.4 J O.4 O.4 O.4 J O.4 O.4 J O.4 <tho.4< th=""> <tho.4< th=""></tho.4<></tho.4<></td><td>OR French I<!--</td--></td></td>	OR French T T T T 0.4 0.4 0.4 German T T T T T 0.4 0.4 0.4 Spanish T T T T T 0.4 0.4 0.4 Korean T T T T T 0.4 0.4 0.4 Mandarin T T T T T 0.4 0.4 0.4 OR Mandarin T T T T 0.4 0.4 0.4 OR OR T T T T T 0.4 0.4 0.4 OR OR T<	OR French I </td <td>OR French - - - - - 0.4 0.4 0.4 3 0.4 German - - - - - - - 0.4 0.4 0.4 3 0.4 Spanish - - - - - - - 0.4 0.4 0.4 3 0.4 Korean - - - - - - - 0.4 0.4 0.4 3 0.4 Mandarin - - - - - - - 0.4 0.4 0.4 3 0.4 Iapanese - - - - - - - 0.4 0.4 0.4 3 0.4 OR - - - - - - - - - - - - - - - - -</td> <td>OR French T T T T O.4 O.4 O.4 3 O.4 O.6 German T T T T O.4 O.4 O.4 O.4 J O.4 O.4 J O.4 O.4 J O.4 O.4 J O.4 O.4 O.4 J O.4 O.4 J O.4 <tho.4< th=""> <tho.4< th=""></tho.4<></tho.4<></td> <td>OR French I<!--</td--></td>	OR French - - - - - 0.4 0.4 0.4 3 0.4 German - - - - - - - 0.4 0.4 0.4 3 0.4 Spanish - - - - - - - 0.4 0.4 0.4 3 0.4 Korean - - - - - - - 0.4 0.4 0.4 3 0.4 Mandarin - - - - - - - 0.4 0.4 0.4 3 0.4 Iapanese - - - - - - - 0.4 0.4 0.4 3 0.4 OR - - - - - - - - - - - - - - - - -	OR French T T T T O.4 O.4 O.4 3 O.4 O.6 German T T T T O.4 O.4 O.4 O.4 J O.4 O.4 J O.4 O.4 J O.4 O.4 J O.4 O.4 O.4 J O.4 O.4 J O.4 O.4 <tho.4< th=""> <tho.4< th=""></tho.4<></tho.4<>	OR French I </td

	SI. No	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
	1	Analytical Mathematics	3	3	2	1	2	-	-	-	-	-	-	2	3	0
		Engineering Physics	3	3	1.4	1.4	1.8	-	-	-	2.6	-	-	2.2	1.4	2
ER 2	2	OR														
TER		Engineering Materials	3	2	1.4	-	-	-	1.6	-	-	-	-	2	1.6	1.6
:MES	3	Advanced Communication Skills	-	-	-	-	-	-	-	1.4	0.4	2.8	1.8	2	1.2	1.4
SE					•											
	4	Mechanics of Rigid bodies	3	2	3	2	1	2	1	1	1	1.2	1	2	1	2
	5	Programming Fundamentals using C Or Programming in Python	2.4	2.4	2.4	1.2	1	1.4	-	1.2	1	0.8	0.8	1.2	1.8	1.4

	OR														
	Engineering Graphics and Computer Aided Design	2.4	1.4	1.2	-	1.6	-	-	1.4	1.6	1.8	-	2	1	0.8
	Engineering Practices Lab	3	2	-	2	-	1	-	-	-	-	-	-	2.3	1.3
6	OR														
	Fab Lab for Core Engineering	1.4	1.4	1.6	1.6	1.4	2	2	2	1	2	1	1.4	1.6	1.6
	Outreach (NCC) – Level 2 #	1	2	1	1	-	2	1	3	2	3	3	2	-	-
7	OR					1						1		1	
,	Outreach (NSS, Y's Men, Rotaract) – Level 2 #	1	2	1	1	-	2	1	3	2	3	3	2	-	-
	Tamil	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
	Hindi	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
	Telugu	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
	OR	•													
	French	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
8	German	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
	Spanish	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
	Korean	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
	Mandarin	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
	Japanese	-	-	-	-	-	-	0.4	0.4	0.4	3	0.4	0.6	-	-
	OR				•		•		•	•		•	•	•	
	Universal Human Values	1	1	1	1	1	2	2	3	2	2	3	1	-	-
9	Mandatory Course I														

Mandatory Course I is a Non-credit course (Student shall select one course							
from the list given under Mandatory							
course i)							

		SI. No	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	РО 10	PO 11	PO 12	PS O1	PS O2
			Partial Differential Equations and														
		1	Transforms	3	3	2	2	2	-	-	-	-	-	-	-	1.4	1.6
		2	Public Speaking and Group Discussion	-	-	2	2	-	-	-	2.6	2	3	2	3	1.2	1.6
		3	Thermodynamics and Heat transfer	3	3	3	3	3	1	1	-	1	-	1	1	2	2
		4	Automotive Engine Technology	3	2	2	2	2.4	2.4	2.4	1	2	1	1	3	3	3
		5	Materials and Manufacturing Process of Automotive Components	1.6	1.2	1.4	-	0.2	0.2	-	-	-	0.4	-	1.4	1.4	1.2
		6	Department Elective-1														
	R 3	7	Environmental Science and Sustainable Development	2	2	2	-	-	1	3	-	-	-	-	2	1.4	1.4
3 2	ESTE	8	Design Project – 1	3	3	2	1	3	2	1	3	3	3	3	2	2	2.3
YEAF	SEM		Internship -1 (To be carried out in														
-	••	9	summer after 2 nd semester and evaluated in 3 rd semester)	2	2	3	3	2	0.6	1	2	1.6	1.6	1.6	0.6	0.6	1
		10	Mandatory Course II														

Mandatory Course II is a Non-credit							
course (Student shall select one course							
from the list given under Mandatory							
Course II)							

		SI. No	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
		1	Probability and Statistics	3	3	1.2	0.8	-	-	-	-	-	0.4	0.4	0.2	-	-
		2	Professional Editing and Project Writing	-	-	-	2	-	-	-	-	-	3	-	2	-	-
		3	Mechanics of Solids and Fluids	3	3	1.6	-	0.6	-	-	2	2	0.6	-	3	2	2
		4	Automotive Chassis and Driveline System	3	3	3	1.8	2	2.2	0.6	1.8	-	-	1.8	3	3	2
		5	Two and Three-wheeler EV Technology (Industry Collaborated Course)	0.6	0.4	0.6	-	0.6	0.2	-	-	-	-	-	-	1	1.2
		6	Department Elective-2														
		7	Non-Department Elective-1														
	-	8	Design Project – 2	3	3	2.6	2	3	2	2	3	3	3	3	1	2	2
AR 2	MESTER 4	9	Personality Development and Soft Skill Techniques	-	-	-	2	-	-	-	-	-	3	-	2	-	-
YE	SEI	10	Mandatory Course III Mandatory Course III is a Non-credit course (Student shall select one course from the list given under Mandatory Course III)														

		SI. No	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
		1	Logical Reasoning and Verbal Ability	-	-	-	-	-	-	-	-	1.2	3	-	2	-	-
		2	Automotive System Design	2.4	2.2	1.4	1.4	0.2	0.2	-	-	-	0.4	-	2.2	1.6	1.4
		3	Mechanics of Machines	2.4	2.2	0.8	1	1.4	1.6	1.8	3	2.6	1	2	2	1.6	1.8
		4	Automotive Electrical and Electronics	0.4	2	0.6	2	0.6	0.2	-	-	-	1	1	2	0.8	1.6
		5	Department Elective-3														
		6	Non-Department Elective-2														
		7	Design Project – 3	3	3	2.6	2	3	2	2	3	3	3	3	1	2	2.6
	TER 5	8	Entrepreneurship	2.75	2.5	1.75	2.5	2.25	2.75	1.75	1.5	2.75	2.5	2	3	2.5	2.5
YEAR 3	SEMES	9	Problem Solving using Quantitative Techniques	-	-	-	-	-	-	-	-	1.2	3	-	2	-	-
		10	Internship -2 (to be evaluated in 5 th semester. To be carried out in summer after 4 th semester))	2	2	3	3	2	0.6	1	2	1.6	1.6	1.6	0.6	0.6	1

		SI. No	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	РО 10	PO 11	PO 12	PS O1	PS O2
		1	Vehicle Dynamics	2.6	2.6	2.6	2.6	2.6	-	2.4	-	-	1	1	2.6	1.6	1.4
		2	Design and simulation of Electric and Hybrid Vehicles	3	3	3	2	3	2	2	1	2	1	1	3	3	3
	TER 6	3	Control system for Automotive applications	3	3	2.4	2	1.2	_	-	-	-	_	-	1.2	1.6	1.4
AR 3	MES	4	Department Elective-4														
ΥE	SE	5	Non-Department Elective-3	3	3	3	3	2	-	1	-	2	З	3	0.8	2	2
		6	Introduction to Industry 4.0	3	3	3	3	2	-	1	-	2	3	3	0.8	2	2
		7	Design Project – 4	3	3	2.6	2	3	2	2	3	3	3	3	1	1.6	1.6
		8	Profesional Skill and Ethics	3	3	2.6	2	3	2	2	3	3	3	3	1	1.6	1.6

		SI. No	COURSE NAME	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	РО 12	PS O1	PS O2
	2	1	English for Competitive Examinations	-	0.8	1.2	1.2	-	1.6	-	-	2	3	1	3	-	-
et .	TER	2	Fundamentals of Finite Element Analysis	3	3	2.4	3	3	1.2	0.6	-	-	-	0.6	3	3	3
EAR 4	EMES	3	Vehicle Diagnostics and Maintenance	3	3	2	3	3	2	2	2	2	1	2	2	1	2.2
≻	S	4	Advanced Vehicle Technology	2.6	1.2	2.2	2.4	2.4	-	-	-	-	-	1.4	2.6	2.4	1.8
		5	Department Elective-5														
		6	Non-Department Elective-4														

	7	Research Methodology & IPR	2.4	2.8	1.2	1.2	3	2.4	1.8	2	2.2	2.6	2	3	2	2
	8	Project Phase - 1	3	3	2	3	2	3	2	3	2	3	2	2	2	2

	~	SI. No	COURSE NAME	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
YEAR 4	SEMESTER	1	Project Phase - 2	ß	3	3	3	3	3	2	3	з	3	3	3	3	3

DEPARTMENT ELECTIVE COURSES: VERTICALS

	Vertical 1	Vertical 2	Vertical 3	Vertical 4
SEM	Electric Vehicle Technology	Intelligent Mobility	Engine and Vehicle Technology	Design and Manufacturing
	Electric Drives and Control	Instrumentation for Intelligent Mobility	Alternative Fuels and Energy Systems	Production Technology
	OR	OR	OR	OR
	Policy for E-Mobility	Intelligent Transportation system	Vehicle body engineering	Product Design and Development
	Battery Technology	Advanced Driver Assistance System	Automotive Pollution and Control	Computer Integrated Manufacturing
IV	OR	OR	OR	OR
	Electric and Hybrid vehicles	V2V and V2X Technology	Off Road Vehicles	Process Planning and Cost Estimation
v	Charging Technology	ECU Model Based System Design	Vehicle Design Data Characteristics	Digital Manufacturing

	OR	OR	OR	OR
	Power Electronics for EV	Cyber security for Automotive Engineers	Design of Engine Exhaust system	Industrial Automation and Robotics
	Modelling and Simulation of EV	Automotive Safety Systems	Renewable Source of Energy	Design of Experiments
1	OR	OR	OR	OR
	Coding for EV	Automotive Electronic Management System	Automotive Heating Ventilation Air Conditioning (HVAC)	Industrial Engineering and Management
	Computer Architecture and Data Analytics	Self-Driving Cars	Vibration and Noise Control	Computational Fluid Dynamics
VII	OR	OR	OR	OR
	Smart Grid for EV	Pose estimation and state estimation of self-driving cars	Fuel Cell Technology	Lean Manufacturing and Six sigma

VERTICAL 1: ELECTRIC VEHICLE TECHNOLOGY

SI. No	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	РО 10	PO 11	РО 12	PS O1	PS O2
1	Electric Drives and Control	3	2	3	2	2	3	3	2	3	3	3	3	3	3
2	Policy for E-Mobility	3	1	2	1	1	2	3	2	1	1	1	3	3	3
3	Battery Technology	1.4	I	1.2	-	-	1.2	1.4	-	-	-	1.4	1.2	1.2	1.6
4	Electric and Hybrid vehicles	0.6	0.4	0.6	-	0.6	0.2	-	-	-	-	-	-	1	1.2
5	Charging Technology	2.2	2.2	1.8	2.8	2.2	2	1.8	1.6	1.6	2	1.8	1.8	3	3
6	Power Electronics for EV	3	2	3	2	2	3	3	2	3	3	3	3	3	3

7	Modelling and Simulation of EV	3	1	2	1	1	2	3	2	1	1	1	3	3	3
8	Coding for EV	1.4	-	1.2	I	-	1.2	1.4	I	I	-	1.4	1.2	1.2	1.6
9	Computer Architecture and Data Analytics	0.6	0.4	0.6	-	0.6	0.2	-	-	-	-	-	-	1	1.2
10	Smart Grid for EV	2.2	2.2	1.8	2.8	2.2	2	1.8	1.6	1.6	2	1.8	1.8	3	3

VERTICAL 2: INTELLIGENT MOBILITY

Sl. No	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
1	Instrumentation for Intelligent Mobility	2.6	2.6	2.6	2.4	1.6	1	0.4	-	-	I	0.6	0	2.6	2.2
2	Intelligent Transportation system	1.8	2	1.2	2.2	0.4	0.6	0.4	1.2	0.4	1.4	1	1.4	1.4	1.6
3	Advanced Driver Assistance System	2.6	2.6	2.6	2.4	1.6	1	0.4	-	-	-	0.6	-	2.6	2.2
4	V2V and V2X Technology	2.6	2.6	2.6	2.4	1.6	1	0.4	-	-	-	0.6	-	2.6	2.2
5	ECU Model Based System Design	2.6	1.2	2.2	-	-	2.4	2.8	-	-	-	1	2.6	1.8	2
6	Cyber security for Automotive Engineers														
7	Automotive Safety Systems	2.2	2.2	1.8	2.8	2.2	2	1.8	1.6	1.6	2	1.8	1.8	3	3
8	Automotive Electronic Management System	0.6	0.4	0.6	-	0.6	0.2	-	-	-	-	-	1.4	1.4	1.6
9	Self-Driving Cars	1.6	1.2	1.4	1.2	-	1.8	1.2	-	1.2	2	1	1.6	1.6	1.2
10	Pose estimation and state estimation of self- driving cars	1.8	2	1.2	2.2	0.4	0.6	0.4	1.2	0.4	1.4	1	1.4	1.4	1.6

VERTICAL 3: ENGINE	E AND VEHICLE TECHNOLOG
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Sl. No	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
1	Alternative Fuels and Energy Systems	3	3	-	0.8	1.4	-	-	-	3	-	-	3	1.4	1.6
2	Vehicle body engineering	2.4	2.4	-	0.8	1.4	-	-	-	2.2	-	-	2.4	1.4	1.2
3	Automotive Pollution and Control	3	3	-	0.8	1.4	-		-	3	-	-	3	1.4	2
4	Off Road Vehicles	2.6	1.2	2.2	-	-	2.4	2.8	-	-	-	1.4	2.6	2.4	1.8
5	Vehicle Design Data Characteristics	2.6	2.4	2.4	2.4	-	-	-	-	-	1.8	1.2	2.4	2.4	3
6	Design of Engine Exhaust system	1.4	0.8	1.4	0.8	1	0.2	-	-		-	-	1.4	1.4	1.6
7	Renewable Source of Energy	1	1	1	1	2	2	2	2	2	2	1	1	1	1
8	Automotive Heating Ventilation Air Conditioning (HVAC)	3	1.4	2	1.4	1	1.2	-	1.2	-	-	1	1	1	1
9	Vibration and Noise Control	2.6	1.4	2.2	2.4	2.4	-	-	-	-	-	1.4	2.6	2.4	1.8
10	Fuel Cell Technology	2.6	1.4	2	3	1	2	2.4	0	0	0	1.4	2.6	2.4	2

VERTICAL 4: DESIGN AND MANUFACTURING

Sl. No	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
1	Production Technology	2.6	2.2	2.6	2	2.6	1.4	1.4	-	1.4	2.4	1.6	2	1.6	1.6
2	Product Design and Development	3	2.8	3	2.8	3	2	2.8	2.8	2	3	2.4	-	1.4	1.2
3	Computer Integrated Manufacturing	1.4	1.6	1.4	1.2	2.6	0.6	-	-	2.4	1.4	2.4	1.4	1.4	1.4

4	Process Planning and Cost Estimation	2.4	2.6	1.8	1.6	1.4	1.2	1.4	-	1.4	-	1.4	1.4	1.2	1.4
5	Digital Manufacturing	2.6	1.4	1.4	1.4	2.4	-	-	-	-	-	-	2.6	2.4	1.8
6	Industrial Automation and Robotics	3	3	3	3	2	2	2	2	1	1	1	1	3	3
7	Design of Experiments	1.6	1.2	1.4	-	0.2	-	-	-	-	0.4	-	1.4	1.4	1.2
8	Industrial Engineering and Management	3	2.2	1.6	1.4	2.8	2.6	2.6	1.6	2.4	2.4	1.8	1.6	3	2
9	Computational Fluid Dynamics	2.2	2.6	2.2	2.8	2.4	2.2	2	2	1.8	2	1.8	2.2	3	3
10	Lean Manufacturing and Six sigma	3	3	3	3	2	2	2	2	2	2	1	1	3	3

NON DEPARTMENT ELECTIVES

NON DEPARTMENT ELECTIVE-1

SI. No	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
1	Automotive Vehicle Technology	3	2.4	-	-	З	2	2.8	2	3	2	-	-		
2	Elements of Motorsports Engineering	1.8	1.8	0.2	1.8	0.4	1.8	0.4	0.2	0.6	-	0.2	1.8		
3	Energy from Renewable Sources	3	3	3	3	1	2	1	2	1	1	1	2		
4	Future Fuels for IC Engines	3	2	2	2.6	2.6	3	3	1	2	1	1.4	3		

NON DEPARTMENT ELECTIVE- 2

Sl. No	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	РО 10	PO 11	PO 12	PS O1	PS O2
1	Smart Materials for Automotive Applications	2.6	2	2	2.6	2.6	3	3	1	2	1	1.4	З		
2	Industrial Safety and Hazard Management	2	-	2	-	-	2	3	-	-	-	-	3		
3	Hydrogen Engine Technology	3	2	2	2.6	2.6	3	3	1	2	1	1.4	3		

4 E-Mobility: Policy & Business	3	1	2	1	1	2	3	2	1	1	1	3	

NON DEPARTMENT ELECTIVE-3

SI. No	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
1	Automotive Safety Systems	2.2	2.2	1.8	2.8	2.2	2	1.8	1.6	1.6	2	1.8	1.8		
2	Introduction to Intelligent Transport Systems	1.8	2	1.2	2.2	0.4	0.6	0.4	1.2	0.4	1.4	1	1.4		
3	Fuel Cell Technology	2.6	1.4	2	3	-	-	-	-	-	-	1.4	2.6		
л	Sensor Technology & Sensor Fusion for														
4	Autonomous Car	0.8	0.8	0.4	0.6	0.4	0.4	0.2	0.2	-	0.2	-	-		

NON DEPARTMENT ELECTIVE- 4

SI. No	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
1	Plant Layout and Material Handling	3	2	-	1	2	-	2.6	-	-	-	2.6	-		
2	Electric Vehicle Technology-Two and Three- Wheeler	0.6	0.4	0.6	-	0.6	0.2	-	-	-	-	-	-		
3	Introduction to Self- Driving Cars	2.6	2.6	2.6	2.4	1.6	1	0.4	-	-	-	0.6	-		
4	Automotive Air-conditioning and Climate	n	1 1	2	1 4	1	1 7		1 2			1	1		
	Control.	3	1.4	2	1.4	1	1.2	-	1.2	-	-	1	T		

Note: PSO1 and PSO2 pertains to the department of the student opting for this course.

B. TECH. AUTOMOBILE ENGINEERING

GENERAL COURSE STRUCTURE & THEME

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hours Practical (P) per week	1 Credit

B. Range of Credits: In the light of the fact that a typical Model Four-year Under Graduate degree program in Engineering has about 160 credits, we have adopted 165 credits.

C. Structure of UG Program: The structure of UG program shall have essentially the following categories of courses with the breakup of credits as given:

S. No.	Course Category	Course Category	Breakup of Credits
1.	HS	Humanities & Social Science Courses	16
2.	BS	Basic Science Courses	24
3.	ES	Engineering Science Courses	19
4.	PC	Program Core Courses	57
5.	DE	Department Elective Courses	15
6.	NE	Non Department Elective Courses	12
7.	EEC	Employment Enhancement Courses	22
8.	MC	Mandatory Courses	*
		TOTAL	165
9.	HN	Honors Courses	12
10.	MN	Minors Courses	9

*Non Credit Course

CURRICULUM COURSE DISTRIBUTION (BASED ON CREDITS)

Semester	HS	BS	ES	PC	DE	NE	EEC	Total Credits per semester
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1	6	8	8					22
2	5	8	5	4				22
3	1	4	2	10	3		2	22
4	1	4		10	3	3	1	22
5	1		2	10	3	3	2	21
6	1			13	3	3	1	21
7	1		2	10	3	3	3	22
8							13	13
Total Credits	16	24	19	57	15	12	22	165

CURRICULUM COURSE DISTRIBUTION (BASED ON COURSE COUNT)

Semester	HS	BS	ES	РС	DE	NE	EEC	МС	Total Courses per semester
1	4	2	2	1					9
2	3	2	2	1				1	9
3	1	1	1	3	1		2	1	10
4	1	1		3	1	1	1	1	9
5	1		1	3	1	1	2		9
6	1			4	1	1	1		8
7	1		1	3	1	1	1		8
8							1		1
Total Courses	12	6	8	17	5	4	8	3	63

MC : Mandatory Course

CREDIT COUNT

Semester	Credit Count
1	22
2	22
3	22
4	22
5	21
6	21
7	22
8	13
	165

B. TECH. AUTOMOBILE ENGINEERING

CURRICULUM FRAMEWORK FOR SEMESTERS I TO VIII

	FRAMEWORK OF CURRICULUM 2022 (in line with NEP 2020)										
			SEMESTER – I								
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Р	с	S	тсн		
1	BS	EMA51001	Matrices and Calculus	3	0	2	4	2	5		
			Any One Course to be Opted								
2	BS	EPH51001	Engineering Physics	3	0	2	4	2	5		
		ECT51001	Engineering Materials								
3	HS	GLS51018	Professional Communication	3	0	0	1	1	3		
			Any One Course to be Opted								
		ECS51009	Programming Fundamentals using C								
4	EC	ECS51010	Programming in Python	2	0	2	2	r	Λ		
4	ES		OR	2	0	2	5	2	4		
		EME51001	Engineering Graphics and Computer Aided Design								
5	ES	EGE51002	Design Thinking	2	0	2	3	2	4		
			Any One Course to be Opted								
6	ES	EGE51406	Engineering Practices Lab	0	0	4	2	2	4		
		EGE51408	Fab Lab for Core Engineering								
		Any (One Course to be Opted (Outreach)								
7	нς	GGE51401	Outreach (NCC) – Level I #	0	0	2	1	Δ	2		
,	115	GGE51402	Outreach (NSS, Y's Men, Rotaract) – Level I #	Ū		2	-	-	۷		
		Any One Cou	rse to be Opted (Indian / foreign language)								
		GLS51008	Tamil								
		GLS51009	Hindi								
		GLS51010	Telugu								
		GLS51011	French								
Q	цс	GLS51012	German	2	0	0	2	2	2		
0	ПЗ	GLS51013	Spanish	2	0	0	2	2	2		
		GLS51014	Korean								
		GLS51015	Mandarin								
		GLS51016	Japanese								
			OR								
		GGE51001	Universal Human Values								
9	HS	GLS51017	Tamil Culture and Technology	1	0	0	1	2	1		
			Total	16	0	14	21	19	30		

Students should choose Level I and Level II of same outreach course in the semester 1 and 2 respectively.

			SEMESTER – II						
SL.	COURSE	COURSE			т	D	C	c	тсц
NO	CATEGORY	CODE	NAIVIE OF THE COORSE	L	1	P	C	3	ТСП
1	BS	EMA51002	Analytical Mathematics	3	0	2	4	2	5
			Any One Course to be Opted						
2	BS	EPH51001	Engineering Physics	3	0	2	4	2	5
		ECT51001	Engineering Materials						
3	HS	GLS51019	Advanced Communication Skill	3	0	0	1	1	3
4	PC	EAT51001	Mechanics of Rigid bodies	2	1	2	4	2	5
			Any One Course to be Opted						
		ECS51009	Programming Fundamentals using C						
_		ECS51010	Programming in Python	_	_	_	_	_	
5	ES		OR	2	0	2	3	2	4
			Engineering Graphics and Computer Aided						
		EME51001	Design						
			Any One Course to be Opted						
6	ES	EGE51406	Engineering Practices Lab	0	0	4	2	2	4
		EGE51408	Fab Lab for Core Engineering						
			Any One Course to be Opted						
		GGE51403	Outreach (NCC) – Level II #						
7	HS		Outreach (NSS, Y's Men, Rotaract) – Level II	0	0	2	1	4	2
		GGE51404	#						
		Any One Cou	rse to be Opted (Indian / Foreign language)						
		GLS51008	Tamil						
		GLS51009	Hindi						
		GLS51010	Telugu						
		GLS51011	French						
0	ЦС	GLS51012	German	2	0	0	2	2	r
0	ПЭ	GLS51013	Spanish	2	0	0	2	2	Z
		GLS51014	Korean						
		GLS51015	Mandarin						
		GLS51016	Japanese						
			OR						
		GGE51001	Universal Human Values						
			Mandatory Course I						
		***	Mandatory Course I is a Non-credit course	-		~	*	-	-
9	MC	<u>ጥ ጥ ጥ ጥ ጥ ጥ ጥ ጥ</u>	(Student shall select one course from the	3	0	U	*	2	3
			list given under Mandatory Course I)						
		1	Total	18	1	14	21	19	33

Students should choose Level I and Level II of same outreach course in the semester 1 and 2 respectively.

* Non Credit Course

		FRAMEWORK	OF CURRICULUM 2022 (in line with NEP	202	0)				
			SEMESTER – III						
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Р	с	s	тсн
1	BS	EMA51003	Partial Differential Equations and Transforms	3	1	0	4	2	4
2	HS	GLS51400	Public Speaking and Group Discussion	0	0	3	1	1	3
3	РС	EAT51002	Thermodynamics and Heat transfer	2	1	2	4	2	5
4	PC	EAT51003	Automotive Engine Technology	2	0	2	3	2	4
5	PC	EAT51004	Materials and Manufacturing Process of Automotive Components	2	0	2	3	2	4
6	DE	EAT515xx	Department Elective-1	2	0	2	3	2	4
7	ES	EGE51003	Environmental Science and Sustainable Development	2	0	0	2	2	2
8	EEC	EAT51800	Design Project – 1	0	0	2	1	6	2
9	EEC	EAT51801	Internship -1 (To be carried out in summer after 2 nd semester and evaluated in 3 rd semester)		#	<u>I</u>	1	2	0
10	МС	*****	Mandatory Course- II Mandatory Course II is a Non-credit course (Student shall select one course from the list given under Mandatory Course II)	3	0	0	*	2	3
			Total	16	2	13	22	23	31
	* Non Credit Co	ourse							
	# 15 Days Minir	num	SEMESTER – IV						
SL.	COURSE	COURSE							
NO	CATEGORY	CODE	NAME OF THE COURSE	L	Т	Ρ	С	S	тсн
1	BS	EMA51007	Probability and Statistics	3	1	0	4	2	4
2	HS	GLS51004	Professional Editing and Project Writing	2	0	0	1	1	2
3	PC	EAT51005	Mechanics of Solids and Fluids	2	1	2	4	2	5

4	PC	EAT51006	Automotive Chassis and Driveline System	2	0	2	3	2	4
5	PC	EAT51007	Two and Three-wheeler EV Technology (Industry Collaborated Course)	2	0	2	3	2	4
6	DE	EAT515xx	Department Elective-2	2	0	2	3	2	4
7	NE	Exx517xx	Non-Department Elective-1	2	0	2	3	2	4
8	EEC	EAT51802	Design Project – 2	0	0	2	1	6	2
9	HS	ETP51853	Personality Development and Soft Skill Techniques	0	0	3	2	2	3
10	МС	*****	Mandatory Course- III Mandatory Course III is a Non-credit course (Student shall select one course from the list given under Mandatory Course III)	3	0	0	*	2	3
			Total	18	2	15	24	23	35

* Non Credit Course

	FRAMEWORK OF CURRICULUM 2022 (in line with NEP 2020)											
			SEMESTER – V									
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	с	S	тсн			
1	HS	ETP51852	Logical Reasoning and Verbal Ability	1	0	2	1	1	3			
2	PC	EAT51008	Automotive System Design	2	1	2	4	2	5			
3	PC	EAT51009	Mechanics of Machines	2	0	2	3	2	4			
4	PC	EAT51010	Automotive Electrical and Electronics	2	0	2	3	2	4			
5	DE	EAT515xx	Department Elective-3	2	0	2	3	2	4			
6	NE	Exx517xx	Non-Department Elective-2	2	0	2	3	2	4			
7	EEC	EAT51803	Design Project – 3	0	0	2	1	6	2			
8	ES	EGE51004	Entrepreneurship	2	0	0	2	6	2			

9	HS	ETP51855	Problem Solving using Quantitative Techniques	1	0	2	1	2	3
10	EEC	EAT51804	Internship -2 (to be evaluated in 5 th semester. To be carried out in summer after 4 th semester))		#		1	0	0
		Tot	al	14	1	16	22	25	31
# 15 Da	ays minimum								
			SEMESTER – VI						
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	с	S	тсн
1	РС	EAT51011	Vehicle Dynamics	2	1	2	4	2	5
2	РС	EAT51012	Design and simulation of Electric and Hybrid Vehicles	2	0	2	3	2	4
3	РС	EAT51013	Control system for Automotive applications	2	0	2	3	2	4
4	DE	EAT515xx	Department Elective-4	2	0	2	3	2	4
5	NE	Exx517xx	Non-Department Elective -3	2	0	2	3	2	4
6	РС	EAT51014	Introduction to Industry 4.0	2	0	2	3	6	4
7	EEC	EAT51805	Design Project – 4	0	0	2	1	6	2
8	MC	ETP51854	Professional Skill and Ethics	0	0	3	*	2	3
	Total					17	20	24	30

	FR	AMEWORK O	F CURRICULUM 2022 (in line with	NEP 2	020)				
			SEMESTER – VII						
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	с	S	тсн
1	HS	GLS51006	English for Competitive Examinations	0	0	2	1	1	2
2	РС	EAT51015	Fundamentals of Finite Element Analysis	2	1	2	4	2	5
3	РС	EAT51016	Vehicle Diagnostics and Maintenance	2	0	2	3	2	4

4	РС	EAT51017	Advanced Vehicle Technology	2	0	2	3	2	4
5	DE	EAT515xx	Department Elective-5	2	0	2	3	2	4
6	NE	Exx517xx	Non-Department Elective-4	2	0	2	3	2	4
7	ES	EGE51005	Research Methodology & IPR	2	0	0	2	2	2
8	EEC	EAT51806	Project Phase 1	0	0	6	3	6	6
		Tota	l	12	1	18	22	19	31
			SEMESTER – VIII						
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	С	S	тсн
1	EEC	EAT51807	Project Phase - 2	0	0	26	13	10	26
Total 0 0 26						13	10	26	
	Total Credits for the Program 1						165		

MANDATORY COURSES I

	SEMESTER – II												
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	С	S	тсн				
1	МС	GGE51011	Introduction to Women and Gender Studies	3	0	0	*	2	3				
2	MC	GGE51012	Public and Personal Administration	3	0	0	*	2	3				
3	MC	GGE51013	Constitution of India	3	0	0	*	2	3				
4	MC	EGE51006	Law for Engineers	3	0	0	*	2	3				
5	MC	GGE51015	Indian Knowledge System (IKS)	3	0	0	*	2	3				

MANDATORY COURSES II

			SEMESTER – III						
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	с	S	тсн

1	МС	GGE51021	Traditional Indian Systems of Medicine and Therapies	3	0	0	*	2	3
2	MC	GGE51022	History of Science and Technology in India	3	0	0	*	2	3
3	MC	GGE51023	Political and Economic Thought for a Humane Society	3	0	0	*	2	3
4	MC	GGE51024	State, Nation-Building and Politics in India	3	0	0	*	2	3
5	MC	GGE51025	Industrial Safety	3	0	0	*	2	3

MANDATORY COURSES III

	SEMESTER – IV												
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	с	S	тсн				
1	MC	GGE51031	Principles of Management	3	0	0	*	2	3				
2	MC	GGE51032	Human Resource Management	3	0	0	*	2	3				
3	MC	GGE51033	Green Technology	3	0	0	*	2	3				
4	MC	GGE51034	Industrial Management	3	0	0	*	2	3				
5	MC	GGE51035	Fintech and Financing new Business	3	0	0	*	2	3				

MANDATORY COURSES IV

			SEMESTER – VI						
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	с	S	тсн
1	MC	ETP51854	Profesional Skill and Ethics	0	0	3	*	2	3

*Non Credit Course

DEPARTMENTAL ELECTIVES

		VERTICAL	1: ELECTRIC VEHICLE TECHNOLOGY	,					
SEM	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	с	S	тсн
3	DE	EAT51500	Electric Drives and Control	2	0	2	3	2	4

	OR											
3	DE	EAT51501	Policy for E-Mobility	2	0	2	3	2	4			
4	DE	EAT51508	Battery Technology	2	0	2	3	2	4			
			OR									
4	DE	EAT51509	Electric and Hybrid vehicles	2	0	2	3	2	4			
5	DE	EAT51516	Charging Technology	2	0	2	3	2	4			
			OR									
5	DE	EAT51517	Power Electronics for EV	2	0	2	3	2	4			
6	DE	EAT51524	Modelling and Simulation of EV	2	0	2	3	2	4			
			OR									
6	DE	EAT51525	Coding for EV	2	0	2	3	2	4			
7	DE	EAT51532	Computer Architecture and Data Analytics	2	0	2	3	2	4			
			OR									
7	DE	EAT51533	Smart Grid for EV	2	0	2	3	2	4			

	VERTICAL 2: INTELLIGENT MOBILITY												
SEM	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	С	s	тсн				
3	DE	EAT51502	Instrumentation for Intelligent Mobility	2	0	2	3	2	4				
			OR										
3	DE	EAT51503	Intelligent Transportation system	2	0	2	3	2	4				
4	DE	EAT51510	Advanced Driver Assistance System	2	0	2	3	2	4				
			OR	-									
4	DE	EAT51511	V2V and V2X Technology	2	0	2	3	2	4				
5	DE	EAT51518	ECU Model Based System Design	2	0	2	3	2	4				
			OR										
5	DE	EAT51519	Cyber security for Automotive Engineers	2	0	2	3	2	4				

6	DE	EAT51526	Automotive Safety Systems	2	0	2	3	2	4
			OR						
6	DE	EAT51527	Automotive Electronic Management System	2	0	2	3	2	4
7	DE	EAT51534	Self-Driving Cars	2	0	2	3	2	4
			OR						
7	DE	EAT51535	Pose estimation and state estimation of self-driving cars	2	0	2	3	2	4

		VERTICAL 3:	ENGINE AND VEHICLE TECHNOLO	G Y					
SEM	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	Т	Ρ	С	S	тсн
3	DE	EAT51504	Alternative Fuels and Energy Systems	2	0	2	3	2	4
			OR						
3	DE	EAT51505	Vehicle body engineering	2	0	2	3	2	4
4	DE	EAT51512	Automotive Pollution and Control	2	0	2	3	2	4
			OR						
4	DE	EAT51513	Off Road Vehicles	2	0	2	3	2	4
5	DE	EAT51520	Vehicle Design Data Characteristics	2	0	2	3	2	4
			OR						
5	DE	EAT51521	Design of Engine Exhaust system	2	0	2	3	2	4
6	DE	EAT51528	Renewable Source of Energy	2	0	2	3	2	4
			OR						
6	DE	EAT51529	Automotive Heating Ventilation Air Conditioning (HVAC)	2	0	2	3	2	4
7	DE	EAT51536	Vibration and Noise Control	2	0	2	3	2	4
			OR						
7	DE	EAT51537	Fuel Cell Technology	2	0	2	3	2	4

	VERTICAL 4: DESIGN AND MANUFACTURING											
SEM	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	С	S	тсн			
3	DE	EAT51506	Production Technology	2	0	2	3	2	4			
			OR	I								
3	DE	EAT51507	Product Design and Development	2	0	2	3	2	4			
4	DE	EAT51514	Computer Integrated Manufacturing	2	0	2	3	2	4			
			OR									
4	DE	EAT51515	Process Planning and Cost Estimation	2	0	2	3	2	4			
5	DE	EAT51522	Digital Manufacturing	2	0	2	3	2	4			
		L	OR									
5	DE	EAT51523	Industrial Automation and Robotics	2	0	2	3	2	4			
6	DE	EAT51530	Design of Experiments	2	0	2	3	2	4			
			OR	•								
6	DE	EAT51531	Industrial Engineering and Management	2	0	2	3	2	4			
7	DE	EAT51538	Computational Fluid Dynamics	2	0	2	3	2	4			
			OR			•	•					
7	DE	EAT51539	Lean Manufacturing and Six sigma	2	0	2	3	2	4			

NON-DEPARTMENTAL ELECTIVES

			Non-Department Elective-1						
SEM	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	с	S	тсн
4	NE	EAT51700	Automotive Vehicle Technology	2	0	2	3	2	4
4	NE	EAT51701	Elements of Motorsports Engineering	2	0	2	3	2	4
4	NE	EAT51702	Energy from Renewable Sources	2	0	2	3	2	4
4	NE	EAT51703	Future Fuels for IC Engines	2	0	2	3	2	4

			Non-Department Elective-2						
SEM	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	С	S	тсн
5	NE	EAT51704	Smart Materials for Automotive Applications	2	0	2	3	2	4
5	NE	EAT51705	Industrial Safety and Hazard Management	2	0	2	3	2	4
5	NE	EAT51706	Hydrogen Engine Technology	2	0	2	3	2	4
5	NE	EAT51707	E-Mobility: Policy & Business	2	0	2	3	2	4

			Non-Department Elective-3						
SEM	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	С	S	тсн
6	NE	EAT51708	Automotive Safety Systems	2	0	2	3	2	4
6	NE	EAT51709	Introduction to Intelligent Transport Systems	2	0	2	3	2	4
6	NE	EAT51710	Fuel Cell Technology	2	0	2	3	2	4
6	NE	EAT51711	Sensor Technology & Sensor Fusion for Autonomous Car	2	0	2	3	2	4

			Non-Department Elective-4						
SEM	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	С	S	тсн
7	NE	EAT51712	Plant Layout and Material Handling	2	0	2	3	2	4
7	NE	EAT51713	Electric Vehicle Technology-Two and Three-Wheeler	2	0	2	3	2	4
7	NE	EAT51714	Introduction to Self- Driving Cars	2	0	2	3	2	4
7	NE	EAT51715	Automotive Air-conditioning and Climate Control.	2	0	2	3	2	4

HONORS COURSES OFFERED BY THE DEPARTMENT

1. LIST OF COURSES UNDER THE HONORS IN MOTORSPORT ENGINEERING:

			SEMESTER - V						
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	С	s	тсн
1.	HN	EAT51900	Race Car Anatomy	3	0	0	3	1	3
			SEMESTER - VI						
2.	HN	EAT51901	Motorsport Vehicle System Design	3	0	0	3	1	3
			SEMESTER - VII						
3.	HN	EAT51902	Aerodynamics for Race Cars	3	0	0	3	1	3
4.	HN	EAT51903	Racetrack and Data Management	3	0	0	3	1	3
			Total Credits				12		

2. LIST OF COURSES UNDER THE HONOURS IN AUTOTRONICS:

			SEMESTER - V						
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Р	с	s	тсн
1.	HN	EAT51904	Perception System for Autonomous Car	3	0	0	3	1	3
			SEMESTER - VI						
2.	HN	EAT51905	Intelligent Transport system and V2V technology	3	0	0	3	1	3
			SEMESTER - VII						
3.	HN	EAT51906	Pose Estimation for Autonomous Car	3	0	0	3	1	3
4.	HN	EAT51907	State Estimation and Vehicle control for Autonomous Car	3	0	0	3	1	3
			Total Credits				12		

3. LIST OF COURSES UNDER THE HONORS IN ELECTRIC VEHICLES AND E- MOBILITY:

			SEMESTER - V						
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Р	С	s	тсн
1.	HN	EAT51908	Hybrid Vehicles	3	0	0	3	1	3
			SEMESTER - VI						

2.	HN	EAT51909	Battery Technology and Management	3	0	0	3	1	3
	SEMESTER - VII								
3.	HN	EAT51910	Advanced Propulsion System for Electric Drive Vehicles	3	0	0	3	1	3
4.	HN	EAT51911	Energy Storage Devices and Systems	3	0	0	3	1	3
					12				

Semester	Credits	S. No.	Category Code	Category Of Credits		СС	OURSE TYPE	
I	22	1	HS	Humanities & Social Science Courses	16	ТР	Theory with Practical Course	
II	22	2	BS	Basic Science Courses	24	тн	Theory Course	
	22	3	ES	Engineering Science Courses	19	PR	Practical Course	
IV	22	4	PC	Programme Core Courses	57	DP	Design Project	
V	21	5	DE	Department Elective Courses	15	PJ	Project	
VI	21	6	NE	Non Department Elective Courses	12	IN	Internship	
VII	22	7	EEC	Employment Enhancement Courses	22			
VIII	13	8	MC	Mandatory Courses	*			
Total 165				TOTAL	165			
		9	HN	Honors Courses	12			
		10	MN	Minors Courses	9			

SYLLABUS

SEMESTER - I

COURSE TITLE			1	MATRIC (Comm	ES AND	CALCU	JLUS ech)			CREDITS				4	
COURSE	EN	1A5100 2	1	COU	IRSE CA	TEGOR	Y	BS	BS L-T-P-S			3-0-2	2-2		
Version			1.0		Approv Details	al S	36 th	ACM	LE	LEARNING LEVEL			BTL-3		
ASSESSM	ENT SC	HEME													
					CIA							E	SE		
First Periodica Assessme (Theory	al nt)	Second Periodical Assessment (Theory)		A	Practica	al ents	Observ Lab rec appro th Depar Exami Comr "D	vation / cords as ved by ne timent nation nittee EC"	Atte	ndance	End Semester Examinati on (Theory)		End Semester Examinatio n (Practical)		
15%		1	5%		10%		5	%		5%	25	5%	25	5%	
Course Descriptio	on	To make the student understand the basic concepts of matrices and calculus using MATLAB													
Course Objectiv	Course1. To perform some simple operations on matricesObjective2. To give a strong foundation on the basic concepts of differentiation and integration3. To demonstrate the fundamental understanding of integrals4. To classify ordinary differential equations.5. To import the lumental understanding of equipations.							ation.							
Course Outcom	e 3	 Upon completion of this course, the students will be able to Calculate the inverse of the matrix using Cayley Hamilton theorem and diagonalize the matrix Determine the derivative and higher derivatives of a given function explicitly and integrate the standard functions using suitable differentiation and integration formulae Evaluate surface area and volume using multiple integrals Compute the solution of second order the differential equations Determine the convergence and divergence of the sequence using the appropriate texts 													
Prerequis	ites: K	nowledg	ge in cal	culus at	: high se	condar	y level.								
CO, PO AI	ND PSC	MAPP	ING												
со	PO-	PO-	PO-	PO-	PO-	PO	PO-	PO-	PO	PO-	PO-	PO-	PS	PS	
	1	2	3	4	5	-6	7	8	-9	10	11	12	0-1	0-2	
CO-1	3	3	1	2	2	-	-	-	-	-	-	1	2	1	
CO-2	2	3	2	1	1	-	-	-	-	-	-	1		2	
CO-3	3 2	2	1	2 1	2	-	-	-	-	-	-	2	2	1 2	
CO-4	י ג	2	2	1	1 2	-	-	-	-	-	-	2 1	2	1	
	5	1	: Weak	⊥ v relate	ed. 2: M	oderat	elv rela	ted and	3: Stro	nglv rel	ated	1		-	
MODULE 1: MATRICES (9L+6P)															

Characteristic (Statement or Diagonalizatio Suggested Rea Lab: Eigen val Diagonalizatio	CO-1 BTL-3							
MODULE 2: D	IFFERENTIAL AND INTEGRAL CALCULUS	(9L+6P)						
Basic Concept	s and Simple Problems in Differentiation and Integration-Partial differentiation –							
Total differen	tiation- Taylor's series – Maxima and minima of functions of two variables.							
Integration – N	Methods of integration – Substitution method – Integration by parts – Integration	CO 3						
using partial fraction – Bernoulli's formula.								
Suggested Rea	ding: Basics of differentiation and integration.	DIL-3						
Lab: Taylor's	series – Maxima and minima of functions of two variables, Integration using							
partial fractio	n							
MODULE 3: N	1ULTIPLE INTEGRAL	(9L+6P)						
Double integr	ation – Cartesian and polar co-ordinates – Change of order of integration. Area as							
a double integ	gral – Triple integration in Cartesian coordinates – Volume as a triple integral -	CO-3						
Change of vari	ables between Cartesian and polar coordinates.	BTI-3						
Suggested Rea	ading: Line Integrals							
Lab: Area and	Volume of double integration and triple integration.							
MODULE 4: O	RDINARY DIFFERENTIAL EQUATIONS	(9L+6P)						
Second orde	r differential equations with constant coefficients – Particular integrals –							
<i>e^{ax},cosax,</i> si	$nax, x^m, e^{ax}cosbx, e^{ax}sinbx$, Solutions of homogeneous differential equations	CO-4						
with variable o	coefficients – Variation of parameters.	BTL-3						
Suggested Rea	ading: Basics of Differential Equations.							
Lab: Solution	of Second order differential equations.							
MODULE 5: S		(9L+6P)						
Definition of S	Sequence and series with examples, Convergence, divergence and Oscillation of							
sequence and	series, properties, Tests for convergence of series (Comparison test, Limit	CO-5						
Comparison te	est, Integral test, Ratio test, D' Alembert's test, Alternating Series).	BTL-3						
Suggested Rea	ading: Basics of sequence and series.							
Lab: Test the	convergence and divergence.							
TEXT BOOKS	A Chandrascharze C Karithe (2010) Matrices and Calarty Dharzen Dublishi							
1.	A. Chandrasekaran, G Kavitna (2019), <i>Matrices and Calculus</i> , Dhanam Publicati	ons, 1 st Edition,						
	Chennal.							
Ζ.	B.S. Grewal (2017), Higher Engineering Mathematics, Khanna Publishers, 43° Edit	tion, New Deini.						
3.	A. P. Santhakumaran, P. Titus P (2017), <i>Engineering Mathematics – II</i> , NiMeric Publications, 2 nd							
REFERENCE DU	D. G. Duffy (2021) Advanced Engineering Mathematics with MATLAP (Advances	in Applied						
1.	<i>Mathematics)</i> , Chapman and Hall Publisher, 5 th Edition, CRC Press, USA.	т Аррпеи						
2.	M. D. Weir, Joel Hass, Thomas (2016), Calculus, Pearson Publication, 12 th Edition	, India.						
2	Srimantha Pal and S.C. Bhunia (2015), Engineering Mathematics, Oxford Universit	ty Press, 1 st						
3.	Edition, New Delhi, India.							
E BOOKS								

1.	https://www.elsevier.com/books/matrix-calculus/bodewig/978-1-4832-3214-0
2.	https://www.ebooks.com/en-er/book/209983367/matrix-calculus-kronecker-product-and- tensor-product-a-practical-approach-to-linear-algebra-multilinear-algebra-and-tensor-calculus- with-software-implementations-third-edition/yorick-hardy/
моос	
1.	https://www.coursera.org/learn/introduction-to-calculus
2.	https://nptel.ac.in/courses/111105035

COURSE TITLE	E (Common)	NGINEERING PHY to ALL branches o	YSICS of Engine	ering)		CREDITS		4						
COURSE CODE	EPH51001	COURSE CATE	GORY	BS		L-T-P-S		3-0-2-2						
Version	1.0	Approval De	etails 36 th LE		LEARNING LEVEL		BTL3							
ASSESSMENT SCH	EME													
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"			Attendance	End Semester Examination							
							Th	eory 25%						
15%	15%	10%	10% 5%			5%	Practical							
Course Description Course Objective	 This course is based on the developing areas of physics integrating both the theoretical and practical training for engineering students. Application of the concepts to solve engineering problems, to acquire practical thinking and logical reasoning. 1. To evaluate various types of modulus of elasticity and impart knowledge on production and application of ultrasonic wave in SONAR and NDT. 2. To provide a strong foundation on the concepts of crystal physics and thermal conductivity. 3. To illustrate theoretically and experimentally the wave – particle duality. 4. To evaluate the material properties based on energy band gap and magnetic moment. 5. To make the students understand the production of lasers and propagation of light through an optical fiber. 													
Course Outcome	 Upon completion of this course, the students will be able to Evaluate the elastic properties of materials and apply the properties of ultrasonic waves for industrial applications Evaluate the characteristics of crystal structure and the thermal conductivity of good and bad conductors. Solve the Schrodinger's wave equations and derive energy density based on Planck's hypothesis Apply the fundamental concepts to classify magnetic and semiconducting materials and thereby, illustrate their applications. 													
	5. Apply lasers and optical fibers as engineering tools													
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Prere	quisites	: Knowle	edge in t	fundam	entals o	f Physic	s at high	ner seco	ndary le	vel				
CO, P	O AND F	SO MA	PPING											
	PO	РО	PO	PO	РО	PO	PO	РО	РО	РО	PO	PO	PSO	PSO
со	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	1	1	1	-	-	-	2	-	-	2	1	2
CO2	3	3	2	2	3	-	-	-	3	-	-	3	2	1
CO3	3	3	1	1	1	-	-	-	2	-	-	2	1	2
CO4	3	3	1	2	1	-	-	-	3	-	-	1	1	3
CO5	3	3	2	1	3	-	-	-	3	-	-	3	2	2
	1: Weakly related, 2: Moderately related and 3: Strongly related													
MODULE 1: PROPERTIES OF MATTER AND ULTRASONICS								(9L +	· 6P)					
Elasticity – Hooke's law – Elastic Moduli – Young's modulus of elasticity – Rigidity modulus - Bulk														
modul	lus – Tw	isting co	ouple on	a wire ·	– Torsio	nal pen	dulum –	Detern	nination	of rigio	lity mod	lulus of		
a wire	– Depre	ession of	f a canti	lever – I	Non-uni	iform be	ending –	Uniforr	n bendi	ng – I sl	nape gir	der.		
Introd	luction ·	- Produ	iction of	t ultrasc	onic way	ves (Ma	gnetost	riction a	and Pie	zoelect	ric meth	nods) –	С	01
Prope	rties of i	ultrason	іс — Арр	lication	s in SOP	NAR and	NDI.						B	TL3
Practi	cal com	ponent	Dotor	minatio	o of rigi	ditu ma	م مارید	f thin	ura and		at of in	ortia of		
Iorsional pendulum – Determination of rigidity modulus of thin wire and moment of inertia of														
regular objects														
MODULE 2: CRYSTALLOGRAPHY AND THERMAL PHYSICS								(91 +	6P)					
Amorphous and crystalline solids – Unit cell – Lattice parameters – Crystal system and Bravais									017					
lattice	s (Quali	tative)	– Mille	r indice	s – Inte	erplanar	spacin	g for cu	ubic crv	stal sv	stem –	Crystal		
structi	ures SC	C, BCC,	FCC, H	CP (no.	of ato	ms, coc	ordinatio	on num	ber, ato	omic pa	acking f	raction		
calcula	ations) –	Bragg's	s law – X	(-ray dif	fractom	eter.							С	02
Therm	nal cond	uctivity	– Expe	rimenta	l deteri	minatior	n of the	rmal co	nductiv	ities of	good a	nd bad	B	TL3
condu	ctors – I	orbe's i	method	(Theory	/ and ex	perimer	nt) – Lee	e's disc r	nethod	for bad	conduc	ctors.		
Practi	cal com	ponent												
Lee's	disc exp	eriment	: – Dete	rminatio	on of the	ermal co	onductiv	ity of ba	ad cond	uctor				
MOD	ULE 3: Q	UANTU	M PHYS	SICS									(9L +	6P)
Black	body ra	diation	– Plancl	c's hypo	thesis –	Photoe	lectric e	effect –	Compto	n effec	t – Theo	ory and		
experi	mental	verificat	ion											
Physic	cal signif	icance	of wave	functio	on – Scł	nrodinge	er's wav	e equat	tion – T	ime inc	lepende	ent and	C	03
time d	epende	nt equa	tions – I	Particle	in a 1D	box – Qı	uantum	Well (n	o deriva	tion)			B	TL3
Practi	cal com	ponent	.											
Photoelectric effect – To plot the KE as a function of frequency for different metals.								(0)	<u>(D)</u>					
Maria	otic mar			D SEIVII	f		oriala //		a forme	ant: f		Domeir	(9L +	6P)
theor	etic mo	ment –			r magno	etic mat	eriais (i ft magn	Jia, par	a, terro, toriale	Anti-te	erro) — I ny annliy	Domain		
Classifi	ication o	f semic	onducto	ysteresi vrs – Dire	act and	in_direct	t handa	euc IIIdi an - Fer	mi ener		i y appilo _ Intrin	sic and		04
extrine	icación C	conduct	tors –	n-tyne	and n-		micondi	ictors /	Oualita	by level	Hall o	ffect -		С- ТI 3
Detern	nination	of Hall	voltage	(Theory	and ex	nerimer	nt) – Ani	olication	s of Hal	l effect		incot ·		
Practic	al comp	onent:		(eery			וייי יי							

Curren								
MOD	ULE 5: MODERN OPTICS	(9L + 6P)						
Princi	ples of laser – Stimulated absorption – Spontaneous emission – Stimulated emission –							
Popula	ation inversion – Pumping action – Active medium – Laser characteristics – Nd-YAG laser –							
CO ₂ las	ser – Dye laser – Laser in Industrial applications.							
Optical fiber – Principle and propagation of light in optical fibers – Numerical aperture and								
accept	tance angle – Types of optical fibers – Optical fiber as temperature sensors.	BTL3						
Practi	cal component:							
La	aser – Determination of the wavelength of the laser using grating							
La	aser – Particle size determination using lycopodium powder							
TEXT B	BOOKS							
1	Rajendran V. (2017), <i>Engineering Physics</i> , Tata McGraw Hill Publications, 3 rd Edition, US.							
2	Gaur R. K. and Gupta S.L. (2014). Engineering Physics, 8th edition, Dhanpat Rai publications (P) Ltd., New							
Delhi								
3	3 Mani P. (2016), <i>Engineering Physics</i> , Dhanam Publications, 13 th Edition, Chennai.							
REFER	ENCE BOOKS							
1.	Arthur Beiser (2017), Concepts of Modern Physics, Tata McGraw Hill Publications, 7 th Edition	n, US.						
2.	Halliday, Resnick and Walker (2021), Fundamental of Physics Extended, Wiley & Sons, 12th	Edition, US.						
2	Shaikh I. A, Kulkarni H. R, Mohril, S. F. and Khairnar (2018), Engineering Physics, Nira	ali Prakashan						
5	Publishers, 5 th Edition, Pune.							
E BOOI	KS							
1	https://industri.fatek.unpatti.ac.id/wp-content/uploads/2019/03/042-Fundamentals-of-Ph	nysics-II-						
1.	Electromagnetism-Optics-and-Quantum-Mechanics-RShankar-Edisi-1-2016.pdf							
2.	2. https://zenodo.org/record/243407#.Y0EfilxBzIU							
3.	https://salmanisaleh.files.wordpress.com/2019/02/physics-for-scientists-7th-ed.pdf							
MOOC								
1.	http://nptel.ac.in/courses/115106061							
2.	http://nptel.ac.in/courses/117101054/12							

COURSE TITLE	EN (C	GINEERING MATE ommon to ALL B.T	RIALS ech.)		CREDI	TS	4		
COURSE CODE	ECT51001	COURSE CATEGORY		BS	L-T-P-S	5	3-0-2-2		
Version	1.0	Approval Details 36 th ACM			LEARNING LEVEL		BTL-3		
ASSESSMENT SCHEME									
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	(red by	Dbservation / cords as appr / the Departr Examinatio committee "D	' lab roved nent n DEC"	Attendance	ESE		
15%	15%	10%		5%		5%	Theory 25% Practical 25%		

Course		То ехр	To expose the students to the basics of Engineering Materials and their applications.											
Descript	lion	1 Te		ام ما م			ما خام م						-	
Course Objectiv	re	 To provide a knowledge on the theoretical basis of the chemical composition, prop applications of abrasives, adhesives, lubricants and refractories. To give a strong foundation on the basic concepts of nanomaterials, the general methods with emphasis on their applications. To provide an exposure on the fundamentals and applications of polymeric mat composites. To illustrate the applications of energy materials, liquid crystals and conducting with a good exposure on their basic terminologies. Upon completion of this course, the students will be able to 									e. roperti eral syr materia ting pol	es and othetic Is and ymers		
Course Outcom Prereau	e Jisites:	 Upon completion of this course, the students will be able to Propose and justify suitable metals/materials for alloying. Distinguish and select a suitable material as abrasives / adhesives / lubricants / refractories based on its properties and applications. Select an appropriate technique for nanomaterial synthesis and characterization. State and select a suitable polymeric / composite material for industrial applications. Develop the suitable organic/inorganic materials that can be employed in energy storage / production and electronic devices. Es: Knowledge in fundamentals of chemistry at higher secondary level. 												
CO, PO AND PSO MAPPING														
	PO	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO	PO-	PO-	PS	PSO
со	-1	2	3	4	5	6	7	8	9	-10	11	12	0-1	-2
CO-1	3	2	2	-	-	-	1	-	-	-	-	1	1	2
CO-2	3	2	1	-	-	-	2	-	-	-	-	2	2	2
CO-3	3	2	2	-	-	-	1	-	-	-	-	3	1	1
CO-4	3	2	1	-	-	-	2	-	-	-	-	2	2	2
CO-5	3	2	1	-	-	-	2	-	-	-	-	2	2	1
1: Weal	kly rela	ted, 2: N	/loderat	tely rela	ited and	d 3: Stro	ongly re	lated						
MODUL	.E 1: CR	YSTAL S	TRUCT	JRE AN	D PHAS	E RULE							(9L +	· 6P)
Basic crystal systems – Types, characteristics, examples – Space lattice, Unit cell – types – X-ray diffraction and crystal structure. Phase rule: Basic terminology - Derivation of Gibbs Phase rule- Phase diagrams: One component system (water), Two component system –- Reduced phase rule: Simple Eutectic system, examples, Phase diagram: Ag-Pb system, Pb-Sn system – Applications of phase rule. CO-1 Practical components: Construction of phenol-water phase diagram - Determination of apparent density of porous solids. CD-1														
MODUL	.E 2: AE	BRASIVE	S, ADHE	SIVES,	LUBRIC	ANTS A	ND REFI	RACTOF	RIES				(9L +	6P)
MODULE 2: ABRASIVES, ADHESIVES, LUBRICANTS AND REFRACTORIES (5) Abrasives - Classification, Properties, Uses - Adhesives - Development of Adhesive strength, Physical and Chemical factors influencing adhesive action, Classification of Adhesives - Epoxy Resin (Preparation, Properties and Applications) - Lubricants - Mechanism of Lubrication, Classification and Properties, Semi Solid Lubricants, Solid Lubricants, MoS2 and Graphite - Refractories - Classification, Properties, Applications. Practical components: Preparation of urea-formaldehyde resin - Determination of porosity of a									CO-J BTL-	2 -3				

MODUI	LE 3: NANOMATERIALS	(9L + 6P)				
Introdu	ction – Scope of nanomaterials - Types of nanomaterials - Synthesis of Nanomaterials -					
Bottom	up and Top-down approaches – Methods of preparation – Laser ablation, Sol-gel process,					
Gas-pha	se condensation, Chemical Vapour Deposition. Properties – Optical, Electrical, Magnetic,	CO 3				
Chemica	al properties (introduction only). Characterization – UV-Visible spectroscopy, FE-SEM and					
TEM (Pr	inciple and Applications only).	DIL-3				
Practica	al components: Preparation of ZnO nanoparticles by wet chemical method – Verification of					
Beer-La	mbert's law using silver nanoparticles.					
MODUI	E 4: POLYMERS AND COMPOSITES	(9L + 6P)				
Introdu	ction – Basic definitions – Classification of polymers – Structure and property relationship					
of polymers – Plastics – Synthesis, properties and applications of polycarbonates and phenol-						
formaldehyde - Biodegradable Polymers, examples and applications. Composites - Introduction -						
Definitio	on – Constituents – Classification - Fiber-reinforced Composites –Types and Applications.	BTL-3				
Practica	I components: Determination of molecular weight / viscosity of polymer using Ostwald					
Viscome	ter.					
MODUI	E 5: MATERIALS FOR ENERGY AND ELECTRONIC APPLICATIONS	(9L + 6P)				
Energy	storage materials – Metal-hydride batteries, Li-batteries - Materials for solar cells: Semi-					
conductors - Materials for hydrogen technology - production (electrolysis), storage (hydrides), fuel						
cells. Liquid Crystals - Introduction – Characteristics – Optical properties- Classification – Chemical						
constitution and liquid crystalline behaviour - Applications. Conducting Polymers: Classification,						
Intrinsic Conducting Polymers, Extrinsic Conducting Polymers, Applications.						
Practica	al components: Preparation of polyaniline / Polypyrrole.					
TEXT BO	OKS					
1	Jain, P.C., Jain, M. (2018). Engineering Chemistry, Dhanpat Raj Publishing Company (P) Ltd	, New Delhi,				
1.	17 th Edition.					
2	Puri, B. R., Sharma, L. R., Pathania, M. S. (2020). Principles of Physical Chemistry, Vishal Pu	ublishing Co.				
Ζ.	Jalandhar, 47 th Edition.					
3.	Rangwala. (2017). Engineering Materials, Charotar Publishing House Pvt. Ltd, 43 rd Edition.					
REFEREN	CE BOOKS					
1	Clyne, T. W., Hull, D. (2019). An introduction to composite materials, Cambridge Universi	ity Press, 3 rd				
1.	Edition.					
2.	Shah, M. A., Ahmad, T. (2021). Nano Science & Technology, Dreamtech Press, 2021 Edition	۱.				
3.	Palanna, O. G. (2018). Engineering Chemistry, Mc Graw Hill Education (India) Pvt. Ltd, 2 nd E	Edition.				
E BOOK	S					
1.	http://www.erforum.net/2016/01/engineering-chemistry-by-jain-and-jain-pdf-free-ebook	.html				
2.	https://abmpk.files.wordpress.com/2014/02/book_maretial-science-callister.pdf`					
MOOC						
1.	https://www.edx.org/course/materials-science-engineering-misisx-mse1x					
2.	https://www.mooc-list.com/tags/materials-science					

COURS	SE TITLE		PROFESSIONAL COMMUNICATION							CRED	TS		1	
COURS	SE COD	E	GLS	51018		COUR	SE CATI	EGORY	HS		L - T - I	P – S	3- 0	-0- 1
Versio	n C)1	APP DE	ROVAL FAILS		42 nd	ACM, 2	6 th Oct.	2024	LE	ARNING	LEVEL	В	TL 4
						ASSESSI	IENT S	CHEME						
			(Continu	ous Ir	nternal A	ssessm	ent (CIA)					ESE
First Periodic al Assessm ent	Ser Peri Asse	cond odical essme nt	d Weekly assignment as approved by the Department Examination Committee "DEC" C			Surr as a Co	orise Te approve Depart Examin mmitte	st / Qui ed by th ment ation e "DEC"	z., e ,	Atten	dance	Th	eory	
15 %	1	5 %		10)%			5 %	6		5	%	5	0 %
Cour Descrip	rse otion	writt corre will la The build and f	written communication, with a strong emphasis on developing accurate and grammatically correct language usage. The focus is on grammar exercises, and practical application, students will learn to articulate ideas clearly while adhering to proper English syntax and conventions. The course covers essential aspects such as grammar review and practice, vocabulary building, pronunciation and articulation, writing skills, speaking practice, and error analysis and feedback, aiming to improve students' accuracy in language usage and enable them to communicate effectively in academic, professional, and social contexts.											
Cour Objec	se tive	imp 2. It f tar, 3. Add pra 4. Fur cor 5. By	proving focuses geted gi ditionall acticing thermo acisely in the end	their gra on dev rammar y, the c clear an re, it ai n variou of the	amma velopin exerc course d effe ms to s forn course	r usage a ng accura ises and emphas ctive com improve ns of writ e, studen	nd voca ate and practica izes the nmunica studen ten con ts will b	abulary. I gramr al applic import ation. nts' wri nmunica be able	natically ation. tance of ting skil ation. to comi	y corre f pronu lls by l munica	ect lang unciation earning te effec	uage us n and an to write tively ar	age th ticulati e clearl nd accu	rough on by y and rately
Cour Outco	rse ome	 Upon completion of this course, the students will be able to Demonstrate the skills of framing simple sentences without grammatical errors. Illustrate proficiency in using verb tenses, active and passive voice, and modal verbs accurately. Apply their knowledge of future tenses, infinitives and gerunds, and conditionals to express hypothetical and real-life situations. Make use of their knowledge of transforming, identifying, correcting and expressing to communicate accurately in various contexts. Apply the knowledge of the different types of sentences in enhancing the clarity and coherence in their communication 									verbs als to ing to y and			
Prerequi	sites:	Plus Tw	o Englis	h-Interr	media	te Level								
CO AND	PO M	APPIN	3											
~~~	РО	РО	РО	РО	PO	PO	РО	РО	РО	РО	РО	РО	PS	PS
	1	2	3	4	5	6	7	8	9	10	11	12	01	02
CO1	-	-	-	-	-	-	-	-	2	3	-	3	1	1
CO2	-	-	-	-	-	-	-	-	2	3	-	3	0	2
03	-	-	-	-	-	-	-	2	2	3	-	3	1	1

CO4	-	-	-	-	-	-	-	2	2	3	2	3	0	2
CO5	-	-	-	-	-	-	-	2	2	3	2	3	1	1
		:	1: Weak	dy relat	ed, 2: N	/lodera	tely rela	ated an	d 3: Stro	ongly re	elated			
MODUI	LE 1 : Ba	sics of	Commu	inicatio	n									(9L)
<ul> <li>Grammar: Parts of Speech – Identification and Transformation – suffixes. Kinds of Sentences – Identification and Transformation. Sentence Pattern – Identifying and Framing Simple Sentences. Articles. Prepositions Vocabulary : Computer terms; email and website terms - Adverbs Denoting updates -Adjectives for Compound Noun Time Management Writing : Writing a Self Introduction - Writing letters as a student in an institution Reading : Introduction to Communication - Communication Process Lab : (Speaking) : Self Introduction (Listening) : Various Self Introductions</li> <li>MODULE 2 : Time Expressions</li> <li>Grammar: Tenses: Introduction to verbs - Types, Forms ; regular and irregular verbs. Tenses – Rules and its usage – Present tenses: simple present, present continuous, present perfect, present perfect continuous - Past tenses: simple past, past continuous, past perfect, past perfect continuous. – Time expressions Vocabulary : Verbs to Describe process - Vocabulary to talk about advertising and marketing. Writing : Topic Sentence - Paragraph Writing - Writing an essay Reading: Verbal &amp;</li> </ul>								- es. bs elf to es ct - nd	(9L) CO-1 BTL-2 (9L)					
marketing. Writing : Topic Sentence - Paragraph Writing - Writing an essay <b>Reading</b> : Verbal & Nonverbal Communication - Types of Communication - Barriers in Communication Lab: Practicum(Speaking) : A Discussion on the impact of technology on human life. (Listening) : Talks on Technology									& ):	BTL-2				
MODUI	LE 3 : E	xpressi	ng the I	Future										(9L)
<b>Grammar:</b> Future Tenses : simple future , future continuous, future perfect, future perfect continuous - Active and Passive Voice – Identifying the voices and Transforming Active to passive and passive to active - Modal Verbs to express modalities: in active and passive voices <b>Vocabulary</b> : Vocabulary for travel - Synonyms and Antonyms <b>Writing:</b> A letter(Email) of invitation – Accepting the invitation and declining the invitation - Writing a Product description <b>Reading</b> : Past and Present Technologies - The future of Technology: predictions.								ct ve ry ng nt	CO-3 BTL-3					
MODUI	F 4 : (	Context	ualizing	, ,	idiai c j	Jians. (L		<b>5</b> 7. DC3C		produc				(91)
Gramma - Condi instruct Manage Reading Lab : (Sp	ar: Infin tionals - ion to ro ment - g: .Barri peaking	itives a – Three ecomm Reporti iers in C ): Role	nd geru types o endatio ing Verl commur Play : In	nds – us of condi on and r os <b>Writ</b> nication terview	ing infin tionals ecomm i <b>ng :</b> W - Globa ing som	nitives a 3. Instru endatic riting a al Warn neone a	and geru uctions on to ins user m ning bout a j	unds in s and Ree struction anual - job char	sentenc comme n <b>Voca</b> Email : nge <b>(Lis</b>	es as dit ndation abulary Reques tening)	fferent of s – Tran : Affixe sting inf	element nsformin s - Glob formatio	ts. ng bal on	CO-4 BTL-3
MODUL	E5:Cl	arity ar	nd Cohe	rence										(9L)
<b>Grammar</b> : Concord: Identifying the error and Correcting the errors - Adjectives: Degrees of Comparison - Discourse Markers : application of discourse markers in the sentences. <b>Vocabulary</b> : Describing Trends - Finance Vocabulary - Phrasal Verbs <b>Writing</b> : Writing an Argumentative essay - Summary writing <b>Reading</b> : Describing Statistics - Company finances, investments and starting up <b>Lab</b> : <b>(Speaking)</b> : Discussing qualities needed in candidates for a job vacancy <b>(Listening)</b> Tips to enhance the employability skills							of <b>/:</b> p to	CO-5 BTL-4						
ТЕХТ ВООК														
1Doff, A., Thaine, C., Puchta, H., Stranks, J., & Lewis-Jones, P. (2023). Empower Second Edition. Cambridge University Press & Assessment. New Delhi.								tion.						
REFEREN	NCE BO	OKS												
1.	Murph	y, Raym	nond.(20	021). Es	sential	English	Gramm	ar, Cam	nbridge	Univers	ity Pres	s. India	(Page	300)
2. Redman, Stuart.(2020). English Vocabulary In Use: Pre - Intermediate And Intermediate. Car University Press. India (Pages 264)									nbridge					

3.	Bikram K. Das. et al., (2019) An Introduction to Professional English and Soft Skills with audio CD,										
	Cambridge University Press. India (Pages 272)										
4.	John, Dolly., (2018), English for Life and the Workplace Through LSRW&T Skills, Pearson										
	Publications.India (Pages 263)										
E BOOK	KS										
1.	https://www.cambridge.org/gb/files/9116/4138/4615/A1_Student_Book.pdf										
2.	https://www.cambridge.org/gb/files/1416/4138/4681/A1_Workbook.pdf										
3.	https://www.cambridge.org/gb/files/7216/4138/1999/A2_Student_Book.pdf										
4.	https://www.cambridge.org/gb/files/6816/4138/2072/A2_Workbook.pdf										
MOOC											
1.	https://www.edx.org/professional-certificate/tsinghuax-english-communication-skills										
2.	https://www.britishcouncil.org.tr/en/english/mooc/english-for-the-workplace										

COURSE TITLE	PROGRAMM	ING FUNDAMENTA	LS USING C	CREDITS	3					
COURSE CODE	ECS51009	COURSE CATEGORY	ES	L-T-P-S	<b>2- 0- 2</b> -	· 2				
VERSION	1.0	APPROVAL DETAILS	36 th ACM	LEARNING LEVEL	BTL-5	6				
ASSESSMENT	SCHEME				1					
		CIA	1 .	T	ESE					
First Periodical Assessment (Theory)	First Second Periodical Periodical Practical Assessment Theory) (Theory) Assessments Department 15% 15% 10% 5%			Attendance	Theory	Practical				
15%	15%	10%	5%	5%	25%	25%				
Course Description	To introduce computers and programming in C and also explore the power of computational techniques that are currently used by engineers and scientists and to develop programming skills with reasonable complexity.									
Course Objective	<ol> <li>To acquire the basic knowledge in computer hardware, programming languages and Problem- solving techniques.</li> <li>To learn the fundamentals of C programming.</li> <li>To gain knowledge in Functions, arrays and strings in C programming.</li> <li>To understand the pointers, Structures and Union in C programming</li> </ol>									
Course Outcome Prerequisites	5. To gain knowledge on Embedded Programming and real time applications of C Programming.         Upon completion of this course, the students will be able to         1. Describe the basics of digital computer and programming languages.         2. Demonstrate problem solving techniques using flowchart, algorithm/pseudo code to solve the given problem.         3. Design and Implement C program using Control Statements and Functions.         4. Design and Implement C program using Pointers and File operations.         5. Identify the need for embedded C and C Programming in real-time applications.									

CO, PC	AND P	SO MAI	PPING											
	PO -									PO-	PO-	PO-	PSO-	PSO-
co	1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	10	11	12	1	2
CO-1	2	2	2	-	-	2	-	2	-	-	1	2	2	1
CO-2	3	3	3	2	2	1	-	2	2	1	-	1	1	2
CO-3	3	3	3	2	2	2	-	1	3	3	2	1	2	1
CO-4	3	3	3	2	-	-	-	-	-	-	1	-	2	2
CO-5	1	1	1	-	1	2	-	1	-	-	-	2	2	1
			1: We	akly rel	ated, 2:	Moder	ately re	lated ar	nd 3: Str	ongly re	elated			
MODU	ILE 1: PF	ROGRA	MMING	LANGU	AGES A	ND PRO	BLEM-S	OLVING	<b>TECHN</b>	IIQUES			(6L+	6P)
Introd	uction -	– Funda	amental	s of di	gital co	mputer	s - Pro	grammi	ng lang	uages	-Progra	mming		
Paradigms – Types of Programming Languages – Language Translators – Problem Solving														
Techniques: Algorithm – Flow Chart - Pseudo code.														
Practical Component														
Draw Flowcharts using E- Chart & Write pseudo code for the following problems								1						
1. Grea	atest of	three n	umbers										ВТ	-1
2. Sum	of N nu	umbers											ы	L-4
3.Com	putatio	n of nCr												
Softwa	are Req	uired: G	icc											
Sugges	sted Rea	adings:	https://	www.sii	mplilear	n.com/t	tutorials	s/progra	mming	tutorial	/proble	<u>m-</u>		
solving-in-programming														
MODULE 2: FUNDAMENTALS OF C								(6 L+	· 6 P)					
Evolut	Evolution of C -Why C language - Applications of C language - Data Types in C – Operators and													
Expressions – Input and Output statements in C – Decision Statements – Loop Control Statements.														
Practio	al Com	ponent												
1. Prog	gram to	illustrat	e arithn	netic an	d logica	l operat	ors							
2. Prog	gram to	read an	d print (	data of o	differen	t types								
3. Prog	gram to	calculat	e area a	and volu	me of v	arious g	geometr	ical sha	pes				cc	)-2
4. Prog	gram to	comput	e bigge	st of thr	ee num	bers							BT	L-4
5. Prog	gram to	print m	ultiplica	tion tab	le									
6. Prog	gram to	convert	days to	years,	months	and day	/S							
7.Prog	ram to f	find sum	n of the	digits of	^f an inte	ger								
Softwa	are Req	uired: G	icc											
Sugges	sted Rea	adings:	https://	www.w	3school	s.com/c	/c_intro	<u>p.php</u>						
MODU	ILE 3: FL	JNCTIO	NS, ARR	AYS, ST	RINGS								(6 L+	6 P)
Function	ons – St	orage C	lass – Ai	rrays – S	Strings a	nd stan	dard fui	nctions -	Pre-pro	ocessor	Statem	ents.		
Practic	al Com	ponent	:											
1. Prog	gram to	comput	e Facto	rial, Fibo	onacci s	eries an	d sum o	f n num	bers usi	ing recu	rsion			
2. Prog	gram to	comput	e sum a	nd aver	age of N	Numb	ers stor	ed in an	array					
3. Prog	gram to	sort the	e given r	numbe	ers store	d in an	array							
4. Prog	gram to	search f	for the g	given ele	ement ir	n an arra	ау						CO	-3
5. Prog	gram to	do word	d count										BTL	-4
6. Prog	gram to	insert a	substri	ng in a s	tring									
7. Prog	gram to	concate	enate an	id comp	are two	strings								
8.Prog	ram usii	ng pre-p	orocesso	or stater	nents	-								
Softwa	are Req	uired: G	icc											
Sugges	sted Rea	adings:	https://	<u>cppgui</u> d	<u>e.read</u> t	<u>nedocs</u> .i	io/en/la	test/cp	<u>o/array</u> .	<u>html</u>				
MODU	MODULE 4: POINTERS. STRUCTURES AND UNION									_		1	(6 L+ 6	5 P)

Pointers	<ul> <li>Dynamic Memory allocation – Structure and Union – Files.</li> </ul>	
Practical	Component	
1. Progra	m to compute sum of integers stored in a 1-D array using pointers and dynamic memory	
allocation	1	
2. Progra	m to read and print records of a student/payroll database using structures	CO-4
3. Progra	m to simulate file copy	BTL-4
4. Progra	m to illustrate sequential access file	
5.Program	n to illustrate random access file	
Software	Required: GCC	
Suggeste	d Readings: <u>https://www.ibm.com/docs/en/zos/2.4.0?topic=types-structures-unions</u>	
MODULE	5: APPLICATIONS OF C	(6L+ 6P)
Structure	of embedded C program - Data Types - Operators - Statements - Functions - Keil C	
Compiler		
Game de	velopment using c - Analysing the environment - Snake game - Tic-Tac-Toe - flappy bird.	
Practical	component: Simple programs using embedded C-Game Development using C	CO-5
Software	Required: GCC	BTL-4
Suggeste	d Readings: <a href="https://www.interviewbit.com/blog/applications-of-c-programming-">https://www.interviewbit.com/blog/applications-of-c-programming-</a>	
<u>language</u>	<u>/</u>	
	JKS Ashali Karathana "Commuter Drammine" Desreen Education 7th Edition Inc. 2017	
1.	Ashok Kamthane, Computer Programming, Pearson Education, /th Edition, inc 2017.	
Ζ.	Wark Siegesmund, "Embedded C Programming", first edition, Eisevier publications, 20.	1.4
2		14.
3.	Robert Marmelstein, "Programming Games in C"	14.
3. REFEREN	Robert Marmelstein, "Programming Games in C" CE BOOKS	14.
3. <b>REFEREN</b> 1.	Robert Marmelstein, "Programming Games in C" <b>CE BOOKS</b> Jeyapoovan T, "Fundamentals of Computing and Programming in C", Vikas Publishing h	14. nouse, 2015.
3. <b>REFEREN</b> 1. 2	Robert Marmelstein, "Programming Games in C" <b>CE BOOKS</b> Jeyapoovan T, "Fundamentals of Computing and Programming in C", Vikas Publishing H Yashavant Kanetkar, "Let us C", 15th edition, BPP publication, 2016.	14. nouse, 2015.
3. <b>REFEREN</b> 1. 2 3	Robert Marmelstein, "Programming Games in C" <b>CE BOOKS</b> Jeyapoovan T, "Fundamentals of Computing and Programming in C", Vikas Publishing h Yashavant Kanetkar, "Let us C", 15th edition, BPP publication, 2016. S. Sathyalakshmi, S.Dinakar, "Computer Programming Practicals – Computer Lab Manu	14. nouse, 2015. al", Dhanam
3. <b>REFEREN</b> 1. 2 3	Robert Marmelstein, "Programming Games in C" <b>CE BOOKS</b> Jeyapoovan T, "Fundamentals of Computing and Programming in C", Vikas Publishing h Yashavant Kanetkar, "Let us C", 15th edition, BPP publication, 2016. S. Sathyalakshmi, S.Dinakar, "Computer Programming Practicals – Computer Lab Manu Publication, First Edition, July 2013.	14. nouse, 2015. al", Dhanam
3. <b>REFEREN</b> 1. 2 3 <b>E BOOKS</b>	Robert Marmelstein, "Programming Games in C" <b>CE BOOKS</b> Jeyapoovan T, "Fundamentals of Computing and Programming in C", Vikas Publishing h Yashavant Kanetkar, "Let us C", 15th edition, BPP publication, 2016. S. Sathyalakshmi, S.Dinakar, "Computer Programming Practicals – Computer Lab Manu Publication, First Edition, July 2013.	14. nouse, 2015. al", Dhanam
3. <b>REFEREN</b> 1. 2 3 <b>E BOOKS</b> 1.	Robert Marmelstein, "Programming Games in C" <b>CE BOOKS</b> Jeyapoovan T, "Fundamentals of Computing and Programming in C", Vikas Publishing h Yashavant Kanetkar, "Let us C", 15th edition, BPP publication, 2016. S. Sathyalakshmi, S.Dinakar, "Computer Programming Practicals – Computer Lab Manu Publication, First Edition, July 2013. <u>https://en.wikibooks.org/wiki/C_Programming</u>	l4. nouse, 2015. al", Dhanam
3. <b>REFEREN</b> 1. 2 3 <b>E BOOKS</b> 1. <b>MOOC</b>	Robert Marmelstein, "Programming Games in C" <b>CE BOOKS</b> Jeyapoovan T, "Fundamentals of Computing and Programming in C", Vikas Publishing h Yashavant Kanetkar, "Let us C", 15th edition, BPP publication, 2016. S. Sathyalakshmi, S.Dinakar, "Computer Programming Practicals – Computer Lab Manu Publication, First Edition, July 2013. <u>https://en.wikibooks.org/wiki/C_Programming</u>	l4. nouse, 2015. al", Dhanam
3. <b>REFEREN</b> 1. 2 3 <b>E BOOKS</b> 1. <b>MOOC</b> 1.	Robert Marmelstein, "Programming Games in C" <b>CE BOOKS</b> Jeyapoovan T, "Fundamentals of Computing and Programming in C", Vikas Publishing h Yashavant Kanetkar, "Let us C", 15th edition, BPP publication, 2016. S. Sathyalakshmi, S.Dinakar, "Computer Programming Practicals – Computer Lab Manu Publication, First Edition, July 2013. <u>https://en.wikibooks.org/wiki/C_Programming</u> <u>https://onlinecourses.nptel.ac.in/noc18-cs10/preview</u>	14. house, 2015. al", Dhanam
3. <b>REFEREN</b> 1. 2 3 <b>E BOOKS</b> 1. <b>MOOC</b> 1. 2.	Robert Marmelstein, "Programming Games in C"         CE BOOKS         Jeyapoovan T, "Fundamentals of Computing and Programming in C", Vikas Publishing F         Yashavant Kanetkar, "Let us C", 15th edition, BPP publication, 2016.         S. Sathyalakshmi, S.Dinakar, "Computer Programming Practicals – Computer Lab Manu         Publication, First Edition, July 2013. <a href="https://en.wikibooks.org/wiki/C Programming">https://en.wikibooks.org/wiki/C Programming</a> <a href="https://onlinecourses.nptel.ac.in/noc18-cs10/preview">https://onlinecourses.nptel.ac.in/noc18-cs10/preview</a> <a href="https://nptel.ac.in/courses/106105085/2">https://nptel.ac.in/courses/106105085/2</a>	14. nouse, 2015. al", Dhanam
3. <b>REFEREN</b> 1. 2 3 <b>E BOOKS</b> 1. <b>MOOC</b> 1. 2. 3.	Robert Marmelstein, "Programming Games in C"         CE BOOKS         Jeyapoovan T, "Fundamentals of Computing and Programming in C", Vikas Publishing h         Yashavant Kanetkar, "Let us C", 15th edition, BPP publication, 2016.         S. Sathyalakshmi, S.Dinakar, "Computer Programming Practicals – Computer Lab Manu         Publication, First Edition, July 2013.         https://en.wikibooks.org/wiki/C Programming         https://onlinecourses.nptel.ac.in/noc18-cs10/preview         http://nptel.ac.in/courses/106105085/2         https://www.udemy.com/c-programming-for-beginners/	I4. nouse, 2015. al", Dhanam

COURSE TITLE		PROGRAMMING IN PYTHON CREDITS 3									
COURSE CODE	ECS51010	COURSE	CATEGORY	ES	L-T-P-S	2-0-2-2					
Version	1.0	Approv	val Details	36 th ACM	LEARNING LEVEL	BTL- 5					
ASSESSMENT	SCHEME										
		CIA				ESE					
First Periodical	Second Periodical Assessment	Practical Assessments	Observation / lab records as approved by	Attendance	Theory	Practical					

Assessm	ent	(The	ory)			t	he									
(Theor	y)	nt (Theory)				Depa	rtment									
							Examination									
						Com	mittee									
						"D	EC"									
15%		15	%		10%	5	5%		5%		25%		25%	6 		
		Compu	ter pro	gramm	ing skills	are now	becomi	ng pa	irt of bas	ic ec	lucation	n as	these skil	lls are		
		increasi	ngly of	vital ir	nportance	e for futu	ire job a	nd ca	reer pros	pects	5. The F	ytho	n progran	nming		
		languag	ge which	i is one	of the mo	st popula	ar progra	mmir	ng languag	ges w		ae. Tr	ne course	snows		
Cours	е		use the	free o	pen-sourc		to write	basic	program	s and	nign-ie ieine Dr	evera	pplication	15. orning		
Descript	ion		irse is o	inered	as a meor	y megra	horo th		ourse by		icing Pr	ojeci	. Baseu Le	arning		
		(PDL), e	d hand			uoing, w	that com		onts the f	b pro	viue u	ie sit	standing	of the		
subject matters. The assessment is through the combination of written tests as we													well as pr	actical		
		through	nnaiter	5. me a ts	33553511161					will	en test	.5 0.5 1		actical		
	The course should enable the students															
		1.	1. To introduce basic concepts of Python programming language as well as common													
Course			packages and libraries.													
Objective	9	2.	<ol> <li>To generate an ability to design, analyze and perform experiments on real life problems</li> </ol>													
			using python.													
		Upon c	Jpon completion of this course, the students will be able to													
		1.	Comp	rehend	basic con	cepts in	python.									
Course		2.	Write	pythor	n program	to solve	scientific	, mat	hematica	prob	olems					
Outcome	9	3.	Devel	op moc	lular prog	rams usir	ng functi	ons ar	nd use dat	a str	uctures	i				
		4.	Use to	oolboxe	es/ librarie	es and de	esign sim	ple a	lgorithms	usin	g Pytho	on to	solve rea	l time		
			applic	ations												
Prerequi	sites:															
CO, PO A	ND P	SO MAPP	PING			0			1 – T					l		
CO -	РО	PO-2	PO-	PO-	PO-5	PO-6	PO-	PO-	PO-	РО	PO-	PO-	- PSO-	PSO-		
PO	-1		3	4			7	8	9	-10	11	12	1	2		
CO-1	3	-	2	-	3	-	-	-	-	-	-	2	1	-		
CO-2	3	3	3	-	3	-	-	-	-	-	-	2	-	1		
CO-3	3	3	3	-	3	-	-	-	-	-	-	2	1	-		
CO-4	3	3	3	3	3	-	-	1	2	2	2	2	-	1		
			1: Wea	kly rela	ted, 2: M	oderatel	y related	and	3: Strong	y rela	ated					
MODULE	ני <b>1: P</b> '		UNDAN	1ENTAI	S								(6L+ 6	P)		
Introduct	tion to	python a	and its a	applicat	ions. Insta	allation o	f Python	and s	etting up a	a pro	grammi	ng				
environm	nent s	uch as Ar	naconda	a and S	pyder											
Python E	Basics	Variable	e and v	/ariable	e types, B	ooleans,	Numbe	rs: int	tegers, flo	oats,	fractio	ns,				
complex	numb	ers, basi	c opera	tors (ar	ithmetic,	relationa	I, logical	mem	nbership, i	dent	ity)		CO-	1		
Practical	comp	onent:											BTL-	- 3		
•	Solve	simple m	athema	atical e	xpressions	s using py	/thon							-		
•	Perfo	rm type o	onversi	ion												
Suggeste	d Rea	dings:	_		_											
•	10 Re	asons to	Learn P	ython l	Programm	ing Lang	uage in 2	022								

•	Learning Python: From Zero to Hero	
MODULE	2: STRINGS, LISTS, TUPLES	(6L+ 6P)
Strings, l	sts, tuples, sets, dictionaries. bytes and byte arrays, manipulating variables, indexing,	
slicing, St	tring methods, list methods, list slicing, set methods, in built python functions, input	
and outp	ut functions	
Practical	component:	<b>60 3</b>
•	Perform string manipulation	
•	Data sorting using lists	BIL-5
•	Write functions for data handling	
Suggeste	d Readings:	
•	Python programming for beginners	
MODULE	3: CONTROL STATEMENTS, LOOP AND FILE HANDLING	(6L+ 6P)
If, else, e	else if statements, for loops, range function, while loops, List comprehensions,	
function	s in python. Introduction to OOP, Classes, Objects, Reading and writing files	
Practica	component:	
•	Write a python program using control statements	CO-2
•	Develop objects and classes in python	BTL-5
•	Work with files for specific applications	
Suggeste	d Readings:	
•	Python programming for beginners	
MODULE	4: PYTHON LIBRARIES	(6L+ 6P)
Installing	of different libraries, packages or modules. Basic concepts of the following libraries:	
NumPy,	Matplotlib, Pandas, SciPy libraries	
Practical	component:	CO-4
•	Python programming using libraries	BTL-5
Suggeste	d Readings:	
•	The Python Bible	
MODULE	5: CASE STUDIES	(6L+ 6P)
Case Stu	dies using Python:	
1. Solving	g a linear differential equation using SciKit and plotting the result in matplotlib.	
2. Image	processing and manipulation and auto detection of any object based on color.	
3. Pythor	n programming for an Arduino/ Raspberry PI	
4. Machi	ne Learning application using python	CO-4
4. Case s	tudy that uses Python to solve department specific problems.	BTL- 5
Practical	component:	
•	Mini Project / Case studies	
Suggeste	d Readings:	
•	Python at Netflix	
TEXTBO	DKS	
1	Dr. R. NageswaraRao (2018). Core Python Programming, Dreamtech Press, Second Ed	ition
2	M.T. Savaliya and R.K. Maurya (2018). Programming through Python, StarEdu Solutio	ns
REFEREN	CE BOOKS	
1	Python Crash Course: A Hands-On, Project-Based Introduction to Programming (2nd I	Edition)
2	Head-First Python: A Brain-Friendly Guide (2nd Edition)	

E BOOKS	
1	https://devfreebooks.github.io/python/
MOOC	
1	"The Python Tutorial", <a href="http://docs.python.org/release/3.0.1/tutorial/">http://docs.python.org/release/3.0.1/tutorial/</a>

COU	RSE TITI	.E	ENGINEERING GRAPHICS AND COMPUTER AIDED CREDITS 3 DESIGN											
COUI	RSE COD	E	EME51001 COURSE CATEGORY ES L-T-P-S 2-0-2-2											
v	ersion		1.0		А	pprova	l Details	5	36 th A	см	LEARN LEVE	ING EL	BTI	3
ASSE	SSMENT	SCHEN	ΛE											
First Ass	Periodi sessmen	cal t	Second     Weekly     Test/Quiz       Periodical     assignment/Observation     Test/Quiz       Assessment     / lab records and viva as approved by the DEC     Attendance											
	15%		15%         10%         5%         25% + 25%											
C Des	Course cription	fu in pr 1.	This course broadly introduces the mechanical design using computer aided design tools and fundamentals of free hand sketching. It prepares the students to learn the basic concepts involved in technical drawing and computer graphics. It also emphasis on the principles of projections and visualization of part drawing.											
C Ob	Course Jjective	2. 3. 4. 5.	CAD s To vis To co To dr drawi To vis to 2D	oftware ualize the mprehe aw the ings. ualize a drawin	e nd the c develop nd draw gs using	s in vario concept: pment o views c CAD to	ous orie s of ison of solid of the ol ols	ntation: netric p surface bject by	s and to rojection es and t free har	draw it ns ogenei nd sketc	s projec rate ass h and to	tions ociated transfo	views o orm 3D n	of civil nodels
C Ou	Course utcome	1. 2. 3. 4. 5.	<ol> <li>Upon completion of this course, the students will be able to</li> <li>Demonstrate the concepts of Engineering graphics and projection of straight lines using CAD software.</li> <li>Apply the acquired knowledge to solve simple problems of regular solids.</li> <li>Create solid objects in isometric view using CAD software</li> <li>Develop the simple solids and to sketch the plan and elevation of the building drawings.</li> <li>Visualize the objects and to draw by free hand sketching.</li> </ol>											
Prere	equisites	: Nil												
СО, Р	O AND	PSO M	APPING						1		T			
со	PO	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO	PO-	PO-	PSO	PSO
	-1	2	3	4	5	6	7	8	9	-10	11	12	-1	-2
CO-1	2	1	-	-	1	-	-	1	1	1	-	2	2	1

								1		r	r	1		
CO-2	2	1	-	-	2	-	-	1	1	2	-	2	1	-
CO-3	2	2	2	-	2	-	-	2	2	2	-	2	1	2
CO-4	3	2	2	-	3	-	-	2	2	2	-	2	1	-
CO-5	3	1	2	-	-	-	-	1	2	2	-	2	-	1
1: We	eakly rel	ated, 2	: Moder	ately re	lated a	nd 3: St	rongly r	elated		•	•			
MOD	ULE 1: B	BASICS (	OF ENGI	NEERIN	G GRAP	HICS							(6L + 6	P)
Releva	ance of	Graphic	s in Ind	ustry - I	BIS conv	ventions	s and sp	pecificat	ions - d	rawing	sheet si	izes -		
Letter	ing – Di	mensior	ning - Sc	ales. Dr	afting n	nethods	- Introd	duction	to Com	puter Ai	ded Dra	ifting		
–Ехро	sure to	Solid N	Modellir	ng softw	/are – I	Printer	and Plo	otter – :	3D prin	ter. Inti	roductic	on to	co	-1
of points and projection of Straight lines.												ction	BTI	2
or points and projection or straight lines. Suggested Reading: Solid modelling Software commands														
Sugg	MODULE 2: PROJECTION OF SOLIDS (6L + 6P)													
MODULE 2: PROJECTION OF SOLIDS (6L Projections of solids, Solids in simple positions and axis inclined to one plane only. Section of												(6L + 6I	<b>)</b>	
Projections of solids. Solids in simple positions and axis inclined to one plane only. Section of														
solids. Section planes inclined to Horizontal Plane only. True shape of the section. (Manual and CO-2													-2	
CAD Drawing)												,	BTI	2
<b>Suggested Reading:</b> Solids inclined to both the planes. Section of solids with sectional planes														
	inclined to VP.												<b>D)</b>	
NOD	ULE 3: 1:	SOIVIET		JECHOR	N							T	(6L + 6	P)
Conce	epts of is	sometri	c projec	tion. Iso	metric	scale, Is	ometric	view of	simple	solids w	with sect	ional	со	-3
planes	s. (Manu	ual and	CAD Dra	iwing)	of colid	c	aultinla	contion	معاماه	~			BTI	3
									ai piane	5.			(61 + 6	D)
Deve		t of Surf			olids wi	th simpl			os Para	ما اما	method	hand		
Radia	l line me	thod or	nlv. (Ma	nual and		rawing)			105.1 010		methot		со	-4
Civil ſ	Drawing	: PLAN a	and FLF	/ATION	of Simp	le resid	ential bi	uilding.	(Manua	l and CA	D Draw	ing)	BTI	-2
Sugg	ested Re	eading:	Develo	pment d	of Spher	e, Sectio	onal ele	vation o	f buildir	ng draw	ing			
MOD	ULE 5: F	REE HA	ND SKE	TCHING					-		_		(6L + 6	P)
Visua	lization	concep	ts and F	ree Hai	nd skete	ching: V	'isualiza ⁻	tion pri	nciples	-Repre	sentatio	on of		
Three	-Dimens	sional o	bjects -	– Pictoi	rial Proj	ection	method	s - Layc	out of v	iews- C	onversio	on of	CO	-5
pictor	ial view	s to orth	nograph	ic view.									BTL	-3
Sugg	ested Re	eading:	Orthogr	aphic vi	iews to j	pictorial	views							
TEXT E	BOOKS													
1. Jeyapoovan, T., Engineering Graphics and Design, Vikas Publishing House Pvt Ltd., New Delhi, 8 th														
Edition, 2022.														
2. 2016.														
REFER	ENCE B	оокѕ												
	1.	Alf Y	'arwood	, Introd	uction t	o AutoC	AD – 20	) and 3D	) Design	, Newne	es Elsevi	ier, 201	1	
	2 Bhatt N.D and Panchal V.M, Engineering Drawing: Plane and Solid Geometry, Charotar Publishing													
	•	Hous	se, 2019	•										
	3.	Kirst	ie Plant	enberg,	Engine	ering Gr	aphics E	ssential	s, SDC F	Publicati	ions., fif	th Editi	on, 2016	i.

E - Books	
1.	https://www.amazon.in/Technical-Drawing-Engineering-Graphics-International- ebook/dp/B00IZ0FZHA
моос	
1.	http://nptel.ac.in/courses/112103019/
2.	https://nptel.ac.in/courses/112102304/

COURSE TITLE		DESIGN T	HINKING		CREDITS	3
COURSE CODE	EGE51002	COURSE C	ATEGORY	ES	L-T-P-S	2-0-2-2
Version	1.0	Approva	l Details	36 th ACM	LEARNING LEVEL	BTL-4
ASSESSMENT S	CHEME					
		CIA			I	ESE
First Periodical Assessment	Second Periodical Assessment	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	Theory	Practical
15%	15%	10%	5%	5%	25%	25%
Course Description	Design, in a t through the ap Design thinkin industries and and strategies taking into cor safety and de approach with engineering in domain centric to create new	ypical engineerin oplication of best og, in this relevan organizations for s. In essence, it is asideration of the veloping solution of cross-functional dustries to service c. It opens a new v and innovative pr	ig context refers engineering pra- for evolving optim truly about unc customer needs is. The design th teams and ado e sectors. Hence world of problem roducts, services,	s to the <i>detaile</i> actices for creat <i>matic methodol</i> <i>mal designs with</i> lerstanding a pr , technology, bu ninking methodo pted to wide ra this methodolo a-solving possibil and processes.	d plans & scho ing new produc ogy currently b n innovative de oblem in an ove sinesses, enviro ology is essenti anging organiza gy is universal, l ities and helps t	emes developed cts and systems. eing adopted in sign approaches erall perspective nmental impact, ially an iterative tions right from holistic and non- he organizations

	The design thinking course offered at our university is well structured with good numbers of cas studies and projects which makes the new and innovative concepts discussed in lecture hou get assimilated in the minds of students. This course is intentionally offered in the very fir semester for all undergraduate engineering branches to make the students understand this ne philosophy of the design thinking process and adopt the guidelines for their project works the take up in subsequent semesters including start-up projects.													of case hours ry first his new ks they	
Ca Obj	ourse ective	1. 2. 3. 4.	<ol> <li>Inculcate the fundamental concepts of design thinking in students</li> <li>Learn the different phases of design thinking</li> <li>Use design thinking methods in every stage of the problem</li> <li>Apply various methods of design thinking to different problems</li> </ol>												
Co Out	<ul> <li>Course</li> <li>Demonstrate the critical methods of design, systems thinking and key concepts of design thinking.</li> <li>Understand the diverse methods employed in design thinking and establish a workable design thinking framework to use in their practices</li> <li>Practice design thinking in all stages of problem solving.</li> <li>Apply design thinking approach to real world problems</li> <li>Conceive, organize, lead and implement projects in interdisciplinary domain and address social concerns with innovative approaches</li> </ul>														
Prere	quisite	s: NIL													
CO, P	O AND	PSO M	APPING												
0	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PSO-	PSO-	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO-1	1	1	1	2	1	2	2	2	1	1	-	2	1	1	
CO-2	1	1	1	1	2	3	3	2	2	2	-	2	2	3	
CO-4	1 2	2	2	2	2	3	3	2	3	3	2	2	3	3	
CO-5	2	1	2	2	2	3	3	2	3	3	2	2	3	3	
	-	-	1: W	/eakly r	elated,	2: Mode	erately	related a	nd 3: S	trongly r	elated	_	5	5	
MOD	ULE 1:	INTRO		N									(6L -	+ 6P)	
				<u> </u>									(0-	,	
Desig Think Princi Need Think	Design process: Traditional design, Design Requirements, Design approach and Strategies. Design Thinking Concept for Innovative Design - Breaking of patterns, Reframe existing design problems, Principles of creativity. Elements of Design Thinking - Design Thinking Phases: Empathize (Customer Needs), Define, Ideate, Prototype, Testing and Implementation. Design Thinking Frameworks. Design Thinking Team.														
Practi platfo exper enhar	Practical Case Studies: Enhancing the User Experience of a Digital Platform: Choose a popular digital platform or application and ask students to analyze its strengths and weaknesses from a user experience perspective. Examples: Redesigning the platform's interface, functionality, or features to enhance usability, accessibility, and overall user satisfaction.       BTL-3												• 6P)		
			,										(01 )	.,	

Search field determination - Problem clarification - Understanding of the problem – Problem analysis - Reformulation of the problem - Observation Phase - Empathetic design - Tips for observing - Methods for Empathetic Design - Point-of-View Phase - Characterization of the target group - Description of customer needs.	CO-2
specific medical device or equipment used in healthcare settings. Students can explore opportunities to improve its functionality, ergonomics, ease of use, and patient experience through innovative design solutions. <i>Examples: (i) Hand held Blood Glucose Testing Machine (ii) Blood Pressure Monitor</i>	DIL-3
MODULE 3: IDEATION (6	L + 6P)
Ideation Phase - The creative process and creative principles - Principles of Decomposition, Association, Analogy & Confrontation, Abstraction & Imagination. Guide team - Personas with wide range of professional experiences, stronger collaboration dynamics. Creativity techniques – Intuitive creative techniques – brainstorming, Systematic Analytical techniques - SWOT Analysis, The 5 Whys iterative interrogative technique - Valuation of ideas.	CO-3
<b>Practical Case Studies:</b> Redesigning an Educational Environment: Focus on improving the learning experience within a specific educational institution or classroom. Students can explore innovative design solutions that enhance collaboration, engagement, and personalized learning while considering factors such as classroom layout, educational technology, and accessibility. <i>Examples: (i) case study of Educational ERP (ii) Case study of Digital Learning Platform etc.</i>	BTL-4
MODULE 4: PROTOTYPING AND VISULIZATION	6L + 6P)
Prototype Phase - Lean Startup Method for Prototype Development. Minimum Viable Product (MVP) – creation of MVPs, drawing and design models, wireframe, mockups, 3D Rapid prototyping. Visualization and presentation techniques. Visualization types – bar chart, pie chart, radar char, mind mapping, affinity diagram, force field analysis, semantic differential (polarity analysis). Presentation Techniques – story telling, creative collages, design scenarios.	CO-4
<b>Practical Case Studies:</b> Designing an Eco-Friendly Packaging Solution: With a growing concern for environmental sustainability, challenge students to design an eco-friendly packaging solution for a consumer product. They can explore alternatives to single-use plastics, optimize packaging materials and design for efficient production, transportation, and disposal. <i>Examples: City Waste Segregation and consolidation Device (ii) Used Car Destruction and consolidation Device etc</i>	BTL-4
MODULE 5: TESTING AND IMPLEMENTATION (6)	L + 6P)
Test Phase - Tips for interviews - Tips for surveys - Kano Model - Desirability Testing - How to conduct workshops - Requirements for the space - Material requirements - Agility for Design Thinking. Design Activism – Designing tomorrow. Entrepreneurship/business ideas. Technology Reediness Level (TRL) – 9 Levels.	
Practical Case Studies: Designing Assistive Technologies for People with Disabilities: Encourage students to develop innovative solutions to improve the quality of life for individuals with disabilities. They can focus on designing assistive technologies such as prosthetics, mobility aids, communication devices, or sensory enhancements to address specific challenges faced by this user group. <i>Examples: (i) Case study of patient assist mobile Robot (ii) Designing automated level control of overhead water tank etc.</i>	CO-5 BTL-4
IEXT BOOKS	

1.	Christian Mueller Roterberg, Handbook of Design Thinking, 2018.
2.	Johnny Schneider, "Understanding Design Thinking, Lean and Agile", O'Reilly Media Inc, 2017.
REFERE	NCE BOOKS
1	Idris Mootee, "Design Thinking for Strategic Innovation", Wiley, 2013
2	Jeanne Liedtka and Tim Ogilvie, Designing for Growth: A design thinking tool kit for managers, Columbia university Press, 2011
3.	Hasso Plattner, Christoph Meinel and Larry Leifer, "Design Thinking: Understand – Improve – Apply", Springer, 2010
4	Tim Brown, "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", Harper Collins, 2009
5	Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009.
E RESO	URCES FOR REFERENCE
1	https://www.design-thinking-association.org/explore-design-thinking-topics/design-thinking-case-studies
2	https://makeiterate.com/design-thinking-case-studies/
3	https://www.toptal.com/project-managers/digital/a-design-thinking-case-study
4	https://venturewell.org/class-exercises
MOOC	
1.	https://onlinecourses.nptel.ac.in/noc19_mg60/preview
2.	https://onlinecourses.swayam2.ac.in/aic19_de02/preview

COURSE TITLE	ENG (C	SINEERING PRACTICES LAB ommon to All Branches)		iINEERING PRACTICES LAB CREDITS Ommon to All Branches)		2
COURSE CODE	EGE51406	COURSE CATEGORY ES			L-T-P-S	0-0-4-2
Version	1.0	Approval Details 36 th A			LEARNING LEVEL	BTL-3
ASSESSMENT SCHE	ME					
First Periodical Assessment	Second Periodical Assessment	Practical Obser Assessments re appro De		servation / lab records as proved by the Department		ESE

								Exa Comm	minatio littee "D	n DEC"					
	15%		15	%		10%			5%		5%		509	%	
( De	Course scriptio	n	This cou mechani	rse is sp ical engi	ecificall neering	ecifically designed to give the students a clear understanding of the neering design and its process.									
Cours	e Objec	tive	The cour 1. 2. 3.	r <b>se shou</b> To Rela To Lear To Lea Science	<b>Ild enat</b> te theo n basic rn basic	ole the s ry and p concept c conce	tudents practice s in Aer pts in f	<b>s to</b> of basic onautic Electrica	Mechar al and A Il, Electi	nical an utomol ronics,	d Civil Er bile Engi mechati	ngineer neering ronics a	ing. and Con	nputer	
<ul> <li>Upon completion of this course, the students will be able to         <ol> <li>Identify the tools, and types of joints used in welding, carpentry and plumbing.</li> <li>Perform basic fabrication in welding, carpentry and plumbing, to make sim joints/connections.</li> </ol> </li> <li>Course Outcome         <ol> <li>Make simple electrical and electronic circuit connections, and may assemble hardware of a desktop computer.</li> <li>Demonstrate the working of a mechatronics systems like CNC machine, Rol Pneumatic circuits.</li> <li>Demonstrate the working of a 3D printer and list its applications.</li> </ol> </li> </ul>										ng. simple ble the Robot,					
Prerec	quisites	: NIL													
СО, РС	) AND F	SO N	IAPPING												
со	PO-1	PO-	2 PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	РО- 10	РО- 11	PO- 12	PSO- 1	PSO- 2	
CO-1	3	2	-	2	-	1	-	-	-	-	-	-	2	1	
CO-2	3	2	-	2	-	1	-	-	-	-	-	-	3	2	
CO-3	3	2	-	2	-	1	-	-	-	-	-	-	2	1	
CO-4	3	2	-	2	-	1	-	-	-	-	-	-	2	1	
CO-5	3	2	-	2	-	1	-	-	-	-	-	-	2	1	
			1: We	akly rel	ated, 2:	Moder	ately re	lated ar	nd 3: Str	ongly r	elated				
LIST O	F EXPER	RIMEN	NTS with e	xpected	d Learni	ng outc	ome								
E	κ <mark>ρ. No.</mark>						Experin	nent Na	ime				CO /	BTL	
	1		To Perform a Fillet/Groove weld in a Welding Simulator CO 1 & BTL 3									BTL 3			
	2		To Fabric	ate a Bu	itt joint/	Lap Joir	nt using	Arc We	lding				CO 1 &	BTL 3	
	3		To make elbows	basic pij	pe conn	ections	in Plum	bing usi	ng valve	es, coup	lings and	d	CO 1 &	BTL 3	
	4		To make	a comm	on joint	using C	arpentr	У					CO 1 &	BTL 3	
	5		Assembli	ng and [	Dismant	ling of a	gasolin	e/Diese	l Engine	2			CO 2 &	BTL 3	
	6		Measure	ment of	Force u	sing a s	pring ba	lance					CO 2 &	BTL 3	
	7		To make	an Elect	rical Wi	ring for	extensio	on box					CO 3 &	BTL 3	
	8		Study of	Active a	nd Passi	ve Com	nonente						CO 3 &	BTL 3	

9	To make simple circuit using Electronic Components	CO 3 & BTL 3
10	To Assemble a Desktop computer	CO 3 & BTL 3
11	To study the key elements of a Mechatronics system	CO 3 & BTL 3
12	Demo on linear actuator, using pneumatic circuit	CO 3 & BTL 3
13	Demo on Computerized Numerical Control (CNC) machine	CO 3 & BTL 3
14	Demo on a pick and place Robot	CO 3 & BTL 3
15	Demo on a 3D Printer	CO 3 & BTL 3
LIST OF EXPERI	MENTS/TOOLS for 30 Students	
1	Welding Rectifier – 5 Nos	
2	Welding Simulator – 1 No.	
3	Two Stroke Gasoline Engine – 1 No.	
4	Spring balance – 5 Nos	
5	PVC Pipes and its accessories – 5 sets	
6	Saw, Planner, Chisel and its accessories – 5 sets	
7	Extension box and its accessories – 5 sets	
8	Electronic boards and its accessories – 5 sets	
9	Active components – 5 sets	
10	Passive components – 5 sets	
11	Desktop Computer – 5 Nos	
12	Linear Actuators and Pneumatic Kit-1 Nos	
13	Rotary Actuators and Pneumatic Kit- 1 Nos	
14	CNC Machine – 1 No.	
15	6 Axis Robot – 1 No.	
16	3D Printer – 1 No.	
REFERENCE		
1	Jeyapoovan T and Saravanapandian M., (2015), Engineering practices lab	manual, Vikas
2	Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., (2008), "Eleme Technology", Vol.I, Media promoters and publishers private limited, Mumbai.	nts of Workshop
3	Ibrahim Zeid (2011), CAD/CAM Theory and Practice, Tata McGraw-Hill Publishin New Delhi.	ng Company Ltd.,

COURSE TITLE	FA (Auto, B	CREDITS	2		
COURSE CODE	EGE51408	L-T-P-S	0-0-4-2		
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3
ASSESSMENT SCI	HEME				

First F Asse	Periodic essment	Se	econd Pe Assess	eriodica ment	l As	Observation / lab Practical Assessments Assessments Committee "DEC"				Attendance		ESE		
	15%		15%	6		10%			5%		5	%	50	)%
Co Desc	ourse cription	The ma the	e Fab Lat nufactui produc	o is inter ring/ pro t develo	nded to ototypin pment a	promoto g metho and fabr	e 'Do It ' ods to pi ication.	Yourself rovide a	' (DIY) co compre	oncept t hensive	hrough idea to	various the stud	lents ab	out
Cc Obj	ourse jective	The	<ol> <li>The course should enable the students to         <ol> <li>Introduce the concepts of innovation in engineering design</li> <li>Introduce tools, equipment and methods of various fabrication techniques</li> <li>Familiarize the 3D Printing</li> <li>Hands on experience in design and fabrication</li> </ol> </li> </ol>											
Cc Out	ourse tcome	Up	<b>on comp</b> 1. Cru 2. Ha 3. Du 4. Us 5. De	eate diff andle por o 3D prir e the La evelop si	of this co erent ty wer too nting of ser Cutt mple au	purse, the provident of	ne stude oints usi ood and objects hine to on in pno	ents will ing weld metal fa fabricate eumatice	<b>be able</b> ing and abricatio e the rec	to solderin n proce quired sł	g proces ss napes	ss		
Prereq	uisites:	NIL												
СО, РС	DAND P	SO MAF	PPING											
со	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	РО- 10	PO- 11	PO- 12	PSO- 1	PSO- 2
CO-1	1	2	1	2	1	-	-	-	-	-	-	1	2	2
CO-2	2	1	2	1	2	-	-	-	-	-	-	2	1	1
CO-3	1	1	2	2	1	-	-	-	-	-	-	1	2	2
CO-4	1	2	1	1	1	-	-	-	-	-	-	2	1	1
CO-5	2	1	2	2	2	-	-	-	-	-	-	1	2	2
			1: W	eakly rel	ated, 2	: Moder	ately re	lated an	d 3: Stro	ongly re	lated			
LIST O	F EXPER	IMENTS	with e	xpected	Learni	ng outco	ome							
Exp.	. No.						Experi	ment N	ame				cc	) / BTL
	1	Welding: Create a BUTT Joint using Welding Process.CO 1 &Software/Equipment Required: Arc/MIG/TIG Welding Equipment SetupBTL 3										01& 3TL3		
	2	weiging: Create a LAP Joint using weiging Process.         CO 1 &           Software/Equipment Required: Arc/MIG/TIG Welding Equipment Setup         BTL 3										U 1 & BTL 3		
:	3	Weldi Softw	ing: Crea	ate a T Jo Jipment	oint usir <b>Reauir</b>	ng Weldi ed: Arc/	ing Proc MIG/TIO	ess. 6 Weldir	ng Equip	ment Se	tup		C	O 1 & 3TL 3

	Soldering: Prepare a simple voltage regulator circuit in general purpose PCB using	CO 1 &
4	soldering process	BTL 3
	Software/Equipment Required: Solder and basic electronic Components	
	Power Tools: Study of Power Tools available for fabrication process.	CO 2 &
	Software/Equipment Required: Power tools for Mechanical operations like wood	BTL 3
5	cutting tools, metal cutting tools, grinding machine, drilling machine and polishing	
	machine– jig saw, hand held machine saw, angle grinder, drilling machine and	
	polishing machine.	
6	Power Tools: Make a wooden panel/wood frame using wood cutting tools	CO 2 &
0	Software/Equipment Required: Wood Cutting Tools	BTL 3
7	<b>Power Tools:</b> Make a Metal fabrications using power tools like grinding etc.,	CO 2 &
/	Software/Equipment Required: Grinding Machine	BTL 3
8	Drilling: Make the design in metal plates using drilling process	CO 2 &
0	Software/Equipment Required: Drilling Machine with accessories	BTL 3
٩	<b>3D Printer:</b> Generate a simple 3D model in CAD and 3D print the part.	CO 3 &
9	Software/Equipment Required: 3D Printer	BTL 3
	Laser Cutting: Make a unique design and fabricate in acrylic sheets using laser cutting	CO 4 &
10	Process.	BTL 3
	Software/Equipment Required: Laser Cutting Machine	
11	<b>Pneumatics:</b> Assemble the pneumatic components to activate a single acting cylinder.	CO 5 &
11	Software/Equipment Required: SMC Pneumatic Kit	BTL 3
	Pneumatics: Assemble the pneumatic components to activate a Double acting	CO 5 &
12	cylinder.	BTL 3
	Software/Equipment Required: SMC Pneumatic Kit	
TEXT BOOKS		
1	Julia Walter-Herrmann, Corinne Büching, (2017). Fab Lab: Of Machines, Makers and	Inventors,
1	Transcript Verlag.	

COURSE TITLE	OUTREAC	CREDITS	1								
COURSE CODE	GGE51401	COURSE CATEGORY	HS	L-T-P-S	0-0-2-4						
Version	1.0	1.0Approval Details36th ACMLEARNING LEVEL									
ASSESSMENT SCH	IEME										
	CIA ESE										
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	Practical						
15%	15% 10% 5% 5% 50%										
Course Description	The NCC provides exposure to the cadets in a wide range of activities., with a distinct emphasis on Social Services, Discipline and Adventure Training.										

Cou Objec	Course ObjectiveThe training curriculum of the NCC is primarily focused on character building, inculcating leadership qualities and skill enhancement through structured academic syllabi, practical training and opportunity for exposure/interaction beyond a cadets' immediate environment, 													
<ol> <li>To develop character, comradeship, discipline, secular outlook, spirit of adventure and the ideals of selfless service amongst the youth of the country.</li> <li>To create a human resource of organized, trained and motivated youth to provide leadership in all walks of life and always available for the service of the nation.</li> <li>To provide a suitable environment to motivate the youth to take up a career in the Armed Forces.</li> </ol>														
CO, PO A	ND PSC	ΜΑΡΡ	ING											
CO         PO-         PO-												PO- 12	PSO -1	PSO -2
CO-1	1	2	1	1	-	2	1	3	2	3	3	2	-	-
CO-2	1	2	1	1	-	2	1	3	2	3	3	2	-	-
CO-3	1	2	1	1	-	2	1	3	2	3	3	2	-	-
		:	1: Weak	dy relat	ed, 2: N	/loderat	tely rela	nted and	3: Stro	ongly re	lated			
MODULE	1: NCC	GENER	AL										(	6P)
NCC GEN Incentive Camps: T	VERAL: s 2 NCC ypes &	NCC 1 3 Dutie Conduc	Aims, es of NC t 2	Object C Cadet	ives & 1 NCC	Organiz 4 NCC	zation o	of NCC	1 NCC	2			CO-1 BTL-3	
MODULE	2: NAT	IONAL	INTEGR	ATION	AND AV	VARNES	SS						(	6P)
NATION/ Importar Unity in Security	<b>AL INTE</b> nce & N Diversity 1	GRATIC ecessity y & Role	DN ANI / 1 NI 2 e of NC	D AWA Factor C in Nat	<b>RENESS</b> s Affect ion Bui	<b>4</b> NI Ting Nat Iding 1	1 Natio tional Ir NI 4 Th	onal Int itegration reats to	egration on 1 NI Nation	n: 3 al			CO-2 BTL-3	
MODULE	3: PER	SONALI	TY DEV	ELOPMI	ENT.								(6	5P)
PERSON/ Creative Commun	PERSONALITY DEVELOPMENT 7 PD 1 Self-Awareness, Empathy, Critical &       CO-3         Creative Thinking, Decision Making and Problem Solving 2 PD 2       BTL-3         Communication Skills 3 PD 3 Group Discussion: Stress & Emotions 2       CO-3													
MODULE	4: LEAI	DERSHI	Р										(6)	P)
LEADERS ' Code 3	LEADERSHIP 5 L 1 Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour       CO-4         ' Code 3 L 2 Case Studies: Shivaji, Jhasi Ki Rani 2       BTL-3													
MODULE	5: SOC	IAL SER			ΙΜυΝΙΤ	Y DEVE	LOPME	NT				1	(6	5P)

<b>SOCIAL SERVICE A</b> Development Pro Children and Won Initiatives 2 SS 7 C	AND COMMUNITY DEVELOPMENT 8 SS 1 Basics, Rural grammes, NGOs, Contribution of Youth 3 SS 4 Protection of hen Safety 1 SS 5 Road / Rail Travel Safety 1 SS 6 New yber and Mobile Security Awareness 1	CO-5 BTL-3						
TEXT BOOK	<u>s</u>							
<u>1.</u>	1.     NCC COMMON SUBJECT BOOK							
2. RED BOOK (ARMY SPECIAL SUBJECTS)								

COURSE TITLE	OUTREA	1			
COURSE CODE	GGE51401	COURSE CATEGORY	HS	L-T-P-S	0-0-2-4
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3
ASSESSMENT SCH	·				
	ESE				
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	Practical
15%	15%	10%	5%	5%	50%
15% Course Description	<b>15%</b> The NCC provides emphasis on Soci	<b>10%</b> s exposure to the c al Services, Discipl	5% adets in a wide range ine and Adventure Tra	5% of activities., wit ining.	50% h a distinct
15% Course Description Course Objective	15% The NCC provides emphasis on Soci The training curr leadership qualit training and oppo and thereby enab	10% s exposure to the o al Services, Discipl riculum of the NC ies and skill enha prtunity for exposu- pling them for a bri	5% adets in a wide range ine and Adventure Tra C is primarily focused incement through stru ure/interaction beyonc ighter and progressive	5% of activities., wit ining. on character b uctured academ I a cadets' imme future.	50% h a distinct puilding, inculcating nic syllabi, practical ediate environment,

CO, PO AND PSO MAPPING														
со	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PSO	PSO
<u> </u>	1	2	3	4	5	6	7	8	9 2	10 2	11	12	-1	-2
CO-1 CO-2	1	2	1	1	-	2	1	3	2	3	3	2	-	-
CO-3	1	2	1	1	-	2	1	3	2	3	3	2	-	-
		:	1: Weak	ly relat	ed, 2: N	/loderat	ely rela	ted and	d 3: Stro	ongly re	lated			
MODULE	1: NCC	GENER	AL									Т	(6	P)
NCC GENERAL: NCC 1 Aims, Objectives & Organization of NCC 1 NCC 2 Incentives 2 NCC 3 Duties of NCC Cadet 1 NCC 4 NCC Camps: Types & Conduct 2												CO-1 BTL-3		
MODULE	2: NAT	IONAL	NTEGR	ATION	AND AV	VARNES	S					•	(6	P)
NATIONA Importan Unity in I Security 2	<b>L INTE</b> ce & N Diversity L	GRATIC ecessity / & Role	ON ANI 1 NI 2 e of NC	<b>D AWA</b> Factor C in Nat	RENESS s Affect ion Bui	<b>4</b> NI ing Nat Iding 1	1 Natic ional In NI 4 Thi	onal Int tegratio reats to	egration on 1 NI Nation	n: 3 al			CO-2 BTL-3	
MODULE	3: PERS	SONALI	TY DEV	ELOPM	ENT.								(6P)	
PERSONA Creative	ALITY DI Thinking ication 1	E <b>VELOP</b> g, Decis Skills 3	<b>MENT</b> 7 ion Mal PD 3 Gr	PD 1 S king and oup Dis	elf-Awa Probl cussion	reness, em Solv : Stress	Empath ing 2 PI & Emot	ny, Critio 2 ions 2	cal &			CO-3 BTL-3		
MODULE	4: LEAD	DERSHII	P									-	(61	P)
LEADERS ' Code 3	HIP 5 L L 2 Case	1 Leade Studie	ership C s: Shiva	apsule: ji, Jhasi	Traits, l Ki Rani	ndicato 2	rs, Moti	vation,	Moral V	/alues, I	Honour		CO-4 BTL-3	
MODULE	5: SOC	IAL SER	VICE AN		ΙΜυΝΙΤ	Y DEVE	LOPME	NT					(6	SP)
<b>SOCIAL SERVICE AND COMMUNITY DEVELOPMENT 8</b> SS 1 Basics, Rural Development Programmes, NGOs, Contribution of Youth 3 SS 4 Protection of Children and Women Safety 1 SS 5 Road / Rail Travel Safety 1 SS 6 New Initiatives 2 SS 7 Cyber and Mobile Security Awareness 1										<b>CO-5</b> BTL-3				
TEXT BOOKS														
1. NCC COMMON SUBJECT BOOK														
2.		RED	воок (	ARMY S	PECIAL	SUBJEC	:TS)							

COURSE	TITLE		OUT	REACI	H (NCC)- I	LEVEL 1	(NAVY	WING)		CRED	ITS	1		
COURSE	CODE	G	GE5140	1	COURSE CATEGO	RY		HS		L-T-P-	S		0-0-2-4	4
Version			1.0		Approva Details	I	36 th A	СМ		LEARI LEVE	NING -		BTL-3	
ASSESSMENT SCHEME														
CIA												ESE		
First Per Assess (Theo	iodical ment ory)	Pe Ass ("	SecondObservation / labSecondrecords asPeriodicalPracticalAssessmentAssessments(Theory)ExaminationCommittee "DEC"								Practic	al		
159	%		15%		109	%		5%		!	5%		50%	
Cou Descri	rse ption	The l emp	NCC pro hasis or	ovides n Socia	exposure Il Services	e to the o s, Discip	cadets i line and	n a wid I Adven	e range ture Tra	of activ ining.	ities., w	ith a di	stinct	
Cou Objec	rse ctive	The leade train and	training ership ing and thereby	g curri qualiti oppo enabl	culum of es and s rtunity fc ling them	the NC kill enha or exposi for a br	C is pr anceme ure/inte ighter a	imarily ent thro eraction and prop	focused ugh str beyond gressive	l on ch ucturec d a cade future.	aracter I acade ets' imm	buildin mic syl nediate	g, incul labi, pra environ	cating actical ment,
Cou Outco	rse ome	1. 2. 3.	To deve the idea To crea leadersl To prov Forces.	elop cl als of s ate a hip in ide a s	haracter, selfless se human r all walks suitable e	comrad rvice an esource of life ar nvironm	eship, o nongst f of org nd alwa lent to r	disciplin the you anized, ys availa notivat	ie, secu th of the trained able for e the yo	lar outl e count d and r the ser uth to t	ook, spi ry. notivate vice of t ake up a	rit of a ed yout he nati a career	dventur :h to p on. ⁻ in the <i>i</i>	e and rovide Armed
CO, PO A	ND PSO	MAPP	ING											
со	PO- 1	РО- 2	РО- 3	РО- 4	PO- 5	РО- 6	РО- 7	РО- 8	РО- 9	РО- 10	PO- 11	PO- 12	PSO -1	PSO -2
CO-1	1	2	1	1	-	2	1	3	2	3	3	2	-	-
CO-2	1	2	1	1	-	2	1	3	2	3	3	2	-	-
CO-3	1	2	1	1	-	2	1	3	2	3	3	2	-	-
		:	1: Weak	dy rel	ated, 2: N	/loderat	ely rela	ited and	d 3: Stro	ongly re	lated			
MODULE	1: NCC	GENER	AL										(6	P)
NCC GENERAL:NCC 1 Aims, Objectives & Organization of NCC 1 NCC 2Incentives 2 NCC 3 Duties of NCC Cadet 1 NCC 4 NCCCO-1BTL-3														
Camps: T	ypes & (	Conduc	t 2											
MODULE	2: NATI	ONAL	INTEGR	ATION	AND AV	VARNES	S						(6	P)

NATIONAL INTEG Importance & Ne Unity in Diversity Security 1	CO-2 BTL-3	
MODULE 3: PERSO	ONALITY DEVELOPMENT.	(6P)
<b>PERSONALITY DE</b> Creative Thinking, Communication S	VELOPMENT 7 PD 1 Self-Awareness, Empathy, Critical & Decision Making and Problem Solving 2 PD 2 kills 3 PD 3 Group Discussion: Stress & Emotions 2	CO-3 BTL-3
MODULE 4: LEAD	ERSHIP	(6P)
<b>LEADERSHIP 5</b> L 1 ' Code 3 L 2 Case	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Studies: Shivaji, Jhasi Ki Rani 2	CO-4 BTL-3
MODULE 5: SOCIA	AL SERVICE AND COMMUNITY DEVELOPMENT	(6P)
MODULE 5: SOCIA SOCIAL SERVICE A Development Pro- Children and Won Initiatives 2 SS 7 C	AL SERVICE AND COMMUNITY DEVELOPMENT AND COMMUNITY DEVELOPMENT 8 SS 1 Basics, Rural grammes, NGOs, Contribution of Youth 3 SS 4 Protection of nen Safety 1 SS 5 Road / Rail Travel Safety 1 SS 6 New Cyber and Mobile Security Awareness 1	(6P) CO-5 BTL-3
MODULE 5: SOCIA SOCIAL SERVICE A Development Prop Children and Won Initiatives 2 SS 7 C	AL SERVICE AND COMMUNITY DEVELOPMENT AND COMMUNITY DEVELOPMENT 8 SS 1 Basics, Rural grammes, NGOs, Contribution of Youth 3 SS 4 Protection of nen Safety 1 SS 5 Road / Rail Travel Safety 1 SS 6 New Cyber and Mobile Security Awareness 1	(6P) CO-5 BTL-3
MODULE 5: SOCIA SOCIAL SERVICE A Development Pro Children and Won Initiatives 2 SS 7 C <u>TEXT BOOK</u> <u>1.</u>	AL SERVICE AND COMMUNITY DEVELOPMENT AND COMMUNITY DEVELOPMENT 8 SS 1 Basics, Rural grammes, NGOs, Contribution of Youth 3 SS 4 Protection of nen Safety 1 SS 5 Road / Rail Travel Safety 1 SS 6 New Cyber and Mobile Security Awareness 1 <u>SS</u> <u>NCC COMMON SUBJECT BOOK</u>	(6P) CO-5 BTL-3

COURSE TITLE	OUTREACH (N	OUTREACH (NSS, Y's Men, Rotract)- LEVEL I CREDITS								
COURSE CODE	GGE51402	COURSE CATEGORY	L-T-P-S	0-0-2-4						
Version	1.0	-								
ASSESSMENT SC	HEME									
		CIA			ESE					
Volunteering	/olunteering Events attended Awareness Programs attended Attendance									

5%		25% 15% 5%										50%			
Cours Descript	e ion	This c service respon of the qualiti Pre re Howe active	ourse is e, social nsibility oretical ies requ quisite: ver, a g ly engag	design develo and pro knowle ired to There genuine ge with	ed to i pment, omote o edge an make a are no interes diverse	ntroduc and ac civic eng d pract positive specific st in co commu	ce stude tive citi gageme ical exp e impact prereq mmunit unities a	ents to zenship nt amou erience on the uisites f y servio re esseu	the prir . The cong the p s, stude commu for enro ce, socia ntial.	nciples urse ai participa nts wil unity an Iling in al deve	and pra ms to ir ants. Th I develo d societ the NS lopmen	ctices nstill a s rough a p essen y. S Seme t, and	of comm sense of a combin ntial skil ster 1 c willingn	nunity social nation ls and ourse. ess to	
Course Objective		<ol> <li>Service Scheme (NSS) in community development, emphasizing the significance of social responsibility and civic engagement.</li> <li>To develop essential leadership skills, teamwork, and effective project management techniques, preparing students to organize and execute community service projects successfully.</li> <li>To cultivate empathy, compassion, and cultural sensitivity, enabling students to engage respectfully and effectively with diverse communities during their community service activities.</li> <li>To promote environmental awareness and sustainable practices, encouraging students to integrate eco-friendly approaches into their community service initiatives.</li> <li>To enhance students' communication, problem-solving, and decision-making skills, equipping them to engage with community members, stakeholders, and address challenges effectively.</li> </ol>													
Course Outcome		<ol> <li>st si ai ai</li> <li>Pi ch ch in</li> <li>TI sk ex</li> <li>TI</li></ol>	udents gnifican nd socia articipan nallenge itiatives hrough kills, tea kecuting y engag ultural s ctivities pon co roblem- ngage ir	will gi ce of th I respon nts will es in th sin th practica amwork g succes ing with sensitivi mpletio solving, a comm	ain a contraction of S and demonate common al experts, and sful common ty, fost n divers and de unity de	compre onal Ser strate th nunity, iences a project nmunity e comm ering m emester eccision-r evelopm	hensive vice Sch ne abilit laying and woo manag y service nunities leaningf r 1, stu making hent and	y to ide the gro kshops ement projec , studer ul and dents skills, ei d service	standing ISS) in p entify an oundwor , studer techniq ts. ats will o respect will hav mpower e projec	g of ti promoti d asses k for e uts will ues ne cultivat ful inte re impr ing the ts.	he obje ing com as preva effective develop ecessary e empar ractions roved t em to ac	ectives, munity lent so e comm o essen f for o thy, con thy, con thy, con thy, con thy, con thy, con thy, con thy, con thy, con thy, con	history develop cial issue nunity s tial lead rganizin mpassio g their s	r, and poment es and ervice ership g and n, and ervice cation, ctively	
CO, PO AN	ND PSO	MAPP	ING								1		1		
CO	PO- 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO- 10	PO- 11	PO- 12	PSO -1	PSO -2	

<u> </u>	1	h	1	1		2	1	2	h	2	2	2			
CO-2	1	2		1	-	2	1	2	2	2	2	2	-	-	
CO-4	1	2	1	1	-	2	1	2	2	2	2	2	-	-	
CO-4	1	2	1	1	-	2	1	2	2	2	2	2	-	-	
0-5	L L	Z	<u> </u>	1	-	Z	_ <b>_</b>	5	Z	5	5	2	-	-	
			1: Weal	dy relat	ed, 2: N	/lodera	tely rela	ited and	d 3: Stro	ongly re	lated				
		TOPIC	S TO BE		RED										
1.	Introdu	ction to	Nation	al Servi	ce Sche	me (NS	S) and it	s Objec	tives						
2.	Underst														
3.	Project Planning and Management for Community Service Leadership Development and Teamwork														
4.	Leaders														
5. c	Cultura														
0. 7	Environ														
7. 8	Health														
9.	The Rol														
10.	Reflecti														
_	. Reflecting on Community Service Experiences and Personal Growth														
Suggest	t Activities														
	Community Cleanliness Drive: Organize a cleanliness drive in the local community														
1.	<b>Community Cleanliness Drive:</b> Organize a cleanliness drive in the local community,														
	involving students and residents in cleaning public spaces and creating awareness														
2	about c	leanline	ess and	waste n	nanager	nent.									
Ζ.	Health	Awarer		<b>np:</b> Cor		nealth	awaren	ess cam	ip wher	e partic	d prom	can			
	the imp	Dasic i	of bygi	iono an	js, aistr disanita	tion	eaith-re	iated in	normat	ion, an	a prom	ote			
3	Environ	mental	Conser	vation	Project [.]	Initiate	an env	ironme	ntal cor	servati	on nroie	ect			
5.	such as	tree pla	anting.	creating	g green	spaces.	or imp	lementi	ng recv	cling pr	ograms	. to			
	raise av	varenes	s about	enviror	nmenta	l issues.					- 8	,			
4.	Teachin	g Assis	stance	in Loca	l Schoo	ols: Col	laborate	e with	local so	hools t	to prov	ide	(30P	)	
	teachin	g assist	ance, c	onduct	educat	ional w	orkshop	os, and	help st	udents	with th	neir			
	studies.														
5.	Empow	erment	t Work	shops:	Organi	ze woi	rkshops	for w	omen,	youth,	or ot	her			
	margina	alized g	roups t	o empo	wer th	em with	n skills a	and kno	wledge	releva	nt to th	neir			
C	needs, s	Such as	vocatio	nal trair	ning or 1	rinancia	I literac	y. Lavaba			ا میرمان				
б.	Cultura	ante an	ange P	rogram	: Arrai	nge a	cultura	exchair	inge e	vent w ng dan	nere i	NSS sic			
	and foo	d foste	ring mi	itual un	derstan	ding an	d annre	ciation	liaulio	iis, uaii	ces, mu	510,			
7.	Blood D	) Onatio	n Camp	: Partne	er with	local he	althcare	e institu	tions to	o organi	ize a blo	bod			
	donatio	n camp	to add	ess blo	od shor	tages ar	nd raise	awaren	ess abo	ut the i	mporta	nce			
	of dona	ting blo	od.			U					•				
8.	Commu	inity Su	irvey ai	nd Nee	ds Asse	ssment	: Condu	ict a co	mprehe	ensive o	commu	nity			
	survey	to und	erstand	the ne	eds an	d priori	ties of	the loc	al resid	ents, g	uiding	the			
	selectio	n of fut	ure serv	vice pro	jects.										
9.	Awaren	iess Ca	mpaign	s: Crea	te awa	reness	campai	gns on	critical	social	issues	like			
	gender	equalit	y, educ	ation, c	or subst	ance a	buse th	rough s	treet p	lays, po	osters, a	and			
10	Interact	ive sess	sions.	c \4/~~!	chore f	Conduc	t work-	hone e	n dicas	tor pro	narada				
10.	includin	o firct	aid trai	s vvork ning sn	d emer		espone	nups 0	n uisdsi min the	iei hie	pareune unity w	ith			
	necessa	rv skille		ning all	u emer	Bency I	caponse	., .0 20		. comm	annty W				
11.	Senior (	Citizens	' Engag	ement:	Plan ac	tivities	and eve	nts to e	ngage a	nd sup	port ser	nior			
	citizens	, such a	s organ	izing so	cial gath	nerings	or provi	ding ass	sistance	with da	aily choi	res.			

12. <b>Digita</b> memb	I Literacy Initiatives: Set up digital literacy workshops to help community pers. especially elders and underserved individuals, to learn basic computer and	
intern	et skills.	
13. <b>Comm</b> teamv	nunity Sports Event: Organize a community sports event to promote fitness, work, and community bonding.	
14. <b>Skill C</b> with le	<b>Development Sessions:</b> Arrange skill development workshops in collaboration ocal experts to teach practical skills like tailoring, painting, or handicrafts.	
15. Aware govern	eness on Government Schemes: Educate the community about various nment schemes and programs that they may be eligible for, to ensure they can	
avail t	hemselves of the benefits.	
<b>REFERENCE BO</b>	OKS	
1	National Service Scheme Manual, Government of India.	
2	Orientation Courses for N.S.S. Programme officers, TISS.	
3	Case material as Training Aid for field workers, Gurmeet Hans.	
4	National Service Scheme Manual, Government of India.	
5	Training Programme on National Programme scheme, TISS.	
6	Social Problems in India, Ram Ahuja	
7	Social service opportunities in Hospitals, Kapil K. Krishan, TISS.	

COURSE	TITLI	E			ΤΑΜΙ	L		c	REDITS	2		
COURSE	COD	E	GLS510	08	COU CATEG	RSE GORY	HS	L -	T – P – S	2 -	0-0-2	
Version	1.	0	Appr	oval Do	etails		36 th ACM	L	LEARNING LEVEL BTL			
					ASS	ESSMENT	SCHEME	•				
First Periodical Assessment		F	Second Sem Periodical Assign ssessment Pro		ninar/ nments/ oject	Surpris a Depar Co	e Test / Quiz et pproved by the tment Examination ommittee "DEC"	c., as tion	Attendance		End Semester Examination ESE	
15%			15%	10%			5%		5%		50%	
Course Descriptic	on	This Tamil course improves Tamil language skills of the students' Tamil letters and Grammar are included. This course provides an opportunity not only to get interest in learning Tamil Language but also, they can learn to converse easily.										
Course Objective	e	1. B dail 2. D 3. F 4. S 5. T	y studying t y life and dai vevelops lang acilitates stu tudents also his lesson pla	his cou ily conv guage a dents t learn T an help	rse, studer versations. nd interes o create o amil litera s the stude	nts will bo t in learn pportuni ture by d ents to le	e able to write a ing in students. ties for themselv leveloping intere varn about the cu	ves in t est in la ulture l	eak Tamil eas he society. anguage depa by learning th	ily in an artment ne Tami	ny situation, :. I language.	
Course       Upon completion of this course, the students will be able to         0utcome       1. Demonstrate the Letters and basic words of Tamil Language which are in daily use         2. Develops the listening skills of Tamil language												

3. Utilize the letters and common word	ds of the language for communication
----------------------------------------	--------------------------------------

4. Develop the conversational skills

5. Demonstrate the skill of reading and writing

Prerequisites: Plus Two -Intermediate Level

CO, PO AND PSO MAPPING														
0	PO1	PO2	PO3	PO4	PO5	PO6	PO7	POS	PO9	РО	РО	РО	PSO	PSO
	.01	102	105	104	. 05	100	10/	100	105	10	11	12	1	2
CO1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO2	-	-	-	-	-	-	-	2	2	3	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO4	-	-	-	-	-	-	2	-	-	3	2	-	-	-
1: Weakly related. 2: Moderately related and 3: Strongly related													-	-
	அலகு - 1 தமிழ் எழுத்துக்கள்													
900 2400	தமிழ் எழுத்துகள் – ஓசைகள் - எண்கள் – வண்ணங்கள் – வடிவங்கள் - ஓர்													
தயிழ	தம்பித்துச் சொற்கள் - பழங்கள் மற்றும் காய்கறிகள் – மலர்கள் – இயற்கை													
எழுததுச ுசாறகள - பழங்கள மற்றும் காயகறிகள் – மலர்கள் – இயற்கை - மாதங்கள் சொற்கள் - பெயர்சொற்கள் – உரிச்சொற்கள் –														0 1
- யாதங்கள் சொற்கள் - பெயர்சொற்கள் – உராச்சொற்கள் – வினைச்சொற்கள் – காலங்கள் - வாழ்க்துகள்.														U-1 TI - 2
வனைசுுசாற்கள் – காலங்கள் - வாழ்த்துகள். வகுப்புறை செயல்முறைகள் - 1 வார்க்கைகளை வட்புறிடுகல்														16 2
வகுபபறை செயலமுறைகள : 1. வாரததைகளை வடடமிடுதல. 2. விடுபட்ட எமுத்துகளை நிரப்பத. 3. வடிவங்களுக்கு வண்ணம் கீட்டுக.														
2. விடுபட்ட எழுத்துகளை நிரப்புக. 3. வடிவங்களுக்கு வண்ணம் தீட்டுக. அவகு – 2 கேட்டல் மற்றும் உச்சரிக்கல்														1)
ອ ແຖງອ	ாமக்க	துகள்	வை	ເມດແມ	மக்க	தன் ப	റന്ന്വ	່າ ອຸມ	ີ່ຖຸມຸ	ய்எ	மக்க	കരുണ		-,
உச்சர	்சூல் ககல்		പ്രകരം	கள் க	தற்து வாசி	க்கல் க்கல்	– எகி	 ர்ச்செ	ாற்க	ີπ -	ு ஜ பாருள்	тжиња		
– வாக்	தியக்	தில் <u>ச</u>	ചനെപ്പ	க்கு எ	மகு	5ல் – எ	ு <u>இ</u> நாடு செ	ரு பெ சால்லி	பற்றை 91ல் வி	டைய	 பளிக்க	. <u>அ</u> ரு. கல்.	C C	0-2
வகப்	ചനെ	செய	លំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំ	றைகள்	ເ:1. <b>ດ</b>	சாற்க	ளைக்	கட்	டு உச்	ச்சரிக்	கசெ	ய்கல்	. B ⁻	с – TL-2
2. <b>கு மு</b>	விவா	தம் ெ	ு சய்த	້ນ. 3. <b>ຜ</b>	காடிப்	ட்ட இட	ங்கல	ளைச் ச	் சரியா	ன்கெ	சாற்க	 ளைக்		
கூறுத	ல்.		-		•				·		-			
அலகு	-3 <b>எழு</b>	த்துப்	பயிற்	ந்தி									(6	L)
தமிழ்	எழுத்	துகலை	ள எயு	<b>ஒத க</b> ற்	ற்பித்த	5ல் - உ	_யிர் (	எழுத்	துகள்	- மெ	ப் எழு	த்துக	ள்	
- உயிர்	மெய்	எழுத்	துகள்	ர் - ஆப	புத எ(	ழத்து	– சார்	பிர	த்துக	ள் –				
ஒற்றெ	௮ௐġ	து <b>கள்</b> ∙	- ஒரு (	சொல்	) - இரு	சொ	ல் எழு	துதல்	– ஒரு	வரி,	இருவ	ரி		CO-3
எழுது	தல்.												E	3TL-3
வகுப்ப	அறை	செய	ல்முன	றகள்	r: 1. Ca	ொடிட்	ட இட	ங்கன	ள நி	ரப்புக	5.			
2. <b>சரி</b> ப	பான	எழுத்	துகன	ள வட்	ட்டமி(	நெதல்.	3. <b>ඉ</b>	ருவரி	சொ	ற்கன	ள எழு	்துதல்	<b>b</b> .	
அலகு	-4 <b>உ6</b>	ரையா	டல்க	ள் கற்	பித்த	ல்							(6	iL)
சிறு உ	ரைய	ாடல்	கள் க	ற்பித்	தல் –	வாழ்	த்துக்க	கள் - எ	பங்கி	யில் ட	ணம்			
செலுத	ந்துதல்	ல் - சந்	தையி	ில் க	തடക്ന	ாரரிட	ம் உல	ரையா	டுதல்	, பொ	து			
இடங்க	களில்	உரை	யாடு	தல்.										CU-4
வகுப்ப	அறை	செய	ல்முன	றகள்	ா: 1. கு	று நா	டகங்	கள் ந	டித்து	உரை	யாட	ல்கள்		JIL-7
கற்பித	வகுப்பறை செயலமுறைகள்: 1. குறு நாடகங்கள் நடித்து உரையாடல்கள் கற்பித்தல்.													

2. ഖ്	ிண்ணப்ப படிவங்கள் பூர்த்தி செய்தல். 3. மின்னல் அட்டைகள்	
கான	எபித்தல்.	
എഖ	ரகு - 5 தமிழ் வாசிக்க மற்றும் எழுத கற்பித்தல்	(6 L)
ភណ្ឌ	தங்கள் வாசித்தல் மற்றும் எழுதுதல் – விண்ணப்ப கடிதம்,	
வங்	கிகணக்கு படிவங்கள், இரயில் முன்பதிவு விண்ணப்ப படிவம்	60 F
பூர்த்	திசெய்தல் – கவிதை வாசித்தல் – செய்திதாள் வாசித்தல்.	
வகு	ப்பறை செயல் முறைகள்: 1. விண்ணப்ப படிவங்கள் பூர்த்திசெய்தல்.	DIL-3
2. <b>க</b> ல	<mark>பிதை வாசித்தல் போட்டிகள்</mark> 3. வகுப்பறை தேர்வுகள்	
TEXT E	300К	
1	Saidhai. P. Sundaramurthy (2018). Learn Tamil Through english. Manimekalai Prasuram. Chenn	ai - 17.
1.	Pages 1 to 84	
2.	Pulavar Kulanthai (2020). Students Basic Tamil. Manimekalai Prasuram. Chennai -17. Pages1 to	84
REFER	ENCE BOOKS	
1.	Lena tamil vanan. (2017). Easy Tamil Grammar. Manimekalai Prasuram, Chennai -17, Pages 11 t	:o 21
2.	Tamilnadu Board - NCERT/CBSE-Books Class – 6 th TO 9 th (2021-2022)	
E-REF	RENCES	
1	https://cbsetamil.com/cbse-tamil-book/,https://tamil.examsdaily.in/tnpsc-tamil-ilakkanam-ma	<u>terial-</u>
	pdf-download	

COURSE TITLE				HIN			CREDITS	2					
COURSE COD	E	GLS51	009	COURSE HS CATEGORY			I	L - T – P – S	2-0-0-2				
VERSION	1.0	AP DE	ROVAL		36 th /	ACM		BTL LEVEL	3				
				ASSI	ESSMENT S	CHEME							
First Periodical Assessment	Seco Perioc Assessi	nd lical ment	Semir Assignm Proje	nar/ nents/ ect	Surprise approved Examir	Test / Quiz etc., a by the Departme nation Committee "DEC"etc.,	as ent	Attendan ce	End Semester Examination ESE				
15%	159	6	109	6		5%		5%	50%				
Course Description	This cou includes to comr	urse has s Hindi nunicat	s been des language, e accurate	igned to literatu ely, appr	o develop th re, vocabula ropriately ar	e regional languag ary and grammar. nd fluently in regio	ge sk This onal	ills of the stud course teach language.	dents. The course les students how				
Course Objective	1. To pr use it 2. To eq 3. To he const	<ol> <li>To provide an environment to Speak and write in Hindi at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate.</li> <li>To equip the students to Read, comprehend and answer questions based on literary texts.</li> <li>To help student to become sensitive to the requirements of the society and respond to it in a constructive way.</li> </ol>											
1	4. To provide an environment to students to read and appreciate the literature.												

Course       Upon completion of this course, the students will be able to         1. Demonstrate the ability to write the grammatically correct sentences with accurate         2. Integrating various components of Hindi Language and determining it through listening.         3. Organize and articulate ideas, concepts, and perceptions in a comprehensive mann correspondence, and speaking in formal and informal situations.         4. Infer details from after listening and reading and implement it in various situations.         5. Develop writing and speaking skills.												acy. n readin ner in w profes	g and rritten sional		
	PO	PO													
	1	2	2 3 4 5 6 7 8 9 10 11 12												
CO1	-													-	
CO2	-	-	2 2 3												
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-	
CO4	-	-	-	-	-	-	2	-	-	3	2	-	-	-	
1: Wea	CO5         -         -         -         -         2         2         -         2         -         2         -         -         -         1: Weakly related, 2: Moderately related and 3: Strongly related         -         2         2         -         2         -         2         -         -         -         -         -         -         -         2         2         -         2         -         -         -         -         1         Weakly related, 2: Moderately related and 3: Strongly related         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         - <t< td=""></t<>														
मॉड्यूल 1: हिंदी पत्र और लिपि											(6L)				
हिंदी स्वर और व्यंजन अक्षर - आश्रित स्वर सीखें - व्यंजन और व्यंजन समूह - अनुस्वर व्यंजन - संज्ञा - सर्वनाम - क्रिया (भविष्य) - संभावित विशेषण - काल - हिंदी के त्वरित नियम - अभिवादन - 2 अक्षर शब्द बनाना, 3 अक्षर शब्द - हर दिन शब्दावली - संख्याएं - रंग - परिवार - वस्त्र - बगीचा - घर - फल और सब्जियां - प्रकृति सुझाई गई गतिविधियां: देशी वक्ताओं द्वारा स्वर और व्यंजन का उच्चारण सुनना										CO-: BTL-	1 2				
मॉड्यूल	त 2: सु	नने का	कौशल											(6 L	.)
स्वर और व्यंजन का उच्चारण सुनना - लघु कथाएँ सुनना - साक्षात्कार - भाषण - सामाजिक मुद्दों पर पॉड वार्ता - निर्धारित पाठों को सुनना: इकाई 1 सभ्यता का रहस्य, इकाई 2 - युवावों से - वार्तालापों को सुनना - जानकारी सुनना - सम्मेलनों के भाषण सुझाई गई गतिविधियां: सुनें और चुनें उम्मीदवार पाठ को सुनते हैं और तीन विकल्पों के साथ बहुविकल्पीय प्रश्न का उत्तर देते हैं। उम्मीदवार टीवी चैनलों में बातचीत - साक्षात्कार- अतिथि व्याख्यान, सम्मेलनों और कार्यशालाओं के दौरान											वार्ता ग्रारी  रान	CO BTL	-2 -3		
।বহাগ্র	႞ႜၯႃႜႃႝ႞ၒ	१ण सुनत	16												

मॉड्यूल 3: बोलने का कौशल	(6 L)
औपचारिक संवाद - अनौपचारिक संवाद - लिंग रूपों के साथ बोलना - संख्या - काल - परिवार, शहर, त्योहार को र अपने के राज्य - प्रतियर्ग प्राप्त के राज्य - प्राप्त और नामपांत नामन नाम - राज्य - राज्य के संवाद - अपने क	, ,
्शांक आदि जस सामान्य विषया पर बालना - पसंद आर नापसंद व्यक्त करना - ज़रूरत आर संपात्त - मूामक निभाना।	CO-3
सद्माई गई गतिविधियां	BTL-3
प्रस्तुति – फोपप्रमा फो त्तपालन - मापण दना 	
मॉड्यूल- ४ : पढ़ने का कोशल	(6 L)
नमूना पढ़ना - नकल पढ़ना - अक्षरों और शब्दों का सही उच्चारण करना - पढ़ने में प्रवाह - कहानियाँ पढ़ना	-
संपादकीय, समाचारपत्र के लेख पढ़ना।	CO-4
सुझाई गई गतिविधियां	BTL-3
फ्लैशकार्ड का उपयोग - चार्ट - चित्रों की पहचान करना - शब्दों को पढ़ना	
मॉड्यूल-5 लेखन कौशल	(6 L)
सामान्य पत्राचार - पत्र लेखन: छुट्टी लेने पत्र, बैंक खाता खोलना, पुस्तकें मंगवाने के लिए पत्र, शिकायत पत्र	-
संकेत विकास - ज्ञापन - नोटिस	CO-5
सुझाई गई गतिविधियां:	BTL-3
निर्धारित पाठ्यपुस्तक के अनुसार अभ्यास पूरा करना	
पाठ्य पुस्तक	
1. Sashtri. S.R.(2019). Hindi Shikshak, Dakshina Bharat Hindi Prachar Sabha, Chennai (Pages 2	137)
संदर्भ पुस्तकें	
1. Prathamatic Patya Pushthak. (2022), Dakshina Bharath Hindi Prachar Sabha, Chennai. (Pag	ges 168)
2. Madhyama Patya Pushthak. (2022) Dakshina Bharath Hindi prachar Sabha, Chennai (Page	s 184)
ई-संदर्भ	
1. <u>https://www.hindipod101.com/</u>	

COURSE	TITLE	TE	LUGU	CR	2							
COURSE	CODE	GLS51010	COURSE CATEGORY	HS	L - T – P – S	2-0-0-2						
Version	1.0	Approval Details	36 th ACM	BTL	3							
	ASSESSMENT SCHEME											

Fi	rst	Se	cond		Semina	ar/ Surprise Test / Quiz etc., as approved										
Perio	odical	Per	iodical	As	signme	nts /	by	the Dep	partme	nt Exan	nination	Attend	ance	ESE		
Asses	sment	Asse	ssment		Projec	t		Comr	nittee '	'DEC"e	t <b>c.,</b>					
15	5%	1	L5%		10%				5%	, )		5%	, D	50%		
			This cou	urse ł	nas bee	en desi	gned t	o mee	t stude	ents' c	urrent a	nd future	langua	age and		
Cours	e Descr	iption	commur	nicatio	n needs	s. It atte	empts to	o develo	op their	profici	ency in th	e four lang	uage s	kills and		
			knowled	ige of	gramm	ar and s	vocabu	lary. Th	is cours	se teac	nes stude	nts how to	comm	nunicate		
1. This course is at																
			1. Inis C	ourse	is aime		ich the		elugu la	inguage	speaking	s skills.	tial wo	rdc and		
Cours	se Ohie	rtives	z.it wii simpl	a sant		asic skii	ion met	thods	su Lang	guage.	ts aipnai	jets, essem	liai wu	i us allu		
cours		cuves	3 The c		intondo	to facil	litata st	udents	in acqu	iring fo	undation	al skills of r	aadina	writing		
			and s	peakir	ng Telus	u alone	with sy	vnonvm	in acqu	ning io pand vo	ocabularv		caung	, writing		
			Upc	n con	pletion	of this	course	, the stu	dents v	will be a	able to					
			1.Demo	onstra	te the b	asic ski	lls of Le	tters ar	nd soun	ds in Te	elugu.					
			2.Devel	op the	e basic v	/ocabul	ary for	every d	ay's co	nversat	ion.					
Cour	<b>Course Outcome</b> 3. Construct simple Telugu sentences with the simple words.															
			4.Utilize	4. Utilize the words that have conjunct character, and can learn functional, everyd												
			conve	conversation.												
5.Construct Simple sentences for delivering appropriate meaning.																
Prereq	Prerequisites: Plus Two Telugu-Intermediate Level															
CO, P	O AND	PSO M	APPING													
СО	PO 1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO	1 PSO2		
CO1	-	-	-	-	-	-	-	-	-	3	-	-	-	-		
CO2	-	-	-	-	-	-	-	2	2	3	-	-	-	-		
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-		
CO4	-	-	-	-	-	-	2	-	-	3	2	-	-	-		
CO5	-	-	-	-	-	-	-	-	- -	3	-	2	-	-		
~~× ×	N1. 9	××~	1: W	еакіу	related	, Z: IVIO	Geratei	y relate	a and a	3: Stror	igiy relat	20				
భోగిని తెలుగు	<b>ນ I</b> : ຝ	പല് പാം പാം	, ພລູເຜ 	$\sqrt{320}$		5000 G	0							(6L)		
ಅಲುಗ ಸ ್ಮಾ	) అయి. ఎ.చ ం.S	్రలు ఉ	ు చెల్లురు	റ പത്ര പ്രം പ്രം പ		<u> </u>		( ~ ) ~ ( )					0	0-1		
ພິເລະ ແລະ	്രറം	ನ ಇದು ನ ಇದು		) ಎ°ಲ್ಲ ೧೭೭೭	ಲ್ಲಲ ನಂ	000000	ల ఎ౦ఒ	50000								
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ಬ೦ ₁ ೮	ມ:500		. అనైన — ఆ <b>గ</b> ్గ	<u>మ</u> రం	ມຼ/ [ຝ 	జందిం జందిం	ນ _ເ ດ - 5	10000	0 					(61)		
భాగిచ	ນ 2:	సర్ల ప్ర 	దాలను,	လဝန	ນໃຄ <i>2</i>	), మర	యు వ	းရာ ကရ	ణాల ్	ುಂಬಂ	ພວ		1	(6L)		
මෙවා (t	ು ನ್ _{ಮಿ} ಂ	ವ್`ಬಿS(	ఎంచం	ໝ໐ ຈັ້ນເມັນ												
හොග	తెలుగు సంవ్వామం & దాసి పిషయం రంగా కార్యం క															
ಸಂಖ್ಯ	ನಂಖ್ಯ ಲು ದೇನ ಎಂಬಯಂ & ಅಲುಗು ವಿಇಷಣೀಲು ಎಂಬಯಂ BTL-3															
సూచం																
ಬಂಬಲ	ນ : 5 ဂ័(	ంటలు గ	. అసైన్ • • • • • • •	ಮಂಲಿ	ಬ್ಲ / [ಮ	ಜಂಕು:	ఎన - 5	೧೦ಬಲ	ນ							
భాగ చ	ນ 3: ໍ	సదాల	ను పిడ	ದಸೆ :	రాక్యా	లను రా	ాయడం	0						(6L)		
తెలుగు పూర్వ పదాలు – సంయోగాలు												CO-3				
మరియ	ురియు దాని ఉపయోగం BTL-3												E	BTL-3		

సూచి	ఎంచబడిన : కార్య కలాపాలు						
చర్చలు : 5 గంటలు . అసైన్మెంట్లు / (పెజెంటేషన్ - 5 గంటలు							
భాగశ	ము 4 : పనులు, సమయం, క్రియ మరియు కాల వ్యవధుల పరిచయం	(6L)					
వివిఢ	న క్రియల యొక్క క్రియ & సమయం / కాల సంయోగాలనికి పరిచయం						
సూచి	ఎంచబడిన : కార్య కలాపాలు	CO-4					
చర్చ	ులు : 5 గంటలు . అసైన్మెంట్లు / [పెజెంటేషన్ - 5 గంటలు	DIL-3					
భాగశ	ము 5 : తెలుగు చదవడం, రాయడం మరియు [పశ్నించడం	(6L)					
తెలు	గులో సరళమైన వాక్యాలను రూపొందించడం (ప్రాథమిక వాక్య నిర్మాణ నియామాలు)						
తెలు	గులో (పతీకూల వాక్యాలును రూపొందించడం						
తెలు	గు బోధన అభ్యాస (షక్రియలో (పశ్నర్ధకవాక్యాలువాక్యాలను రూపొందించడం	CO-5					
సూచి	ఎంచబడిన : కార్య కలాపాలు	BIL-3					
చర్చ	ులు : 5 గంటలు . అసైన్మెంట్ల / డ్రెజెంటేషన్ - 5 గంటలు						
TEX	ТВООК						
1	Telugu Akademy. (2018). Sampradaya Telugu Vyakaranalu. Telugu Akademy. Vijayawada, A	Andhra Pradesh.					
1.	India.						
2.	Raghavendra. A. (2019). Telugu Vyakaranam. Prajasakti Book House. Tadepalli.						
REFEI	RENCE BOOKS						
1.	Ramarao, Chekuri. (2019). A Reference Grammar of Modern Telugu. Emesco Books. Hyderaba	d					
2.	Vemuri, V. Rao. (2020). Learn Telugu with Its Grammar, Eco Foundation, Vijayawada.						
E-Re	ferences						
1	https://sarkarihelp.com/telugu-grammar-pdf-download/						

COURSE T	TLE			FRENCH	CREDITS		2			
COURSE C	ODE	GLS51011		COURSE CATEGORY		HS	L - T – P - S		2-0-0-2	
Version	1.0	Approval D	etails	3	6 th ACM		LEARNING LEV	EL	BTL – 3	
				ASSESSM	ENT SCHEN	1E	•			
First Periodi Assessmer	cal nt	Second Periodical Assessment	Weekly assignment/ lab record and viva as approved by the Department Examination Committee "DEC"		Surprise Test / Quiz., as approved by the Department Examination Committee "DEC"		Attendance	I	End Semester Examination (ESE) Theory	
15 %		15 %		10 % 5 %			5 %		50%	
CourseIntroduces students to the culture and language of the French-speaking world. Studevelop an ability to communicate in real-life situations by acquiring reading, we listening, and speaking skills. The elementary courses prepare students to communicate successfully in some common basic social situations using the four language skills—list speaking, reading, and writing—within appropriate cultural contexts. The student will acquire an understanding of cross-cultural awareness.										

Course Objective	<ol> <li>To discover basic elements of the language, such as the different phonemes, the alphabet and its pronunciation</li> <li>To discover the foundation of the language such as conjugations, auxiliaries, numbers, etc.</li> <li>To learn how to form simple sentences about personal topics such as one's family</li> <li>To start interacting with others by asking and answering simple questions</li> <li>Understand your learning style and be able to check your own progress.</li> </ol>												
Course Outcome	Upon of 1. Dem 2. Den write of 3. Der cultura theory 4. Der writers tradition cultura 5. Dem	complein nonstra coherer nonstra al texts, nonstra s, and w ons: Eu es. nonstra	tion of t te adva te the itly abo ite fam such as vorks of ropean te the s	his cour nced pr ability t ut visua iliarity close re wledge the Fre , Africa kills nec	rse, the oficience oread l and lit with me ading, of liter nch-spe n, Caril ressary	e studer cy in spo critical cerary to hethodo socio-h rary and eaking y bbean, for scho	its will k bken an ly, inte exts pro logical istorical d cultur world, fo Asian, blarly re	e able f d writte rpret ar duced i approa contex ral trad ocusing North A	to en Frend nalytica n the Fi ches ir tualizat itions, s on at le America and wri	ch. Ily, spe rench-s the s cion, and such as east one an, and iting in	ak pers peaking tudy of d literar and id other the Hur	suasively g world. f literar ry and cu moven leally mu Francop manities	r, and y and iltural nents, iltiple bhone
Prerequisites:	ntermed	liate Le	vel										
CO. PO AND PS		PING											
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	DS	DC

со	PO	PS	PS											
	1	2	3	4	5	6	7	8	9	10	11	12	01	02
CO1	-	-	-	-	-	-	-	-	-	3	-	-		
CO2	-	-	-	-	-	-	-	2	2	3	-	-		
CO3	-	-	-	-	-	-	-	-	-	3	-	-		
CO4	-	-	-	-	-	-	2	-	-	3	2	-		
CO5	-	-	-	-	-	-	-	-	2	3	2	3		

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE – 1: INTRODUCTION FRANÇAISE	(6L)	
.1 Introduction au cours de français - 1hr		
1.2 La France et ses clichés - 2hr		
1.3 Première rencontre (saluer, prendre congé, parler de son humeur) - 1hr	CO-1	
1.4 Qui es-tu? (se présenter, les chiffres 1-20, être et avoir) - 2hrs	BTL-2	
1.5 Activité fiche d'identité		
MODULE – 2: LE MONDE QUI M'ENTOURE	(6L)	
2.1 Quel temps fait-il? (la météo, les chiffres 20-49) - 1hr		
2.2 Mes couleurs préférées (la possession, le genre des articles) - 2hrs	<b>60 3</b>	
2.3 Introduction à la Révolution Française - 2hrs	CO-2 PTI 2	
2.4 Me repérer dans le temps 1: la date (mois, jours, années) - 2hr	DIL-3	
2.5 Me repérer dans le temps 2: l'heure (chiffres 49-60) - 2hrs		
MODULE – 3: MES GOÛTS	(6L)	
3.1 La nourriture en France - 2hrs	<b>60</b> 3	
3.2 Exprimer ses goûts (verbes du 1er groupe, négation verbale) - 2hrs		
3.3 Manger et boire en France - 1hr	DIL-3	
3.4 IVId	famille extraordinaire - 2hrs	
----------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------
3.5 Act	ivité "qui est qui?" - 2hrs	
MODU	LE – 4: MON QUARTIER EST UN MONDE	(6L)
4.1 Mo 4.2 C'e 4.3 Act 4.4 On 4.5 Mo	n quartier idéal (lieux de la ville, prépositions de lieu, <i>habiter</i> et <i>vivre</i> ) - 2hrs st par où? (verbe <i>aller</i> , les directions, l'impératif, donner des indications) - 2hrs ivité "où vont-ils?" trouver l'itinéraire - 1hr y va comment? (les transports, <i>conduire</i> et <i>prendre</i> , la préposition en/à) - 2hr ntmartre, un quartier pas comme les autres. 2hrs	CO-4 BTL-3
MODU	LE – 5: JOUR APRES JOUR	(6L)
5.1 Une 5.2 Me 5.3 Une 5.4 La p 5.5 Me	Pjournée ordinaire (verbes pronominaux, routine, emploi du temps) - 2hrs s petites habitudes (la fréquence définie et indéfinie) - 1hr e carte postale de vacances - 2hrs provenance et la destination (prépositions in, from, to, le genre des pays) - 1hr s vacances idéales (adjectifs démonstratifs) -2hr	CO-5 BTL-4
TEXT B	OOKS	
1	1.Ego 1 Cahier d'Activités, Annie BERTHET & Co, Hachette 2006 2. Version Originale Cahier d'Exercices, Monique DENYER & Co, ED. Maison des Langues, 2012	1
REFERE	INCE BOOKS	
1.	1. Alter Ego 1	
2	2. Version Originale 1	
2.		
2. E Book	S	

COURSE TIT	LE			GERMAN				CREDITS		2
COURSE CO	DE	GLS51012	2	COURSE CATEG	ORY	HS		L - T – P - S		2-0-0-2
Version	1	Approval D	etails		36 th AC	M		LEARNING LEV	ΈL	BTL – 3
		•		ASSESSM	ENT SC	HEME				
First Periodica Assessment	I A	Second Periodical Issessment	assiį recor appr De Ex Comi	Weekly gnment/ lab rd and viva as roved by the epartment camination mittee "DEC"	Sur ( appr De Exa Co	orise Test / Quiz., as oved by the partment amination ommittee "DEC"		Attendance	E)	End Semester kamination (ESE) Theory
15 %		15 %		10 %		5 %		5 %		50%

Cours Descript	se tion	The students shall understand the basic German Language concepts and cultural difference. They manage to understand and communicate in German when they travel to Germany.														
Cours Object	se ive	1) This 2) The 3) It he require 4) The	course a students lps them ed to clea students	aims to e s learn th n to unde ar the A1 s learn th	quip the ne spoke erstand t first lev ne conce	e student n Germa the 4 diff vel interr pts whic	ts with a an requir ferent m national o ch is requ	basic da red to co odules ( certifica uired for	aily comm mmunica Horen, Sa te exam. pursuing	nunicati ate with chreiber g their P	on in Ge 1 native s n, Sprech G or Job	rman. speakers nen and in Germ	Lesen) w nany	vhich is		
Upon completion of this course, the students will be able to1. Recall and recognize the facts and use familiar, everyday expressions, create very simple sent which relate to the satisfying of concrete needs.2. Understanding the texts and trying to communicate in a simple manner provided the person th speaking to speaks slowly and clearly and is willing to help.Outcome3. Understanding and recalling the basic German Vocabulary, Verb conjugations with pror expressions and connecting the learned facts to communicate in simple German sentences 4. Applying the above learned facts and trying to create own sentences, E-mails etc. as per the level achieved 5. Understand the native speaker and apply the knowledge (at basic level) in writing and speakingPrerequisites: Intermediate Level														tences, ney are nouns, e basic g parts.		
Prerequisi	i <b>tes:</b> Inte	ermedia	te Level													
CO, PO A	ND PSO	MAPPIN	NG													
со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2		
CO1	-	-	····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ····         ···· <th< td=""></th<>													
CO2	-	-	<u> 1</u> - <u> 1</u>													
CO3	-	-	<u> 1</u>													
CO4	-	-	-	-	-	-	-	-	-	1	-	-	-	-		
CO5	-	-	-	-	-	-	-	-	-	2	-	-	-	-		
			1: We	eakly rel	ated, 2:	Modera	tely rela	ted and	3: Stron	gly rela	ted					
MODULE	1 : SUP	ER!												(6L)		
Jemanden - Eine kurs <u>Grammati</u> - Definite – aus, in	vorstell liste sch i <u>k:</u> regel r Artike	len - Eine nreiben Imäßge v I im nom	e Hitliste verben – iinative o	internat möchte der,die,d	ionaler \ n, sprecl as -	Wörter si	chreiben - W	/ - Nach /	dem Nan Persor n, Ja/Neii	nen und nalprono n Frager	der Herl omen – i n - Pr	kunft fra ch,du,er äpositio	gen ,sie. nen	CO-1 BTL-2		
MODULE	2: Me	nschen											(	6L)		
Jemanden erfragen u <u>Grammat</u> – mein,dei	nach d Ind darü Inde in,sein	lem Befi Iber beri efiniter A	nden fra chten - Artikel –	agen - Über sei ein/eine	Sich v ne Freur - Nega	erabschi nde und ativartike	eden - die Freu el – kein/	Intervio nde and keine	ew: Info erer schr	rmation eiben u	en über nd sprec Posse	die Fan hen essiveart	nilie :ikel	CO-2 BTL-3		
MODULE	3 : Esse	n und Ti	rinken											(6L)		
MODULE 3 : Essen und Trinken         Lebensmittel vergliechen - Lieblingfarbe und Lebensmittel zuordnen - Umfrage: mein Lieblingsfrühstück - Eine         Einkaufsliste für ein Lieblingsessen schreiben         Grammatik:       Verb Konjugation – sein, haben - Imperative!         Verbposition im Satz - W - Rragen,													CO-3 BTL-3			
MODULE	4 : Me	ein Lebe	n											(6L)		
Sich über I Interview: Grammati Akkusativ(	Leben, E : sich üb i <b>k:</b> Tr definite	Beruf, He er den T ennbare /indefin	erkunft, e agensab en ver ite/nega	etcaust lauf aus rbena tive Arti	auschen tauchen - kel) - Pr	- Eine V - Die zał "m äpositio	/isitenka hlen bis : an" ι nen – un	rte schre 100 Ind "I n, als, fü	eiben negation r,bei	nich	ıt" be	enutzen_		CO-4 BTL-3		

MODUL	E 5 : Freizeit	(6L)
Ein kurs	poster mit Hobbys schreiben - Welche Hobbys habe ich, welche nicht -	
Notierer	n und sprechen – Was man selbst und die Familie am - Wochenende gerne macht- Über seinen	CO-5
Sonntag	schreiben	BTL-4
Gramm	atik: Modalverben - Präpositionen – in,am	
TEXT BC	oks	
1	Rolf Bruseke , Starten Wir! (A1) ,Hueber Verlag,2018	
REFERE	NCE BOOKS	
1.	Stefanie Dengler, "Netzwerk neu A1.1 [Kurs und Übungsbuch]", Klett, 2015	
2.	Harmut Aufderstrasse, Heiko Bock, "Themen 1 aktuell kursbuch", Hueber, 2003	
E Books		
1.	https://www.learn-german-online.net/en/learning-german-resources/free-german-lessons-a1.htm	

COURSE	TITL	E				Span	ish				CRE	DITS		2
COURSE	COD	E	GL	\$51013		COUR	SE CATEO	GORY	HS	5	L-T	-P-S	2.	-0-0-2
Version	1	0	Appro	val Deta	ils	3	36 th ACM			LEAI	RNING LEV	EL	B	STL- 3
						ASSESS	SMENT S	CHEME						
						CIA								
First Period Assessme	Second Periodical mentSecond Periodical 							n	Attendanc	e	ESE	1		
15%			15%		10%	,	5% 5%							
Course Descriptior	ד ז ז	his Spa he stud equire	anish lang dent. Its c ment of t	uage co ontent is he stude	urse ha s very c ent	s been pr omprehe	ogramm nsive and	ed to me d will also	et the gr assist in	amma i the p	tical and co rofessional	onversat and per	ion need sonal lar	ls of nguage
Course Objective	1 2 3 0 4 2	L. To fa 2. To m 3. To im commu 1. To pr all the L	cilitate th ake an im prove the nicate wi ovide sur atin Ame	e studer imediate e overall th global vival skil rican co	nt in rea conne person clients ls to stu untries	ching ou ct by spea ality of th udents re and Spair	t to inter aking to t ne studer locating I n.	national he prosp ht thereb n countr	clients ac pective cl y making ies where	cross t ient/ c ; him/l e Span	he globe. ompany in ner more c ish is spok	their na onfident en. This i	tive lang to ncludes	;uage. USA,
Course Outcome	1 2 3 2	L. Unde 2. Creat 3. Enab 4. Unde 5. Unde	rstand sp ing conve les the lea rstanding rstanding	oken Sp ersations arners to g the per g of not o	anish a & oral decod ceptior only the	nd constr understa e a messa s, phrase language	uction of nding. age and t s, and ot e but also	basic se o give a s her voca o culture,	ntences. suitable r bulary. music, fr	eply ir ood ar	n the same nd other as	manner. pects of	the lang	uage.
Prerequisite	es: Plu	ıs Two	-Interme	diate Lev	vel									
CO, PO AND	PSO	MAPP	ING											
CO PO	01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	0 PO11	PO12	PSO1	PSO2

CO1	-	-	-	-	-	-	-	-	-	3	-	-			
CO2	-	-	-	-	-	-	-	2	2	3	-	-	1	_	
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CO4		-					2			2	2		+		
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05	-	-	-	-	-	-	-	-	2	3	2	3	<u> </u>		
1: Weak	dy relate	ed, 2: Mo	oderatel	y related	and 3: 5	strongly	related								
MODUI	F 1 · Intr	oduction	tolana	11200 & C	òmmun	ication (	Part 1)							(61)	
WIODOL		ouuction		suage & C	Johnnan	incation (	rait 1j							(01)	
1.	El Alfa	beto – T	he Alpha	bets											
2.	Nume	ros – Nu	mbers												
3.	Saludo	os - Salut	ations											CO-1	
4.	La hor	a – The 1	Time											DTI 1	
Suggest	ed Read	lings: US	O (Basico	o)										DIL-I	
Dele Gra	Dele Gramatica Epanola Author by Francisca Castro														
Author	Author by Francisca Castro MODULE 2: Introduction to Language & Communication (Part 2)														
MODUL	MODULE 2: Introduction to Language & Communication (Part 2)														
1	1. Los Meses, La Semana- The Month, The week and the days of the year														
1. 2	<ol> <li>Los Meses, La Semana- The Month, The week and the days of the year</li> <li>Los Estaciones Delan'o – the Seasons of the year</li> </ol>														
2.	<ol> <li>Los Misses, La Semana- The Month, The Week and the days of the year</li> <li>Los Estaciones Delan'o – the Seasons of the year</li> <li>En el Aeropuerto, Cpger El Taxi – At the Airport, Booking tickets</li> </ol>														
<ol> <li>En el Aeropuerto, Cpger El Taxi – At the Airport, Booking tickets</li> <li>Hola – Salutations and Greetings</li> </ol>															
<ol> <li>Hola – Salutations and Greetings</li> <li>Durante La Clase – During the class</li> </ol>															
<ol> <li>Durante La Clase – During the class</li> <li>Art'culos – Different Articles</li> </ol>															
Suggest	6. Art'culos – Different Articles Suggested Reading: USO (Basico)														
Dele Gra	amatica	Epanola	• • • • • •	,											
Author	by Franc	isca Cast	tro												
MODUL	.E 3: Un	derstan	ding of B	Basic verb	and Int	roductio	n to Gra	mmar						(6L)	
1.Verbp	ser : Pre	esente –	Present	tense of V	Verb "to	be"									
2. Estar	/ Hay – (	Conjucat	ions of t	he verb "	to be" a	nd the ve	erb there	e is / The	re are					CO-3	
3. Verbo	os En Pre	esente: R	egulares	- Introd	uction to	o regular	verbs								
4. Ser / 1	Estar / T	ener – Co	onjucatio	on of Irre	gular Ve	rbs								BTL-3	
Suggest	ed Read	ing: USO	) (Basico	)											
Dele Gra	amatica	Epanola													
Author	Dy Franc	cisca Casi	tro and intro	duction	o hacic	Concont								(61)	
WIODOL	.E 4. GI	annnar a		Junction		concept								(0L)	
1.Posesi	ivos – Po	ssesive A	Adiective	es and No	uns										
2. Color	es – Colo	ours and	Expressi	ons											
3. La Far	milia – T	he Famil	y and its	member	S									CO-4	
4. Nomb	ores Y Ac	djetivos -	- Nouns a	and Adje	ctives									DTI 3	
Literary	Reading	s: <b>USO (</b> I	Basico)	-										BIL-Z	
Dele Gra	amatica	Epanola													
Author	by Franc	isca Cast	tro												
MODU	LE 5 :													(6L)	
				6.1											
1.Los no	ombres d	ie la fam	ila – Nan	ne of the	Family	viembers	5								
2. Relac	iones — r		ala da fa	milio ida	nt:figati	on of the	familut	abla							
J. Ronar		mostro a	ue la	i i i i i a - i ae	mincati		e ranniny t	aule						CO-5	
4. Repaso del semestre entero -													BTI-2		
Literary Readings: USO (Basico)													DIL-3		
Dele Gramatica Epanola															
Author by Francisca Castro															
TEXT BC															

	Módulo Mind your Language Institute
1.	
E-REFER	RENCES
1	Open.umn.edu
2	Pdfdrive.com/francisa-castro

COUR	SE TITLE						Kor	ean				С	REDITS		2
COUR	SE CODE			GLS51	)14	(	COURS	E CATEGO	DRY	ŀ	IS	1	T-P-S	-0-0-2	
Versio	on 1	.0	Ap	proval	Details			36 th A	СМ		L	EARNING	G LEVEL	E	STL- 3
						•	ASSES	SMENT S	CHEME						
							CIA								
First Pe Assess	riodical sment		Se Per Asse	cond iodical ssment	S Ass	eminar/ ignment Project	ts/	Surpri approv Examin	se Test / ed by the ation Con	Quiz etc. e Departr nmittee '	, as nent 'DEC"	Atten	dance	ES	ε
15	5%		1	L5%		10%			5%	)		5	%	50	%
Cou Descri	irse iption	K be Tł	lorea ecom his co	n langua ne more ourse co	age will g confider vers mos	ive you It with t t basic g	the op heir ski ramma	portunity lls in com itical stru	to take a municati cture and	deep div ng with t everyda	ve into k heir emp y vocabu	Corean co ployers a plaries.	ulture. T Ind pote	he stude ntial cus	nts will comers.
Course       1. To make the students get an upper hand in the prime industries of the world and direct access to Korean speaking community.         Objective       2. To enable the students to create a direct connect thereby eliminating the requirement of a translational of the student to community of the student thereby making them more confident to community with global clients.         4. To provide survival skills to students relocating to countries where Korean is spoken.													; to the slator. unicate		
Cou Outc	irse ome		1. 2. 3. 4. 5.	Enhance Create a Identify Analyse	n idea to and cons their lan	ations & decode struct ph guage, c	oral u messa rases, ulture,	derstand ges and e and other music, fo	ding of few enable a s vocabula od and of	w commu uitable re ary. ther aspe	unicatior oply in th ects of th	is. i concep ie same ie Korear	ts. manner. n Langua	ge.	
Prerequ	i <b>isites:</b> Pl	us T	wo -	Interme	diate Lev	el									
CO, PO	AND PSC	) MA	APPIN	NG											
со	PO1	PC	02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-			-	-	-	-	-	-	-	3	-	-		
CO2	-		-	-	-	-	-	-	2	2	3	-	-		L
CO3	-		-	-	-	-	-	-	-	-	3	-	-		
C04	-		-	-	-	-	-	-	-	- 2	<u>ડ</u> ર	2	- ર		<u> </u>
1: Weak	dy relate	d, 2	: Mo	derately	related	and 3: S	trongly	/ related		2	5	2	5		
MODUL	.E 1 – Int	rodu	uctio	n: Langu	age and	Culture		·							(6L)
What ki	nd of lan	guag	ge is	Korean?			ongNe	m Ctulat	n this re-	odula at	udorsta	uill lee	Korrer		:0-1
culture 'Hange	philoso e, philoso eul'. Afte	pny ophy r coi	of the providence of the provi	ting the	Korean : lessons,	scripts, student	angivar and th s will b	n Style! Ne Korear Ne able to	alphabe understa	t or Kore and the p	an writi vinciples	ng syste how ea	m called ch letter	E	TL-1

was ir	nvented. Also, students will be able to understand Korean sign languages as well.	
Sugges	ted Activities: Memory game	
MODU	LE 2 – HANGEUL	(6L)
Greetin	ngs and Introducing phonics, the character system, Noun, Pronoun Basic Verb and Greetings &	CO-3
Introdu	icing. In this module, Students will learn how to greet, ask someone's nationalities / jobs and answer	CO-2
those q	and talk about someone's nationalities and escurations. Suggested activities: Introduce themselves, greet a	BTL-2
song F	and talk about someone's nationalities and occupations. Suggested activities. Introducing, Game with lash cards game	
MODU	LE – 3 : Restaurant & Shopping	(6L)
Reading	g simple sentence - to be able to comprehend sign board and name ordering at arestaurant	
countin	g units Interrogative sentence	
In this	module, students will learn how to order food and make requests at a restaurant in Korean. After	CO-3
comple	ting the lesson, students will be able to inquire about restaurant menus, order a specific portion of food	
at a res	taurant, and order a drink at a café. After completing the lesson, you will be able to express prices per	BIL-3
item, p	urchase a product from a store, and make a specific request while shopping.	
Sugges	ted Activities: Playing in the condition of restaurant and Shop, Dictation	
MODU	LE – 4 : Daily Life & Time	(6L)
Talk	ing about daily life, expressing movement, memo, simple message, object marker, expression of	
In t	duon, a whung. his module students will learn various Korean vocabulary regarding your daily lives. After	
com	inleting the lessons, students will be able to utilize informal sentence endings, ask and answer	CO-4
abo	ut their everyday life.	
Stuc	lents will learn about time and date in Korean. And students will also say the days of the week as	BTL-2
well	. After completing the lessons, students will be able to ask and respond time & date using Korean	
num	bers.	
Sugges	ted activities: Songs about numbers and family	
MODU	JLE 5 : MODULE - 5 : Speaking and interaction with Natives	(6L)
Self-Int	troduction, conversations, finding out information about friends, talk with Korean, visit aKorean	
market	or company. K-POP!	CO-5
studen	ts are able to successfully handle a limited number of uncomplicated communicativetasks	
Telateu		BIL-3
Sugges	ted Activities: Talk with Native Korean	
TEXT B	ООК	
	비조하구이 1 The Netional Justitute of The Kenner Lenguage	
1.	제승만국어 I The National Institute of The Korean Language	
REFERE	INCE BOOKS	
1	[ Active Korean 1 ] ,	
2	[ Practical Korean 1 ] Darakwon, Korea, Korea	
3	[ Korean Language for a Good Job ], Darakwon (2007), Korea	
E-REFE	RENCES	
1	https://www.amazon.in/Korean-Made-Simple-beginners-learning- ebook/dp/B00JHT4PCE	
2	http://www.twoponds.co.kr/en/snu	
3	https://www.koreantopik.com/2017/10/1-8-sejong-korean-textbook-pdfaudio69.html	

COU	RSE TIT	SE TITLE MANDARIN CREDITS 2												2	
cou	IRSE CO	DE	GLS5101	15		COURSE	CATEG	ORY	HS		L	L-T-P-	с	2-0-0	)-2
Ver	sion		2.0	Appro	val Det	ails	36 th A	CM		LEAR	NING	LEVE	L	BTI	L- 3
ASSE	SSMEN [.]	T SCH	ME												
First Ass	Periodi sessmer	cal nt	So Per Asso	econd riodical essment	t	Semir Assignm Proje	aar/ aents/ ect	Surpris etc., a by the Exa Comm	e Test Is app Depar minat littee '	/ Quiz roved tment ion "DEC"	A	ttend	ance	E	SE
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Cc Obj	ourse ectives		<ol> <li>As inc</li> <li>He tra</li> <li>Th co</li> <li>Th Ma</li> </ol>	Manda dustries s/she wil anslator. is will in nfident e course andarin	rin tops of the v II be ab nprove to com e will pr is spoke	all globa world an le to crea the over municate rovide su en.	al langua d direct ate a dir all perso e with g rvival sk	ages, the access t rect conr onality o lobal clie kills to st	e stude o the nect th f the s ents. udent	ents ge Chines hereby student s reloca	t an u e spe elimin : ther ating	upper aking nating eby m to co	hand in commu g the rec naking h untries v	i the pri inity. quireme iim/her where	me int of a more
Cu	ourse tcomes		<ol> <li>Lea bas</li> <li>Bei diff</li> <li>Pra in stru</li> <li>Pra in stru</li> <li>Thu cha Chi Alp</li> <li>5. 5. 1 Chi</li> </ol>	arning th sed com ing able ferentia acticing l class, st ucture a rough in aracters; inese in shabetic Through inese str	ne rules mon vo to diffe te the s basic co cudents ind oral n-class ; in ado pinYin symbo in-class rokes or	of Hany pocabulary rentiate imilar pr ommunic are to communic assignm dition, st i system ls. is assign rder and	ru pinyin r, funda the maj onuncia ative sk learn co nicative ents, st udents i and u ments, charact	n, pronu mental g ior tones ition of c ills in Ma ommonly skills. cudents are to I nderstar student ers	nciatio gramm s of Ch differe andari y usec are to earn t nd the s are	on, Ma har, and inese c nt voca n Chines Chines Chines o recog the reg e speci to prad	ndari I oral harad bulan ese; tl e voc gnize guize guize fic ad	n Chin and v cters; ries. hroug cabula easy on of loptio the c	nese tor writing p Being a h repet iry, sent and b expres n of bo drawing	nes, cha practice ble to ition pr ences asic Ma sing Ma prrowing ofMan	racter- s. ractices undarin undarin g from darin
Prereq	uisites:	Plus T	wo -Interr	mediate	Level										
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со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	0 P	011	PO12	PSO1	PSO2
CO1	3														
CO2	-	-	-	-	-	-	-	2	2	3		-	-		

CO3	-	-	-	-	-	-	-	-	-	3	-	-			
CO4	-	-	-	-	-	-	2	-	-	3	2	-			
CO5	-	-	-	-	-	-	-	-	2	3	2	3			
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		ianua	rin Chines	se chara	icter and	a rones							(0)	L)	
Basic st ideogra - deriva double <b>Sugges</b> t Direct lo	crokes in ims - co ative co vowels <b>ted acti</b> ecturing	n Chin mpou ognate - initia <b>vities:</b> g. repe	ese - con nd ideogr s - phone al, medial	nmonly raphs - p etic loar and vov mes lect	used rad phono-se ns - 4 t vels uring	dicals - 1 emantic ones inf	formatio compo troducti	on of vo unds on - co	ocabular nsonant	y -picto :s -singl	grams - le vowel	-	CO-1BT	-2	
MODU	LE - 2 L	isteni	ng Skills										(6L)		
Listenin one ch pronun <b>Sugges</b> t Listenin	ng to na haracter ciation <b>ted acti</b> ng to nat	tive s with or ton <b>vities:</b> tive sp	oeaker's p differer es beaker's p	pronunci nt pron ronuncia	iation of unciatio ation an	f scripts, n or t d transla	, vocabu ones, c ate it int	ularies. 1 different to Englis	Γones di chara h.	fferenti cters w	ating tra vith the	ainings, same	СО-2ВТ	-3	
MODUI	ODULE - 3 Speaking Skills														
Imitatin <b>Sugges</b> t Reverse activitie	ng nativ <b>ted acti</b> e teachi es, desc	e spea <b>vities:</b> ng, pr ribing	aker's pro esentatio things	nunciati n, forma	ions, tor al and in	nes and formal d	intonat conversa	ions to ations, s	speakna ingingCl	turally ninese s	ongs, cu	ıltural	CO-3BT	-3	
MODUI	LE-4 R	eadin	g Skills.										(6L)	)	
50 voca <b>Sugges</b> t Flashca	ibularie <b>ted acti</b> rds to p	s - eas <b>vities:</b> ractico	y to diffic e, word re	ult - imp ecognitic	oortant a	and com etition	monly ι	ısed -					CO-4 B1	Г-З	
MODUI	LE 5 W	/riting	Skills										(6L)	)	
15 voca <b>Sugges</b> t Only pr	abularie <b>ted acti</b> acticed	es - ea <b>vities:</b> in ase	isy to diff	ficult - i s, not te	mportai ested in	nt and o any exa	commor Ims, cor	nly used npositio	- Chine	eseCallia	graphy onal)		CO-5BT	-3	
ТЕХТ ВО	оок														
1.	Natio comp	nal Ta any. A	iwan Nori Course ii	mal Univ n Conter	versity M nporary	1andarir Chinese	n Trainir e (Textb	ng Cente ook) 1	r (2015)	. Linkin	gpublisł	ning			
REFERE	NCE BC	ок													
1.	Natio Practi	nal Ta ical Au	iwan Nor Idio-Visua	mal Univ Il Chines	versity N e Vol. 1	Mandari , 3rd Edi	n Traini tion	ng Cent	er (2017	'). Linkiı	ng publi:	shing co	mpany.		

## MOOC REFERENCE

1 <u>http://chineseworksheetgenerator.org</u>

cou	RSE TITI	.E				Japane	se					CRED	ITS		2
cou	RSE COI	DE	GLS5	1016	СС	OURSE C	ATEGOR	Y	H	5		L-T-F	9-S	2-0	0-0-2
Versio	n	1.0	Арр	roval		3	6 th ACM				LEAR	NING LE	VEL	BT	rL- 3
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Cou Descr	urse iption	This course has been designed to acquire grammar and be able to use Japanese to communicate in everyday simple and practical situations. The content of this course includes pronunciations speaking skills, listening practice and reading and writing.													cate in Jeaking
Course (	Objectiv	1 cc 2 3 4 5	. To make onversation . To develo . To facilita . To develo . To help th	the stu ns. op langu nte stude op the sp ne stude	age skills age skills ents to cr boken lar ents to lea	o write a and intereate opp nguage fl arn abou	and spea erest in le portunition uently. It the uni	k Japar earning. es for th quenes:	ese e emse s of th	asily i lves in e Japa	n any the s	y situati ociety. Languag	on, daily e.	life and	d daily
Course (	Outcom	e 2 3 4 5	Upon t . Demonstr . Develops . Utilize the . Develop t .Demonstr	he comp rate the the liste e letters he conv ate the s	oletion o letters a ening skil and com ersation skill of re	f this cound basic Is of Japa Imon wo al skills Pading an	urse, the words of anese lan ords of th d writing	student f Japane guage e langua g	s will se Lar age fo	be abl nguage r comi	e to e whic munic	ch are in cation	daily use	2	
Prerequ	isites: Pl	us Tw	o -Interme	diate Le	vel										
СО, РО А	AND PSC	) MAP	PING	[	T	1			r —						1
c000	P01	РО 2	PO3	PO4	PO5	PO6	PO7	PO8	PO	9   P	01 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-		3	-	-		
CO2	-	-	2 2 3												
CO3	-	-	-	-	-	-	-	-	-		3	-	-		
CO4	-	-	-	-	-	-	2	-	-		3	2	-		
CO5	-	-     -		-		-	- rolatod	-	2		3	2	3		I
MODUL	E 1 – LA	NGUA	GE AND CI	JLTURE		Sciongry	relateu							(	6L)

Greetings	Self-Introduction - Numbers and Alphabets – Names of countries & Continents-Telling the time-	
Profession	ns-Introduction about the language and country - Context based learning –At the Café, City	CO-1
orientatio	on, Family, Daily routine, Weather and Clothing	DTI 1
挨拶自i	己紹介-数字とアルファベット-国と大陸の名前-時間を伝える-職業-言語と国についての紹介-	DIC-1
コンテキ	ストベースの学習-カフェで、都市オリエンテーション、家族、日常、天気と服装	
MODULE	2 : BASIC GRAMMAR	(6L)
Definite a	nd indefinite articles - Simple verbs and conjugation – Pronouns-Possessive Pronoun-W Questions-	CO-2
Adjective	s –Separable verbs	BTI -2
明確な冠	詞と不定冠詞-単純な動詞と活用-代名詞-所有代名詞-W質問-形容詞-分離動詞	DIE-2
MODULE	3 : READING & LISTENING SKILLS	(6L)
Reading s	imple passages - to be able to comprehend advertisements and short texts - Listening comprehension o	f
real time	situation based dialogues	CO-3
		BTL-3
間里な又	草を読む-広告や短いテキストを埋解できるようにする-リアルタイムの状況に基ついた対話の	
理解を聞	K	
MODULE	4 : WRITING SKILLS	(6L)
Small pas	sages – Comprehension – Composition – Letter writing	<b>CO A</b>
		CO-4
小さな文	章–理解–作文–手紙の書き方	BTL-2
MODUL	E 5 : SPEAKING SKILLS	(6L)
Introducii	ng self- describing daily routine - engaging in dialogues about family, city, orientation, ordering food at	t
the café a	nd weather	
		CO-5
自己記述	的な日常生活の紹介–家族、都市、オリエンテーション、カフェでの食事の注文、天気につい	BTL-3
ての対話	に参加する	
00001111		
TEXT BOO		
1.	Minna no Nihongo: main textbook and translation book. (second edition, Elementary level 1-1) Publish Goyal Publishers	ner:
REFEREN	CE BOOKS	
1.	Konomi,Emiko.Begginning Japanese for Professionals:Book 1, Portland State University,2015. https://www.academia.edu/81329400/Basic japanese A grammar and workbook	
E-REFERE	I NCES	
	https://www.academia.edu/81329400/Basic japanese A grammar and workbook	

COURSE TITLE	UNIVERS	CREDITS	2		
COURSE CODE	GGE51001	COURSE CATEGORY	HS	L-T-P-S	2-0-0-2
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3

First Periodical Assessment         Second Periodical Assessment         Seminar/ Assignments/ Project         Surprise Test / Quiz         Attendance         ESE           15%         15%         10%         5%         5%         50%           Course Description         This course if mandatory as per the AICTE for the UG students to motivate the students for focusing on the human values. The main aim is to focus on the sustainability of happiness with harmony and natural acceptance in the career. Lecture cum power points is provided as guidelines from AICTE.           1         To create awareness to students on themselves and their surroundings (family, society, nature).         2.           2.         To create responsibility among students on life in handling problems with sustainable solutions         3.           3.         To prepare the students with human relationships and human nature in mind.         4.           4.         To Prepare the students on critical ability and sensitive to their commitment. (Human values, human relationship and human society).           5.         To Apply the learning to their real life.         Upon completion of this course, the students will be able to           0.         Demonstrate the necessity of relationship with family, society and nature. Familiarize with the challenges ahead and proposed solutions.           2.         Formulate and design human cyber security policies, plans and procedures for organizations.           3.         Apply standard security countermeasure tools to s							
Assessment         Assessment         Assignments/ Project         Test / Quiz         Attendance         ESE           15%         15%         10%         5%         5%         50%           Course Description         This course if mandatory as per the AICTE for the UG students to motivate the students for focusing on the human values. The main aim is to focus on the sustainability of happiness with harmony and natural acceptance in the career. Lecture cum power points is provided as guidelines from AICTE.           I.         To create awareness to students on themselves and their surroundings (family, society, nature).         2.         To create responsibility among students on life in handling problems with sustainable solutions         3.         To prepare the students with human relationships and human nature in mind.         4.           4.         To Prepare the students on critical ability and sensitive to their commitment. (Human values, human relationship and human society).         5.         To Apply the learning to their real life.           Upon completion of this course, the students will be able to         1.         Demonstrate the necessity of relationship with family, society and nature. Familiarize with the challenges ahead and proposed solutions.         2.         Formulate and design human cyber security policies, plans and procedures for organizations.           3.         Apply standard security countermeasure tools to sustain human relationships and nature.es.         4.           Course Outcome         2.         Formulate and desi							
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<b>CO-2</b> 1 1 1 1 1 2 2 3 2 1 3							
<b>CO-3</b> 1 1 1 1 1 2 2 3 2 1 3							
<b>CO-4</b> 1 1 1 1 1 2 2 3 2 1 3							
<b>CO-5</b> 1 1 1 1 1 2 2 3 2 1 3							
1: Weakly related, 2: Moderately related and 3: Strongly related							
MODULE 1: Introduction (6L)							
Need, Basic Guidelines, Content and Process for Value Education							
Purpose and motivation for the course, recapitulation from Universal Human Values-I Self-Exploration-what							
is it? - Its content and process; 'Natural Acceptance' and experiential Validation- as the process for self-							
exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding,							
Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being							
with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the							
the test contest provide the statistic reprints and respective contesting. A children approximation of the							
current scenario - Method to fulfil the above human aspirations: understanding and living in harmony at <b>CO-1</b>							
current scenario - Method to fulfil the above human aspirations: understanding and living in harmony at various levels. BTL-2							
current scenario - Method to fulfil the above human aspirations: understanding and living in harmony at various levels.  Practical component: Include practice sessions to discuss natural accentance in human being as the inpate accentance for living with							
current scenario - Method to fulfil the above human aspirations: understanding and living in harmony at various levels.       CO-1         Practical component:       BTL-2         Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitraringes in choice based on							
current scenario - Method to fulfil the above human aspirations: understanding and living in harmony at various levels.       CO-1         Practical component:       BTL-2         Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking							
current scenario - Method to fulfil the above human aspirations: understanding and living in harmony at various levels.       CO-1         Practical component:       BTL-2         Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking       Suggested Readings:							
current scenario - Method to fulfil the above human aspirations: understanding and living in harmony at various levels.       CO-1         Practical component:       BTL-2         Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking       Suggested Readings:         Evolution of cyber security       Evolution of cyber security							

Harmony in Myself! Understanding human being as a co-existence of the sentient 'l' and the material 'Body'	
Understanding the needs of Self ('I') and 'Body' - happiness and physical facility Understanding the Body as	
an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of	
'I' and harmony in 'I' - Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal	
of Physical needs, meaning of Prosperity in detail -Programs to ensure Sanyam and Health.	CO-2
Practical component:	BTL-2
Include practice sessions to discuss the role others have played in making material goods available to me.	
Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for	
ensuring health vs dealing with disease	
MODULE 3: Understanding Harmony in the Family and Society	(6L)
Harmony in Human-Human Relationshin- Understanding values in human-human relationshin: meaning of	(•=)
lustice (nine universal values in relationshins) and program for its fulfilment to ensure mutual happiness: Trust	
and Respect as the foundational values of relationship - Understanding the meaning of Trust: Difference	
hetween intention and competence Understanding the meaning of Respect. Difference between respect and	
differentiation: the other salient values in relationshin. Understanding the harmony in the society (society	
heing an extension of family): Resolution Prosperity fearlessness (trust) and co-existence as comprehensive	CO-3
Human Goals	BTL-3
Practical component:	
Include practice sessions to reflect on relationships in family hostel and institute as extended family real	
life examples teacher-student relationship goal of education etc. Gratitude as a universal value in	
relationships. Discuss with sconarios. Elicit examples from students' lives	
MODULE 4. Understanding Harmony in the Nature and Evistance	(61)
Wobole 4: Onderstanding Harmony in the Nature and Existence	(6L)
whole existence as coexistence - Understanding the harmony in the Nature -Interconnectedness and	
Friction of the second se	
et all lavels of existence	CO-4
at all levels of existence.	BTL-2
Include practice sessions to discuss human being as sause of imbalance in pature (film "Home" can be used)	
notice practice sessions to discuss numan being as cause of imbalance in nature (nim nome can be used),	
MODULE 5: Implications of the above Helistic Linderstanding of Harmony on Professional Ethics	
wobole 5. Implications of the above holistic onderstanding of Harmony on Professional Ethics	(61)
Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic	(01)
Education Humanistic Constitution and Humanistic Universal Order -Competence in professional ethics: a	
Ability to utilize the professional competence for augmenting universal burger and the Ability to identify	
the scope and characteristics of people friendly and oce friendly production systems c. Ability to identify	
and develop, appropriate technologies and management patterns for above production systems, C. Ability to identify	
studies of typical bolistic technologies and management models and production systems. Stratogy for transition	CO-5
from the procent state to Universal Human Order: a. At the level of individual: as socially and ecologically	BTL-2
responsible angineers, technologists and managers h. At the level of reciety, as mutually enriching	
institutions and organizations. Sum up	
Practical component:	
Include practice evereises and case studies to discuss the conduct as an engineer or scientist etc.	
1 P.P. Gaur, P. Asthana, G.P. Pagaria, Human Values and Professional Ethics (2nd revised edition) Excel Books	Now
1. P.R. Gaur, R. Astriana, G.P. Bagaria, Human values and Professional Ethics (2 ^m revised edition) excel books,	New
2 A Nagarai Jeevan Vidua: Ek Parichava Jeevan Vidua Prakashan Amarkantak 1000	
2. A N Trinathi Human Values New Are Intl Publichers New Delhi 2004	
Lawrence C (2016) Cyber security for Dummies John Wiley & Sons Inc. 2nd Edition on 212 422	
REFERENCE BOOKS	

1	AICTE STUDENT INDUCTION PROGRAM HANDBOOK-https://fdp-si.aicte-
1.	india.org/download/Guidelines/G012%20SIP%20Hand%20Book%20v2.pdf
E BOOKS	
1.	https://fdp-si.aicte-india.org/download.php#1

COURSE TITLE	<b>தமிழ் க</b> (T/	<b>கலாச்சாரமும் தொழில்நுட்பமு</b> AMIL CULTURE AND TECHNOLOGY)	مند	CREDIT	1				
COURSE CODE	GLS51017	COURSE CATEGORY	HS	L-T-P-S	1-0-0-2				
VERSION	1.0	APPROVAL DETAILS	35 th ACM	LEARNING LEVEL	BTL- 4				
		ASSESSMENT SCHEME							
FRIST PERIODICAL ASSESSMENT	SECOND PERIODICAL ASSESSMENT	SECOND SEMINAR/ASSIGNMENTS SURPRISE ATT PERIODICAL /PROJECTS TEST/QUIZ ATT							
15%	15%	10%	5%	5%	50%				
பாட விளக்கம்	தமிழர்களின் மாணவர்களு மாணவர்களி இப் பாடத்திட் தமிழர்களின் தமிழரின் மரா களவு ஒழுக்க வாழ்க்கைக்கு	தமிழர்களின் வரலாறு மற்றும் கலாச்சார மரபுகளைப் படிப்பதன் மூலம் மாணவர்களுக்கு மொழித்திறன் ஆற்றல் நன்கு வளர்ச்சி அடைகிறது. மேலும் மாணவர்களிடையே மொழிப்பற்று உருவாகி கற்றலில் ஆர்வம் அதிகரிக்கிறது. இப் பாடத்திட்டத்தில் செய்யுள், இலக்கிய வரலாறு, நாகரிகம், பண்பாடு, பண்டையத் தமிழர்களின் உணவு, உடை, உறையுள், அணிகலன், போர் முறை, பண்டையத் தமிழரின் மரபு பற்றிய செய்திகள் அடங்கியுள்ளன. களவு ஒழுக்கம், கற்பு ஒழுக்கம் ஆகியவற்றை மாணவர்கள் கற்பதன் மூலம் வாழ்க்கைக்குத் தேவையான ஒழுக்க நெறிமுறைகள் நன்கு வளர்ச்சியடையும்.							
பாடத் திட்டத்தின் நோக்கம்	இப் பாடத்திட்டத்தின் மூலம் சமுதாயத்தில் தங்களுக்குத் தேவையான வாய்ப்புக்களை மாணவர்கள் உருவாக்கிக்கொள்ள வழிவகைச் செய்கிறது. அத்துடன் சமய வழிபாடு, விழாக்கள், சடங்குகள், நம்பிக்கைகள், மந்திரம், விளையாட்டுகள், தொழில்கள், வாணிகம் முதலியச் செய்திகளைக் கற்பதன் மூலமாக மாணவர்களிடையே பகுத்தாயும் திறன் நன்கு வளர்ச்சியடைகிறது. இப்பாடத்திட்டதினைக் கற்பதன் மூலம் மொழித்துறையில் ஆர்வம் ஏற்பட்டுத் தமிழ் இலக்கியங்களைப் பற்றியத் தேடல் மாணவர்களிடம் அதிகரிக்கிறது.								
பாடத் திட்டத்தின் பயன்கள்	இந்தப் பாட இந்தப் பாட இற்பக்கலை, வானூர்தியிய தகவல்கள் இ நண்ணறிவுத் அமையும். பண்டையக் ச கணினித்தமி முதலியன இப தொழில்துட்ப மாணவர்கள் கட்டுரை, சிழ செலுத்தி சிற நல்ல படைப்ட மாணவர்கள் கொள்ளவும், நாகரிக வளா தங்களின் எ உறுதுணைய	.த்திட்டத்தில் பண்டையத்து ஒவியக்கலை, நாடகக்கனை ஸ், கனிமவியல், உயிரியல், என இணைக்க பட்டிருப்பதால் ட தேடலை ஏற்படுத்தி எதிர்கா போடத்திட்டத்தில் இணைக்கட பாடத்திட்டத்தில் இணைக்கட திறனை வளர்க்கும். மொழித்திறனை வளர்த்துக்கு றகதைப் போன்றவைகளைப ந்த படைப்பாளராக உருவாக குழுக்க நெறியோடு தங்கள பண்டையத் தமிழர்களின் வ ர்ச்சி, தொழில்நுட்பம் ஆகிய வாழ்க்கை தரத்தை மேம்ப ாக அமைந்துள்ளது.	மிழரின் கட ல, அறிவிய ன்ணியல் முத மாணவர்களி ல வேலை வா கள், தொழில்ந கவல் தொடர பட்டிருப்பது ம கொண்டு தெ பட்டிருப்பது ம கொண்டு தெ பட்டிருப்பது ம கொண்டு தெ தை சமுதாய வ யில் பாடத்திட வற்றைக் கற டுத்திக் கெ	ட்டிடக்கலை, இ ல், மருத்துவம், தலிய தொழில்நுட் டம் உளவியல் ாய்ப்பிற்கு உந்து தட்ப எந்திரங்கள் நட்ப எந்திரங்கள் நட்ப எந்திரங்கள் நட்ப எந்திரங்கள் வாணவர்களிடை வேறை பன்பாடு, ச ற்றுக்கொண்டு ம பாள்ள இந்த ப	சைக்கலை, வானியல், டபம் சார்ந்த ரீதியான சக்தியாக , இன்றைய ஊடகவியல் ய ல் கவிதை, பம் ஆர்வம் வயான பல ட்டுள்ளன. பல்படுத்திக் லாச்சாரம், ாணவர்கள் ாடத்திட்டம்				

PO -1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO - 10	PO- 11	PO- 12	PSO- 1	PSO- 2	
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-	-	-	-	-	-	-	2	2	3	-	-			
-	-	-	-	-	-	-	-	-	3	-	-			
-	-	-	-	-	-	2	-	-	3	2	-			
-	-	-	-	-	-	-	-	2	3	2	3			
akly rel	ated, 2:	: Mode	rately r	elated a	and 3: S	trongly	related	1						
த - அல	<b>்கு</b> –1 <b>ெ</b>	மாழி ப	மற்றும்	இலக்	கியம்								(31	_)
மொழி - செம்மொழி - சங்க இலக்கியம் - பண்டைத் தமிழர்களின் உணவு - உடை - உறையுள் - அணிகலன் – போர்முறை – தமிழ் காப்பியங்கள் – பக்தி இலக்கியம் - நவீன இலக்கியத்தின் வளர்ச்சி – பாரதியார், பாரதிதாசன், கவிமணி, நா.முத்துக்குமார். வகுப்பறை செயல்முறைகள் : 1. விரிவுரை முறை 2. வினா - விடை முறை 3. குழுவிவாதம் 4. வகுப்பறை தேர்வு இதுப்போன்ற வகுப்பறை செயல்முறைகளைக் கொடுத்து மாணவர்களிடம் கற்றலில் ஆர்வத்தை ஏற்படுத்துதல்								CO-1 BTL-2						
<b>த</b> -2 கன	லகள்												(3L)	
நாடகக்கலை - (அறிமுகம்) - தெருக்கூத்து - தோல்பாவை – ஒயிலாட்டம் –மயிலாட்டம் - கரகாட்டம் - புலியாட்டம் - சிலம்பாட்டம் – இசைக்கலை – சிற்பக்கலை – ஓவியக்கலை. வகுப்பறை செயல்முறைகள்: 1. விளக்கவுரை 2. வினா எழுப்புதல் 3. பாடல்கள் அல்லது கவிதை சொல்லுதல் 4. கதைச் சொல்லுதல் 5. ஒப்படைப்பு கொடுத்தல் இதுப் போன்ற வகுப்பறை செயல்முறைகளைக் கொடுத்து மாணவர்களிடம் கற்றலில்								CO-2 BTL-3						
<b>5</b> −3 உ	ற்பத்த	) தொ	சில் <del>நு</del> ட்	பம்									(3L)	
உலோகவியல் - இரும்புத் தொழிற்சாலை - நாணயங்கள் - அச்சடித்தல் -மணிகள் உருவாகுதல் - தொல்லியல் சான்றுகள் - நெசவுத்தொழில் -மண்பாண்டங்கள் செய்தல் - ஜவகை நிலங்களின் தொழிகள் - (முதற்பொருள்-கருப்பொருள்). வகுப்பறை செயல்முறைகள்: 1. விளக்கவுரை அளித்தல் 2. வினா எழுப்புதல் 3. வகுப்பறை குழுவிவாதம் 4. வினாடி - வினா நிகழ்வு நடத்துதல் இதுப்போன்ற வகுப்பறை செயல்முறைகளைக் கொடுத்து மாணவர்களிடம் கற்றலில் ஆர்வத்தை ஏற்படுத்துதல்.							CO-3 BTL-3							
	PO-1 PO-1	PO-1 PO-2	PO -1         PO -2         PO -3           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -	PO-1         PO-2         PO-3         PO-4           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -           -	PO -1         PO -2         PO -3         PO -4         PO -5           -         -         -         -         -         -           -         -         -         -         -         -           -         -         -         -  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  -         -           -         -         -         -         -         -         -           -         -         -         -         -         -         -           -         -         -         -         -         -         -           -         -         -         -         -         -         -           -         -         -         -         -         -         -           -         -         -         -         -         -         -           -         -         -         -         -         -         -           -         -         -         -         -         -         -           -         -         -         -         -         -         -           -         -         - </td <td>PO -1         PO-2         PO-3         PO-4         PO-5         PO-6         PO-7           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -<td>PO-1         PO-2         PO-3         PO-4         PO-5         PO-6         PO-7         PO-8           .         .         .         .         .         .         .         .         .         .           .         .         .         .         .         .         .         .         .         .           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  -         -         -         -         -         2         2         3           -         -         -         -         -         -         -         3           -         -         -         -         -         -         -         3           -         -         -         -         -         -         2         3           -         -         -         -         -         -         2         3           -         -         -         -         -         -         2         3           -         -         -         -         -         2         3           -         -         -         -         -         2         3           -         -         -         -         -         2         3           -         -         -         -         -         -<th>PO-1         PO-2         PO-3         PO-4         PO-5         PO-6         PO-7         PO-8         PO-9         PO-10         11           .         .         .         .         .         .         .         .         .         . 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        .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .</th><th>PO-1         PO-2         PO-3         PO-4         PO-5         PO-6         PO-7         PO-8         PO-3         PO-10         PD-11         PD-12         P3-1           ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·         ·<td>PO -1         PO -2         PO -3         PO -4         PO -5         PO -6         PO -7         PO -8         PO -9         PO -1         <t< td=""></t<></td></th></th></td></td>	PO -1         PO-2         PO-3         PO-4         PO-5         PO-6         PO-7           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         -           -         -         -         -         -         -         -         - <td>PO-1         PO-2         PO-3         PO-4         PO-5         PO-6         PO-7         PO-8           .         .         .         .         .         .         .         .         .         .           .         .         .         .         .         .         .         .         .         .           .         .         .         .         .         .         .         .         .         .           .         .         .         .         .         .         .         .         .           .         .         .         .         .         .         .         .         .           .         .         .         .         .         .         .         .         .           .         .         .         .         .         .         .         .         .           .         .         .         .         .         .   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     2         2         3           -         -         -         -         -         -         -         3           -         -         -         -         -         -         -         3           -         -         -         -         -         -         2         3           -         -         -         -         -         -         2         3           -         -         -         -         -         -         2         3           -         -         -         -         -         2         3           -         -         -         -         -         2         3           -         -         -         -         -         2         3           -         -         -         -         -         -<th>PO-1         PO-2         PO-3         PO-4         PO-5         PO-6         PO-7         PO-8         PO-9         PO-10         11           .         .         .         .         .         .         .         .         .         .         .         .         .         .        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    PO -5         PO -6         PO -7         PO -8         PO -9         PO -1         <t< td=""></t<></td></th></th>	P0-1         P0-2         P0-3         P0-4         P0-5         P0-6         P0-7         P0-8         P0-9           .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .  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அருவி - ஆறு - ஏரி - அணை - குளங்கள் - கால்நடை பராமரிப்பு – மீன்வளம் - தொழில்சார் அறிவியல் சமுகம் - சொட்டுநீர் பாசனம் - தெளிப்புநீர் பாசனம். வகுப்பறை செயல் முறைகள்: 1.வினா எழுப்புதல் 2. மின்னல் அட்டைகள் காண்பித்தல் 3. வகுப்பறை குழுவிவாதம் 4. வகுப்பறை தேர்வு							
அலகு –5 அறிவியல் மற்றும் கணினித்தமிழ்	(3L)						
கணினித்தமிழ் - தோற்றம் - வளர்ச்சு - தமிழ் நூல்களை மின்பதிப்புச் செய்தல் - மென்பொருள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின்நூலகம் - இணையத்தமிழ் அகராதிகள் - சொற்குவை திட்டம். வகுப்பறை செயல் முறைகள்: 1. விளக்கவுரை அளித்தல் 2. காட்சு விளக்கப்படங்கள் 3. பட்டிமன்றம்							
பாடப்புத்தகம்							
1.பண்டைத் தமிழ் நாகரிகமும் பண்பாடும், ஞா.தேவநேயபாவாணர், தமிழ்மண் பதிப்பகம் சென்னை. 2000. 2. பழந்தமிழில் அறிவியல், க.பலராமன், உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை. 2009. 3. தமிழக வரலாறும் மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளீயீடு தமிழ்நாடு பாடநால மற்றும்) 4. கணினிக்கமிம் - முனைவர் இல.சுந்காம் (விகடன் பிரசுரம்)							
பார்வை நூல்கள்							
1. அ. , 2014, தமிழர் நாகரிகமும் பண்பாடும், யாழ் வெளியீடு, மேற்கு அ சென்னை-40,     2. மயிலை சீனி வேங்கடசாமி, 2014, நுண்கலைகள், பூம்புகார் பதிப்பகம், செ 3. க.மங்கையர்க்கரசி , 2017,பழந்தமிழ் இலக்கியங்களில் அறிவியல் இ லாவண்யா பதிப்பகம், திருவல்லிக்கேணி, சென்னை-05, 4. துரை.மணிகண்டன் இணையமும் தமிழும், நன்னிலம் பதிப்பகம், சென்ன	ண்ணா நகர், ர்னை-08,. சிந்தனைகள், ன.						
மின் 2. <u>www.projectmadurai.org</u> நால்கள் 3. <u>www.tamilnoolagam.in</u>							

COURSE TITLE	TAM தமிழ் கல	CREDIT	1		
COURSE CODE	GLS51017	COURSE CATEGORY	L-T-P -S	1-0-0-2	
VERSION	1.0	APPROVAL DETAILS	LEARNING LEVEL	BTL- 4	
		ASSESSMENT SCHEME			
FRIST PERIODICAL ASSESSMENT	SECOND PERIODICAL ASSESSMENT	SEMINAR/ASSIGNEMNTS/P ROJECTS	SURPRISE TEST/QUIZ	ATTENDANCE	ESE
15%	15%	10%	5%	5%	50%

Course Desc	n	<ul> <li>By studying the history and cultural traditions of the famil, the language skills of the students are well developed. Also, the interest in learning increases and develops a passion for the language among the students.</li> <li>This syllabus contains information about Literary History, Civilization, Culture, Ancient Tamil Food, Dress, Clothing, Ancient War System and Tamil Tradition.</li> <li>By learning about theft and chastity, students will able to develop good moral values in life.</li> </ul>												
Course Obje		<ul> <li>Through this curriculum the students are empowered to create opportunities for themselves in the society. Also, by learning about religious worship, ceremonies, rituals, beliefs, mantra, sports, professions, commerce, etc., analytical skills are well developed among the students.</li> <li>By learning this syllabus, the interest in the field of language and the search for learning about Tamil literature increases in the students.</li> </ul>												
Course Outo		<ul> <li>III scups</li> <li>fut</li> <li>Th co cu</li> <li>Th int</li> </ul>	e inclus rriculum e curricu e curricu	painting, cal intell ployment ion of a Tamil, In develop ulum has reading a	igence s igence s incient t iternet a is technic been se and writi	drama, a kills of t echnolo ind Tam cal skills et up so ng poem	gical to among t among t that the	ols and nation co he student s, short s	technolo ommuni ents. ts develo tories, e	are inco and beco ogical n cation a op their tc. in a c	nachines nachines nd medi languag	in prese a studies e skills an	ent-day in the nd take	
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Prerequisite CO, PO AND CO I	es: Plus D PSO I PO - 1 -	s Two Ta MAPPINO PO-2	int Th ab mil-Inte G PO-3 -	o great of is curriculout the volume of the	creators ulum hel way of lif e Level PO-5	and prov ps the s re, tradit PO-6	vide mar tudents ion, cult PO-7	to impruure, civil	works ne ove their ization a PO-9	PO - 10 3	r the de of life whology c PO- 11	PO- 12	nt of soc ipline an cient Tam PSO- 1	PSO- 2
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Prerequisite CO, PO AND CO   1 	es: Plus D PSO I PO - 1 - - -	s Two Ta MAPPIN PO-2 - - - -	int Th ab mil-Inte G PO-3	o great of is curricu out the v rmediat PO-4 - - - -	creators ulum hel way of lif e Level PO-5 - - - - -	and prov lps the s fe, tradit PO-6 - - - - -	vide mar tudents ion, cult PO-7 - - 2	ny good v to imprure, civil PO-8 - 2 - -	PO-9 C C C C C C C C C C C C C C C C C C C	PO - 10 3 3 3 3 3	PO- 11 - 2	PO- 12 - - -	nt of soc ipline an cient Tam PSO- 1	PSO-2
Prerequisite         CO, PO AND         CO         CO-1         CO-2         CO-3         CO-4         CO-5	es: Plus D PSO I PO - 1 - - - -	s Two Ta MAPPIN PO-2 - - - - - - -	int • Th ab mil-Inte G PO-3 - - - - - - - - - - - - -	o great of is curriculout the work of the	reators ulum hel way of lif e Level PO-5 - - - - - - - - -	and prov lps the s fe, tradit PO-6 - - - - - - - - - - - -	vide mar tudents ion, cult PO-7 - - 2 - 2	y good v to imprure, civil PO-8 - 2 - - - -	PO-9  PO-9  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C  2  C	PO - 10 3 3 3 3 3 3 3	PO- 11 - 2 2	PO- 12 - - - 3	nt of soc ipline an cient Tam PSO- 1	PSO-2
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அலகு

Language - Classical - Sanga Literature - Ancient Tamils, Food – Costume – Clothiing – Martial Arts - Tamil	
Copies - Bhakti Literature - Development of Modern Literature - Bharathiyar and Bharathidasan – Kavimani -	
N.Muthukumar.	
Classroom Procedures:	CO-1
1. Lecture Method	
	BTL-2
2. Question-Answer Method	
3 Group discussion	
4. Classroom test	
	(0.11
Unit - 2 Tamii Arts	(3 Hours)
Silambatam – Music – Sculpture – Painting	
Classroom Procedures:	
1 Evaluation	
	CO-2
2. Questioning	BTI-2
	DIE-5
3. Recitation of songs or poetry	
4. Story telling	
Insists interest in learning among students by giving such classroom processes.	
	(a
Unit –3 Manufacturing Technology	(3 Hours)
Metallurgy - Iron industry – Coins – Printing - Read making - Archaeological Evidence - Weaving –	
Carpentry - Industries of five types of lands - (Primary material - Theme)	
Classroom Procedures:	
1. Presentation	CO-3
2. Questioning	BTL-3
3. Classroom group discussion	
4. Conduct a guiz event	
Instill interest in learning among students by giving such classroom processes.	
Unit - 4 Agriculture and Irrigation Technology	(3 Hours)
Dam – lake – ponds - livestock maintenance – fisheries - knowledge community - drip irrigation	
Classroom Activities:	CO-4
1. Questioning	
2. Displaying lightning cards	BTL-1
3. Classroom group discussion	
4. Classroom test	
Unit – 5 Science Tamil and C Tamil Computing	(3 Hours)
Computerized Tamil Development – E- Printing of Tamil Texts - Software Development – Tamil Internet	
Education Institute - Tamil e – Library - Internet Tamil Dictionaries -Vocabulary Project	
Classroom Activities:	CO-5
1. Presentation	
2. Visual charts	BTL-2
3. projector show in the class room	

TEXT BOO	DK
	<ol> <li>Ancient Tamil Civilization and Culture, J. Devaneyapa Bhavanar, A. Nakkiran (P.A.), Tamilman Publishing House, Chennai. 2000.</li> <li>Palantamil Science, K. Balaraman, World Tamil Research Institute, Chennai. 2009.</li> <li>Tamil History-People-Culture-KKPillai (Exhibit Tamil Nadu Textbook and)</li> <li>Computer Tamil-PhD I. Sundaram (Vikatan Publications)</li> </ol>
Reference	e books
	<ol> <li>A. Dakshinamurthy ,2014, Tamil Civilization and Culture, Jaffna Publication, West Anna Nagar, Chennai-40.</li> <li>Mailai Seeni Venkatasamy, 2014, Fine Arts, Boombukar Publishing House, Chennai-08.</li> <li>K. Mangaiyarkaras, Scientific, 2017, Thoughts in Ancient Tamil Literature, Lavanya Publishing House, Thiruvallikeni, Chennai-05.</li> <li>Durai. Manikandan. Sundaram Internet and Tamil, 2014, Computer TamilL Nannilam Publishing House, Chennai.</li> </ol>
E-	1. www.tamilvu.org
BOOKS	<ol> <li><u>www.projectmadurai.org</u></li> <li><u>www.tamilnoolagam.in</u></li> </ol>

## Semester-II

COURSE TITLE	AN	ALYTICAL MAT	HEMATICS		CREDITS		4			
COURSE CODE	EMA51002	COURSE	CATEGORY	L-T-P-S	3-0-2-2					
Version	1.0	Approval Details	36 th AC	М	LEARNING LEVEL	BTL-3				
ASSESSMENT SCH	EME									
		CIA				E	SE			
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessment S	Observation records as ap by the Depa Examinat Committee	Attendance	End Semester Examinatio n (Theory)	End Semester Examinatio n (Practical)				
15%	15%	10%	5%		5%	25%	25%			
Course	To make the	student under	stand the basi	c analyt	ical mathemati	cal skills that i	is imperative			
Description	for effective u	Inderstanding	of engineering	g subject	using MATLAB					
Course Objective	<ol> <li>To implet</li> <li>To provid bilinear t</li> <li>To compt</li> <li>To illustration</li> <li>To make</li> </ol>	ment problem le an exposure ransformation rehend integra ate the applica the students u	solving skills u on the conce Is using Cauch tions of Laplac nderstand the	ising vec pts of co y's integ ce Trans e concep	ctors omplex variable gral and residue forms t of Fourier ser	es, conformal i e theorem. ies	mapping and			
Course Outcome	<ol> <li>Upon completion of this course, the students will be able to</li> <li>Verify the standard theorems in Vector Calculus and apply them to evaluate surface area and volume.</li> <li>Construct an analytic function when real and imaginary parts are given.</li> <li>Evaluate finite integrals using Cauchy's theorem.</li> </ol>									

	5. Expand the Fourier series for the given function.																
Prerequ	isites:	Knowled	dge in si	ngle-va	riable c	alculus.											
CO, PO	AND PS	SO MAP	PING														
60	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PS	PSO			
0	1	2	3	4	5	6	7	8	9	10	11	12	0-1	-2			
CO-1	3	3	2	-	1	-	-	-	-	-	-	1	2	1			
CO-2	3	2	1	-	2	-	-	-	-	-	-	1	1	1			
CO-3	3	2	1	2	1	-	-	-	-	-	-	1	2	2			
CO-4	з	3	2	1	1	-	-	-	-	-	-	2	1	1			
CO-5	3	3	2	-	1	-	-	-	-	-	-	- 2 2					
			1: Wea	kly rela	ted, 2:	Modera	tely rel	ated an	d 3: Str	ongly re	elated						
MODUL	E 1: VE	CTOR C	ALCULU	IS									(9L+6	P)			
Gradien	Gradient, Divergence and Curl – Unit normal vector, Directional derivative – angle																
between surfaces- Irrotational and Solenoidal vector fields. Green's theorem - Gauss											S						
diverger	divergence theorem and Stoke's theorem (without proof) - Verification and											(	^O_1				
evaluati	on of th	he abov	e theor	ems - S	imple a	pplicati	ons to	regions	such as	s square	2,	P	сті _3				
rectangl	e, trian	gle, cub	oids and	d rectar	igular p	arallelo	pipeds.						,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
Suggest	Suggested Reading: Basics of Vectors																
Lab: Gra	adient,	Diverge	ence, Cu	rl, Irrot	ational	and Sol	enoidal	vector	fields								
MODUL	.E 2: CO	MPLEX	VARIAE	BLES								(9L+6P)					
Functio	ns of a	complex	x variab	le – Ana	alytic fu	nction -	Cauchy	/ - Riem	ann equ	uations	-						
Properti	es of ar	halytic f	unction	(Staten	nent On	ly) – Co	nstructi	on of Ai	nalytic f	unction	S						
by Milne	e – Thor	mson m	ethod –	Confor	mal Ma	pping –	Mappir	ng by fu	nctions			(	:0-2				
w = z	+ c, w =	= cz, w	y = 1/z,	, Bilinea	r transf	ormatio	on.					BTL-3					
Suggest	ed Read	ding: Co	mplex N	lumber	S												
Lab: Ve	rificatio	on of An	alytic F	unction								(0) - (0)					
MODUL	.E 3: CO	MPLEX	INTEGR	ATION							- T	(9L+6P)					
Stateme	ent and	d Applic	cation o	of Cauc	hy's In	tegral t	heorem	n and i	ntegral	formul	а						
(without	t proof)	-Evalua	tion of i	ntegral	s using t	the abo	ve theo	rem-Tay	ylor and	Laurer	nt						
series e	xpansic	ons-Sing	ularities	s-Classif	ication.	Residu	ies-Cau	chy's re	esidue	theorer	n						
(without	t proof	)-Conto	ur integ	gration	over u	init circ	le and	semi-ci	rcular	contour	S	-	20-3				
(excludii	ng pole	s on boi	undaries	5)								E	STL-3				
Suggest	ed Read	ding: Ty	pes of ir	ntegrati	on		¢				_						
Lab: EVa	aluation	n ot inte	egrais u	sing Ca	ucny's i	ntegrai	formul	a and C	aucnys	residu	e						
MODU	1. E 4. I AI													1			
	trancfo		andition		stenco	- Tranci	form of	elemon	tary fu	octions	_		(JLTOP	1			
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of periodic functions inverse laplace transforms using partial fraction and											d						
convolution theorem. Solution of linear ODF of second order with constan										ut l	(	0-4					
coefficients.												BTL-3					
Suggest	ed Read	ding: Ba	sics of T	ransfor	m												
Lab: Sol	utions	of diffe	rential e	equatio	ns using	z Laplac	e transf	form									
MODULI	E 5: FOL	JRIER S	ERIES	1									(9L+6P)				

Dirichlet's Co	onditions – General Fourier Series – Odd and even functions – Half range								
sine and cosi	ne series –Harmonic Analysis.	CO-5							
Suggested Re	eading: Basics of series	BTL-3							
Lab: Finding	Fourier Series								
TEXT BOOKS									
1.	A. Chandrasekaran, G. Kavitha (2022), <i>Analytical Mathematics</i> , Dhana Chennai.	m Publications, 1 st Edition,							
<ol> <li>T. Veerarajan (2016), <i>Engineering Mathematics-II</i>, McGraw Hill Education (India), Private Limited, 4th Edition, New Delhi.</li> </ol>									
3.	Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma (2016), <i>M</i> <i>in Engineering</i> , Pearson Publication, 2 nd Edition, New Delhi.	ATLAB and its Applications							
4.	D. G. Duffy (2021), Advanced Engineering Mathematics With MAT Mathematics), Chapman and Hall Publisher, 5 th Edition, CRC Press, USA	LAB (Advances in Applied							
REFERENCE B	OOKS								
1.	P. Sivarama Krishna Das, C. Vijayakumari (2017), Engineering Mather Publishing, Chennai.	natics, 1 st Edition, Pearson							
2.	A. P. Santhakumaran, P. Titus P (2017), <i>Engineering Mathematics – II</i> Edition, Nagercoil, India.	, NiMeric Publications, 2 nd							
3.	Kreyszig Erwin (2016) Advanced Engineering Mathematics, John Wiley a Delhi.	and Sons, 10 th Edition, New							
4.	S.S. Sastry (2015), Engineering Mathematics, Vol. I & II, PHI Learning Delhi.	; Pvt. Ltd, 4 th Edition, New							
E BOOKS									
1.	http://ggn.dronacharya.info/APSDept/Downloads/QuestionBank/Mat	thematics-I/SectionD.pdf.							
2.	https://people.math.sc.edu/girardi/m7034/book/AshComplexVariable	esWithHyperlinks.pdf							
3.	https://ocw.mit.edu/courses/18-03sc-differential-equations-fall-2011	/pages/unit-iii-fourier-							
	series-and-laplace-transform/								
4.	https://www.pdfdrive.com/calculus-ii-sequences-and-series-e116767	<u>78.html</u>							
моос									
1.	https://www.edx.org/course/introduction-engineering-mathematics	-utarlingtonx-engr3-0x							

COURS	E TITLE		Ad	vanced	Communi	CREDITS	1		
COURS	E CODE	GLS51	019 COURSE CATEGORY HS					L - T – P – S	3- 0-0- 1
Versio n	01	Арр	roval De	etails	42 nd	ACM, 26 th (	Dct. 2024	LEARNING LEVEL	BTL -4
	ESE								
First Second Periodical Periodical Assessment Assessment Assessment Committee "DE					as :he DEC"	Surpri Quiz., as by the D Exam Commit	se Test / approved epartment ination tee "DEC"	Attendance	Theory
15 %	15	<b>5</b> %		10 %		5	5%	5 %	50 %

CourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionCourseDescriptionDescriptionDescriptionCourseDescriptionDescriptionCourseDescriptionCourseDescriptionDescriptionDescriptionDescriptionDescriptionDescriptionDescription														kills at rcises, al and luctive ultural re the ication uipped rs and
Cour	se Obje	ctive	<ol> <li>listening skills by an enhanced acquisition of the English language.</li> <li>To provide an environment to Speak in English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate.</li> <li>To equip the students to Read, comprehend and answer questions based on literary, scientific and technological texts.</li> <li>To enhance the writing skills of the students via training in instructions, recommendations, checklists, process-description, letter-writing and report writing.</li> <li>To equip the learners in analyzing and applying creative thinking skills and participate in brainstorming, mind-mapping, audiovisual activities and excel in employability skills.</li> </ol>											
<ul> <li>Upon completion of this course, the students will be able to</li> <li>Demonstrate the ability to construct the grammatically correct sentences with an and syntax structures.</li> <li>Integrating various components of English Language and determining it through and listening.</li> <li>Analyze and transcode data, construct different types of written essays, read c passages and summarize ideas, create personal profiles in the form of a resume.</li> <li>Organize and articulate ideas, concepts, and perceptions in a comprehensive ma written business correspondence, and speaking in formal and informal situation.</li> </ul>											with ac rough re read co esume. ive mar uations s profes	curacy eading implex iner in ssional		
Prerec	uisites:	Plus Tv	vo Englis	sh-Inter	mediate	e Level								
CO, P	UAND		PPING							PO1	PO1	PO1	PSO	PSO
СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	0	1	2	1	2
CO1	-	-	-	-	-	-	-	-	-	3	-	-	1	1
CO2	-	-	-	-	-	-	-	2	2	3	-	-	0	0
CO3	-	-	-	-	-	-	-	-	-	3	-	-	1	1
CO4	-	-	-	-	-	-	2	-	-	3	2	-	0	1
COS	•	-	-	- akly ro	- lated 2	- Modor	- atoly re	- lated av	2 ad 2. St	5 rongly r	2 alatad	5	T	U
MODI	II E1 . To	lkahou	+ difford			. WIUUEI	atery re		10 5. 50	longiy i	elateu			(01)
MODULE1: Talk about different cultures(9L)Grammar : Modals of Obligation - Comparatives and Superatives - Asking for and Giving Recommendations - Writing : Two Reviews Positive and Negative Language Adverbs. Reading: Article: Culture Shock, There's an app to deal with that - Blog: Hungry Adventures, - Reviews of Café. Pronunciation : Word Stress : compound nouns 2. Sound and Spelling: /S/ and /tS/ - Sounding Interested LAB: (Listening) Three monologues : Culture shock - Radio show : Vending Machines in Japan, - A Special Gift - Three Monologues : Special Occasions (Speaking) Describing Different Cultures - Describing a Special Meal - Asking for and giving recommendations : Expressing Surprise Places to goCO-1												CO-1 BTL-2		

MODULE 2 : House and Home	(9L)
<ul> <li>Grammar: Modals of deduction - Quantifiers - Making offers and requests and asking for permissions</li> <li>Vocabulary : Buildings - Verbs and Prepositions Pronunciation : Modal Verbs: final /t/ and /d/ sounds - Sentence stress verbs and prepositions - Sounding polite Writing : A note with useful information offering choices. Reading : Articles : Web Page : A More personal place to stay - Web page : five Reasons why small towns are better than cities Top five things to do in and around Miami, Florida; a note.</li> <li>LAB (Listening) : Four monologues : describing buildings - Conversation : Comparing life in a town and a city - Visiting a friend's family - Conversation: a holiday in Florida (Speaking) : A note with useful information offering choices.</li> </ul>	CO-2 BTL-3
MODULE 3 : Information	(9L)
<b>Grammar :</b> Reported Speech – Verb Patterns - Generating and being Vague <b>Vocabulary :</b> Sharing information - Reporting Verbs <b>Pronunciation :</b> Sound and spelling /g/ and /k/ - sound and spelling :/h/ and /w/ <b>Writing :</b> An email about a news story summarizing information <b>Reading :</b> Articles : Thinking of making a podcast? Just give it a try! - The Restaurant that wasn't there - A news Story <b>LAB : (Listening) :</b> Podcast : Pod – on – pod - Interview : fake reviews – A job Interview - Monologue: A news story. <b>(Speaking) :</b> Giving Opinions about podcasts – Describing experiences using reporing verbs. – Generalising being vague - Air Travel.	CO-3 BTL-3
MODULE 4 : Entertainment	(9L)
<ul> <li>Grammar : The passive - Defining and non-defining relative clauses - recommending and responding to recommendations Vocabulary : -ed / -ing adjectives – Music; Word Building(nouns) Pronunciation :Sound and spelling: final – ed in adjectives – relative clauses ; pausing word stress – showing contrast Writing : An article about a form of entertainment Contrasting ideas, the structure of an article.</li> <li>Reading : Articles on Business abroad</li> <li>LAB : (Listening) : Conversation : Film trailers - Three monologues: Musical experiences - Planning an evening out – Two monologues : live music (Speaking) : Recommending a film or TV programme – A musical experience - Recommending and responding; Asking someone to wait - Live vs recorded music</li> </ul>	CO-4 BTL-3
MODULE 5 : Opportunities	(9L)
Grammar :Second Conditional – third conditional – Talking about possible problems and reassuring someone Vocabulary :Sport ; Adjectives and prepositions – Expressions with do, make and take Pronunciation : Sentence stress: would – Sentence stress : would and . have – sounding sure and unsure Writing :An email with advice advising a course of action Reading :Article : Searching for serendipity – A web page about volunterring: Emails Giving advice. LAB : (Listening) : Conversation: trying new activities – Making a marriage proposal – Monologue: Volunteering. (Speaking) :Taking New opportunities – A past event that made life better – Talking about possible problems and reassuring someone; changing the subject – volunteering.	CO-5 BTL-4
TEXT BOOKS	
1         Doff, A., Thaine, C., Puchta, H., Stranks, J., & Lewis-Jones, P. (2023). Empower Second Edition. Cambr University Press & Assessment. New Delhi.	ridge
	25.0)
1   Murphy, Raymond(2019). Intermediate English Grammar. Cambridge University Press. India. (Pages	350)
<ul> <li>Barnes, D., (2020). Exploratory talk for learning in Mercer, N. and Hodgkinson, S. (eds) Explorin School. London: Sage Publications. (Pages 208)</li> <li>Dhanavel. S P (2018). English and Soft Skills. Orient BlackSwan. India. (Pages 136)</li> </ul>	g Talk in
4 Goldsmith, Marshall &M.S. Rao.(2020) Soft Skills: Enhancing Employability. Dreamtech Press. Indi 256)	ia (Pages
E Books	

1	https://www.pdfdrive.com/basic-english-grammar-with-exercises-e12486779.html
2	http://dspace.vnbrims.org:13000/jspui/bitstream/123456789/4733/1/Leadership%20The%20Power%20of
	<u>%20Emotional%20Intellegence.pdf</u>
M	IOOC Courses
1	https://www.edx.org/professional-certificate/ritx-communication-skills
2	https://www.coursera.org/specializations/people-and-soft-skills-for-professional-success

CC	OURSE TI	TLE		MECHANICS OF RIGID BODIES						CREE	DITS	4		
со	URSE CO	DDE	EAT5:	1001	COU CATEC	irse Gory		PC		L-T-	P-S	2-1-2-2		
VER	SION		1.0		APPR DET/	OVAL AILS		36 th ACN	N	LEARN LEV	NING /EL		BTL-4	
ASSES	SMENT	SCHEME												
					CI	Α							ESE	
Fi Perio	irst odical	S Per	econd riodical		Semina Assignme	nr/ ents/	Surpi etc., a the	Surprise Test / Quiz       etc., as approved by       the Department       Attendance					/ Pi	ractical
Asses	sment	Ass	essment		Projec	ct	E	xaminati	on					
							Com	mittee "	'DEC"					
1	5%	This	15%		10%			5%		5%	6	25%		25%
Co Desci	urse ription	This c know Finally	his course will provide knowledge on statics of particle and rigid bodies in planar and special coordinates. his course will also impart knowledge on analysis of forces on trusses and frames. In addition to that howledge on center of gravity and moment of inertia calculation for surfaces and solids are also included. hally, the dynamic analysis of particle in both kinematics and kinetics are also included in this course. To apply concept on force analysis and equilibrium of a particle in plane and space											
Course Object	e tives	2. 1 3. 1 4. 1 5. 1	Fo educat Fo impart Fo instruc Fo educat	te the co knowle t on for te kinem	ndition c dge on ce ce analys atics and	of equilib enter of _{ is in diffe l kinetics	rium of a gravity a erent stru of partic	a rigid bo nd mome uctures s cles	dy in pla ent of ine uch as tr	ne and s ertia for p usses an	pace planar ar d frames	eas and v	olumes	
Course Outco	e mes	Upon 1. 4 2. 4 3. [ 4. ( 5. 4	complet Apply the Analyze t Determin Conduct f Analyze p	ion of th condition he condi e the cent force and osition,	is course on of equ tion of eq nter of gr alyze on t velocity,	e, the stu ilibrium quilibriur ravity and crusses an accelera	dents wi of a part n of a rig d momer nd struct tion, and	II be able icle in pla gid body i nt of iner sures I forces t	e to ane and s in plane a tia for pl hat cause	space and spac anar are e the mo	e as and vo tion of p	olumes articles		
CO. PC	O AND P	SO MAP	PING											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	POS	PO9	PO1	РО	PO	PSO	PSO
<u> </u>	.01	102	.03	104	.05	.00	,	100	105	0	11	12	1	2
1	3	3	3 1 2 2 1					-	-	-	1	3	3	1
CO- 2	3	2	2	3	2	1	-	-	-	-	-	3	2	2
CO- 3	2	3	3	2	1	2	1	-	-	-	-	2	2	2

CO- 4	2	2	3	2	1	1	-	-	-	-	1	3	3	1
CO- 5	3	3	3	3	2	1	1	-	-	-	1	2	2	3
			1 - Wea	kly Corre	lated, 2	- Modera	tely Cor	related a	nd 3 - St	rongly Co	orrelated		1	
Modu	le 1 – Sta	atics of <b>P</b>	Particles										(6L+3	Г+6Р)
Funda	mental (	Concepts	and Prin	ciples - S	Systems	of Units.								
Forces	s in a Pla	<b>ne</b> - For	ce on a l	Particle -	- Force a	s Vector	- Resulta	ant of Tv	o Forces	s - Result	tant of S	everal		
Concu	rrent For	rces - Re	solution	of a For	ce into C	compone	nts - Re	ctangular	Compo	nents of	a Force	- Unit		
Vector	s - Equili	brium of	a Particl	e – Free	-Body Dia	agram.							со	-1
<b>Forces in Space</b> - Rectangular Components of a Force in Space - Force Defined by Its Magnitude and Two Points on Its Line of Action - Resultant of Soveral Consurrent Forces in Space - Equilibrium of a Particle in												d Two	BTI	3
Points on Its Line of Action - Resultant of Several Concurrent Forces in Space - Equilibrium of a Particle in												icle in		
Space.														
Suggested Reading: Vector and Scalar Operations														
Module 2 – Statics of Rigid Bodies													(6L+31	Г+6Р)
Rigid Bodies: Equivalent Systems of Forces - External and Internal Forces - Principle of Transmissibility -														
Equivalent Forces - Moment of a Force about a Point - Varignon's Theorem - Moment of a Force about a														
Given	Given Axis - Moment of a Couple - Reduction of a System of Forces to One Force and One Couple.													-7
Equili	Equilibrium of Rigid Bodies - Equilibrium of a Rigid Body in Two Dimensions - Reactions at Supports and													-4
Conne	Connections for a Two-Dimensional Structure - Statically Indeterminate Reactions													
Sugge	Suggested Reading: Equilibrium of a Rigid Body in Three Dimensions - Reactions at Supports and													
Conne	ctions fo	r a Three	e-Dimens	ional Str	ucture.									
Modu	le 3 – Di	stributed	d Forces:	Center o	of Gravit	y and Mo	oment of	f Inertia					(6L+31	Г+6Р)
Centro	oids and	Centers	of Gravit	<b>y -</b> First N	/loments	of Areas	and Line	es - Deter	minatior	n of Cent	roids for	Areas		
and Lir	nes by In	tegratior	n - Comp	osite Pla	tes.					_				
Mome	ents of In	<b>ertia</b> - D	etermina	tion of t	he Secon	d Mome	nt or Mo	ment of	Inertia of	f an Area	by Integ	ration	со	-3
- Mom	ents of l	nertia of	Compos	ite Areas	- Polar N	Noment	of Inertia	a - Radius	of Gyrat	tion - Pro	oduct of I	nertia	BTI	3
- Paral	lel-Axis I	heorem	- Princip	al Axes a	nd Princi	pal Mon	ients of	Inertia -						
Sugge	sted Rea	ading: Th	eorems	of Pappu	s-Guldin	us - Cent	er of Gra	avity of a	Volume	and Con	nposite E	Bodies		
- Norm	ent of in	ertia or a		woment	s of iner	la of Cor	nposite i	soales.					(61.2	
iviodu	le 4 – An		- Structu	res	-	<u></u>	( =						(6L+3	1+6P)
Trusse	es - Defir		a Iruss -	Simple	Irusses -	Analysis	of Iruss	es by the	e Metho	d of Join	ts - Anal	ysis of	~~~	
From	s by the	wethod	of Sectio			have A.								-4
Frame	es - Struc	tures Co		WUITI-FO		ibers - Ar	narysis of	ra Frame					BIL	3
Sugge		iaing: sp	ace rrus	ses and r	viachines	•							101.27	
Iviodu Kimati	ie 5 – Dy		of Partici	es • Mation	of Dout!	alaa Day					Determi		(6L+31	+62)
Kineti	CS OT Par	ticles - K	ectilinea	r iviotior		cies - Pos	sition, ve	elocity, ai		d Rootili	Determin	nation		
Motio		UI d Pd			Rectime		11 - 0111		Leierate	u kecilii				
Kineti	rs of Par	ticles - I	Vewton's	Second	law - Li	near Mo	mentum	of a Par	ticle - Ra	ate of Ch	ange of	Linear		
Mome	ntum - D	)vnamic	Eauilibrii	m -Prin	ciple of V	Vork and	l Energy	- Work o	f a Force	e - Power	and Fffi	ciency	CO-5	
- Pote	ntial Ene	rgy - Co	nservatio	on of Ene	ergy -Pri	nciple of	Impulse	and Mo	omentun	<b>n -</b> Impu	lsive Mo	tion –	BTL	-4
Impact	t - Direct	Central	Impact -	Oblique	Central I	mpact.								
Suggested Reading: Curvilinear Motion of Particles - Rectangular Components of Velocity and Acceleration											ration			
- Tang	ential an	d Norma	l Compo	nents - R	adial and	d Transve	erse Com	ponents		,	-			
TEXT B	OOKS													

1	Beer, F. P and Johnston Jr. E.R. (2019), Vector Mechanics for Engineers: Statics and Dynamics, Tata McGraw-Hill
1.	Publishing company, 12 th Edition.
2	Meriam J.L. and Kraige L.G. (2018), Engineering Mechanics - Statics and Dynamics, John Wiley & Sons, 9th Edition, 448
۷.	pages.
REFE	RENCE BOOKS
1.	Hibbeller, R.C and Ashok Gupta (2017), Engineering Mechanics: Statics and Dynamics, Pearson Education, 14th Edition.
2.	Timoshenko S. & Young D. H. (2017), Engineering Mechanics, Mc-GrawHill Education, 5th Edition.
E BO	OKS
1.	https://drive.google.com/open?id=0B9bpsTYXP4ceTnBneXhzRV96dWs
2.	https://drive.google.com/open?id=0B9bpsTYXP4ceSUZLaEYyNDRGMWs
3.	https://drive.google.com/open?id=0B9bpsTYXP4ceRjBJQjd1UTVmNHM
MO	DC
1.	https://ocw.mit.edu/courses/physics/8-01sc-classical-mechanics-fall-2016/
2.	http://www.nptel.ac.in/courses/112103109/
3.	http://www.nptelvideos.in/2012/11/engineering-mechanics.html

COURSE TITLE	OUTREACH	I (NCC)- LEVEL II (AR	MY WING)	CREDITS	1					
COURSE CODE	GGE51403	COURSE CATEGORY	HS	L-T-P-S	0-0-2-4					
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3					
ASSESSMENT SCHE	ME									
		CIA			ESE					
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	PRACTICAL					
15%	15%	10%	5%	5%	50%					
Course Description	The NCC provides e Social Services, Dis	exposure to the cade cipline and Adventu	ets in a wide range of re Training.	activities., with a	a distinct emphasis on					
	Social Services, Discipline and Adventure Training. The training curriculum of the NCC is primarily focused on character building, inculcating leadership qualities and skill enhancement through structured academic syllabi, practical training and opportunity for exposure/interaction beyond a cadets' immediate environment, and thereby enabling them for a brighter and progressive future.									

Course O	utcome	1 2 3	To devel selfless s To creat walks of To provi	op chara ervice al e a huma life and de a suita	cter, cor mongst t an resou always a able env	mradeshi he youth rce of or vailable ironmen	ip, discip n of the o ganized, for the s t to mot	line, sec country. trained ervice of ivate the	ular outle and mot the nati youth to	ook, spii ivated y on. o take u	rit of adv outh to p p a caree	enture a provide l er in the	nd the id leadersh Armed F	deals of ip in all orces.
CO, PO A	ND PSO I	MAPPIN	G											
со	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	РО- 10	PO- 11	PO- 12	PSO- 1	PSO- 2
CO-1	1	2	1	1	-	2	1	3	2	3	3	2	-	-
CO-2	1	2	1	1	-	2	1	3	2	3	3	2	-	-
CO-3	1	2	1	1	-	2	1	3	2	3	3	2	-	-
			1: W	eakly rel	ated, 2:	Modera	tely rela	ted and	3: Strong	gly relat	ed			
MODULE	1: NCC G	ENERAL	ı.									(	6P)	
NCC GENI 2 NCC 3 D Camps: Ty	ERAL: NO uties of I	CC 1 Aim NCC Cad	s, Objec et 1 NCC	tives & C 2 4 NCC	)rganizat	ion of N	CC 1 NC	C 2 Incen	tives				CO-1 BTL-3	
MODULE	2: NATIC	DNAL INT	FEGRATI	ON AND	AWARN	IESS					I	(	(6P)	
NATIONA Importane in Diversit	L INTEG ce & Nec cy & Role	<b>GRATION</b> essity 1 of NCC i	I <b>AND</b> NI 2 Fact in Nation	<b>AWAREI</b> tors Affe n Buildin	NESS 4 cting Na g 1 NI 4	NI 1 I tional In Threats t	National tegration to Natior	Integra n 1 NI 3 I nal Secur	ition: Jnity ity 1				CO-2 BTL-3	
MODULE	3: PERSC	DNALITY	DEVELO	PMENT.								(	6P)	
PERSONA Creative T Skills 3 PD	LITY DEV hinking, 3 Group	/ELOPMI Decision Discuss	ENT 7 PE Making ion: Stre	0 1 Self-A and Pr ss & Eme	warene oblem So otions 2	ss, Empa olving 2	thy, Crit PD 2 Cor	ical & nmunica	tion				CO-3 BTL-3	
MODULE	4: LEADE	RSHIP										(	6P)	
LEADERSI ' Code 3 I	<b>HIP 5</b> L 1 2 Case S	Leadersł Studies: S	nip Caps Shivaji, J	ule: Trait hasi Ki R	s, Indica ani 2	tors, Mc	tivation,	. Moral \	/alues, H	onour			CO-4 BTL-3	
MODULE	5: SOCIA	L SERVIO	CE AND	сомми	NITY DE	VELOPM	IENT						(6P)	
SOCIAL SI Developm Children a 2 SS 7 Cyb	RVICE A lient Prog and Wom ber and N	<b>ND CON</b> grammes nen Safet Nobile Se	IMUNIT 5, NGOs, 2y 1 SS 5 ecurity A	<b>Y DEVEL</b> Contribu Road / R warenes	<b>DPMENT</b> Ition of N Rail Trave s 1	7 <b>8</b> SS 1 E Youth 3 S el Safety	Basics, Ru SS 4 Prot 1 SS 6 N	ural ection of ew Initia	f tives				<b>CO-5</b> BTL-3	
TE		<u>(S</u>												

<u>1.</u>	NCC COMMON SUBJECT BOOK
<u>2.</u>	RED BOOK (ARMY SPECIAL SUBJECTS)

COURSE	TITLE			s		1									
COURSE	CODE		GGE514	403	COU	RSE EGORY			HS		L-T-P-S			0-0-2-4	
Version			1.0		Appr	oval De	tails	3	6 th ACN	1	LEARNI LEVEL	NG		BTL-3	
ASSESSI	MENTS	SCHEME													
						CIA								ESE	
Fir Perio Assess (The	st dical ment ory)	Sec	cond Per Assessm (Theor	iodical nent 'y)	A	Practica ssessme	al ents	Observation / lab records as approved by the Department Examination Committee "DEC"			Atter	ndance	F	PRACTIC	<b>AL</b>
15	%		15%			10%			5%		5	5%		50%	
Cou Descri	rse ption	The NCC provides exposure to the cadets in a wide range of activities., with a distinct emphasis on Social Services, Discipline and Adventure Training.													
Course Objectiv	/e	The training curriculum of the NCC is primarily focused on character building, inculcating leadership qualities and skill enhancement through structured academic syllabi, practical training and opportunity for exposure/interaction beyond a cadets' immediate environment, and thereby enabling them for a brighter and progressive future.													
Course Outcom	e	1. 2. 3.	To deve selfless To crea walks o To prov	elop chai service a te a hun f life anc ide a sui	racter, c amongsi nan reso I always table en	comrade t the you ource of availabl ovironme	eship, dis uth of th ^c organiz le for the ent to m	cipline, e countr ed, trair e service otivate 1	secular ry. ned and e of the r the yout	outlook, motivat nation. h to tak	, spirit of ted yout e up a ca	f advent h to pro areer in t	ure and vide lea the Arm	the idea dership ed Force	als of in all es.
CO, PO	AND P	SO MAP	PPING												
со	РО -1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	РО- 10	PO- 11	PO- 12	PSO- 1	PSO- 2	
CO-1	1	2	2 1 1 - 2 1 3 2 3 3 2 -										-	-	
CO-2	1	2	1	1	1 - 2 1 3 2 3					3	3	2	-	-	
CO-3	1	2	1	1	-	2	1	3	2	3	3	2	-	-	
			1	: Weakly	/ related	d, 2: Mo	derately	related	and 3:	Strongly	y related	-			
MODUL	MODULE 1: NCC GENERAL (6P)														

NCC GENERAL: NCC 1 Aims, Objectives & Organization of NCC 1 NCC 2 Incentives 2 NCC 3 Duties of NCC Cadet 1 NCC 4 NCC Camps: Types & Conduct 2	CO-1 BTL-3
MODULE 2: NATIONAL INTEGRATION AND AWARNESS	(6P)
NATIONAL INTEGRATION AND AWARENESS 4 NI 1 National Integration: Importance & Necessity 1 NI 2 Factors Affecting National Integration 1 NI 3 Unity in Diversity & Role of NCC in Nation Building 1 NI 4 Threats to National Security 1	CO-2 BTL-3
MODULE 3: PERSONALITY DEVELOPMENT.	(6P)
<b>PERSONALITY DEVELOPMENT 7</b> PD 1 Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving 2 PD 2 Communication Skills 3 PD 3 Group Discussion: Stress & Emotions 2	CO-3 BTL-3
MODULE 4: LEADERSHIP	(6P)
<b>LEADERSHIP 5</b> L 1 Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour 'Code 3 L 2 Case Studies: Shivaji, Jhasi Ki Rani 2	CO-4 BTL-3
MODULE 5: SOCIAL SERVICE AND COMMUNITY DEVELOPMENT	(6P)
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT 8 SS 1 Basics, Rural Development Programmes, NGOs, Contribution of Youth 3 SS 4 Protection of Children and Women Safety 1 SS 5 Road / Rail Travel Safety 1 SS 6 New Initiatives 2 SS 7 Cyber and Mobile Security Awareness 1	<b>CO-5</b> BTL-3
TEXT BOOKS	
NCC COMMON SUBJECT BOOK	
RED BOOK (ARMY SPECIAL SUBJECTS)	

COURSE TITLE	OUTREACH	(NCC)- LEVEL II (NA	AVY WING)	CREDITS	1					
COURSE CODE	GGE51403	COURSE CATEGORY	HS	L-T-P-S	0-0-2-4					
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3					
ASSESSMENT SCHEME										
	ESE									
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	PRACTICAL					

15	%		15%			10%		5%	6		5%		50	1%	
Cou Descri	rse ption	The Socia	NCC pro al Servico	vides ex es, Discij	posure t pline and	the ca d Adven	idets in a ture Tra	a wide ra ining.	ange of a	octivities	s., with a	distinc	t empha	sis on	
Course Objectiv	ve	The quali for e brigh	training ities and exposure nter and	curricul   skill en e/interac progres	um of t hancem tion bev sive futu	he NCC ent thro yond a o ure.	is prim ough stru cadets' i	arily foc actured immedia	used on academi te envir	charac c syllabi onment	ter build , practic , and th	ding, inc al traini nereby e	ulcating ng and c nabling	leaders opportur them fo	hip nity or a
Course Outcom	ie	1. 2. 3.	To deve selfless To crea walks o To prov	lop char service a te a hum f life anc ide a sui	acter, co amongsi nan reso I always table en	omrades t the you ource of availabl ovironme	ship, diso uth of th organize le for the ent to m	cipline, s e countr ed, traine e service otivate t	ecular o y. ed and n of the n he yout	utlook, notivate lation. h to tak	spirit of d youth e up a ca	adventu to prov areer in	ire and t ide lead the Arm	he ideal: ership ir ed Force	s of 1 all es.
CO, PO AND PSO MAPPING															
со	PO -1	PO-2	PO-3	PO-4	PO- 12	PSO- 1	PSO- 2								
CO-1	1	2	2 1 1 - 2 1 3 2 3 3 2												
CO-2	1	2	1	1	-	2	1	3	2	3	3	2	-	-	
CO-3	1	2	1	1	-	2	1	3	2	3	3	2	-	-	
	1: Weakly related, 2: Moderately related and 3: Strongly related														
MODUL	.E 1: NO	CC GENE	RAL										(	5P)	
NCC GE 2 NCC 3 Camps:	NERAL Duties Types	NCC 1 of NCC	Aims, O Cadet 1 uct 2	bjective NCC 4 N	s & Orga NCC	anization	n of NCC	1 NCC 2	Incentiv	es			CC BT	)-1 L-3	
MODUL	.E 2: N/	ATIONA	LINTEG	RATION	AND AV	VARNES	S						(6	P)	
<b>NATION</b> Importa in Diver	IAL IN Ince & sity & F	TEGRAT Necessi Role of N	TION AI ty 1 NI 2 NCC in N	ND AW Factors ation Bu	ARENES Affectir ilding 1	5 <b>S 4</b> NI ng Nation NI 4 Thr	l 1 Nat nal Integ eats to I	tional II gration 1 National	ntegratic NI 3 Un Security	on: ity 1			CC BT	)-2 L-3	
MODUL	.E 3: PE	RSONA	LITY DE\	/ELOPM	ENT.								(6	P)	
PERSON Creative Skills 3 I	PERSONALITY DEVELOPMENT 7 PD 1 Self-Awareness, Empathy, Critical &CO-3Creative Thinking, Decision Making and Problem Solving 2 PD 2 CommunicationBTL-3Skills 3 PD 3 Group Discussion: Stress & Emotions 2CO-3														
MODULE 4: LEADERSHIP											(6F	')			
LEADERSHIP 5 L 1 Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour ' Code 3 L 2 Case Studies: Shivaji, Jhasi Ki Rani 2										CO-4 BTL-3					
MODUL	.E 5: SC	OCIAL SE	RVICE A				LOPMEN	NT				(6P)			

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT 8 SS 1 Basics, Rural Development Programmes, NGOs, Contribution of Youth 3 SS 4 Protection of Children and Women Safety 1 SS 5 Road / Rail Travel Safety 1 SS 6 New Initiatives 2 SS 7 Cyber and Mobile Security Awareness 1	<b>CO-5</b> BTL-3
TEXT BOOKS	
NCC COMMON SUBJECT BOOK	
RED BOOK (ARMY SPECIAL SUBJECTS)	

COURSE TITLE	OUTREACH (I	OUTREACH (NSS,Y's Men, Rotract)- LEVEL II       CREDITS         GGE51404       COURSE CATEGORY       HS       L-T-P-S         1.0       Approval Details       36 th ACM       LEARNING LEVEL       Image: Comparison of the comparison of										
COURSE CODE	GGE51404	COURSE CATEGORY	HS	L-T-P-S	0-0-2-4							
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	-							
ASSESSMENT SCH	EME											
CIA												
Volunteering	Events attended	Awareness Progra	Awareness Programs attended Attendance									
5	25	15	5%	50								
Course Description	This course is designed to introduce students to the principles and practices of community service, social development, and active citizenship. The course aims to instill a sense of social responsibility and promote civic engagement among the participants. Through a combination of theoretical knowledge and practical experiences, students will develop essential skills and qualities required to make a positive impact on the community and society. Pre requisite: There are no specific prerequisites for enrolling in the NSS Semester 1 course. However, a genuine interest in community service, social development, and willingness to actively engage with											
Course Objective	<ol> <li>To familiarize stude (NSS) in community engagement.</li> <li>To develop essentia preparing students</li> <li>To cultivate empath and effectively with</li> <li>To promote enviror eco-friendly approa</li> <li>To enhance student to engage with communication</li> </ol>	<ol> <li>genuine interest in community service, social development, and willingness to actively engage with diverse communities are essential.</li> <li>To familiarize students with the objectives, history, and importance of the National Service Scheme (NSS) in community development, emphasizing the significance of social responsibility and civic engagement.</li> <li>To develop essential leadership skills, teamwork, and effective project management techniques, preparing students to organize and execute community service projects successfully.</li> <li>To cultivate empathy, compassion, and cultural sensitivity, enabling students to engage respectfully and effectively with diverse communities during their community service activities.</li> <li>To promote environmental awareness and sustainable practices, encouraging students to integrate eco-friendly approaches into their community service initiatives.</li> <li>To enhance students' communication, problem-solving, and decision-making skills, equipping them to engage with community members, stakeholders, and address challenges effectively.</li> </ol>										

		1.	stude Natio	nts will nal Serv	gain a co ice Sche	omprehe me (NSS	ensive u 6) in proi	nderstaı moting c	nding of commun	the obj ity deve	ectives, elopmen	history, t and so	and sigr cial resp	nificance onsibilit	of the y.
		2.	Partic in the	cipants v commu	vill demo unity, lay	onstrate ving the	the abil groundv	ity to ide vork for	entify an effective	id asses e comm	s prevale unity se	ent socia vice init	al issues tiatives.	and cha	llenges
Course Outcom	ne	3.	Throu team comn	ugh prac work, ar nunity se	ctical ex nd proje ervice pr	perienco ct mana ojects.	es and gement	workshc techniq	ops, stuc ues nece	dents w essary f	ill deve or orgar	op esse nizing ar	ential le nd execu	adership iting suc	o skills, cessful
		4.	By en	gaging	with div	erse coi	nmuniti	es, stud	ents wil	l cultiva	ite empa	athy, co	mpassio	n, and c	ultural
			sensit	tivity, fo	stering r	neaning	ful and ı	respectf	ul intera	ctions d	luring th	eir servi	ce activi	ties.	
		5.	Upon and d devel	comple decision- opment	tion of S -making and ser	emestei skills, e vice pro	r 1, stude empowe jects.	ents will ering the	have im em to a	proved ctively	their cor and effe	mmunic ectively	ation, pr engage	roblem-s in com	olving, munity
CO, PO	AND P	SO MAP	PING												
со	PO -1	PO-2	PO-3	D-3 PO-4 PO-5 PO-6 PO-7 PO-8 PO-9 PO- 10 11 12											
CO-1	1	2	1	1 1 - 2 1 3 2 3 3 2									-	-	
CO-2	1	2	1	1 1 - 2 1 3 2 3 3 2 -							-	-			
CO-3	1	2	1	1	-	2	1	3	2	3	3	2	-		
CO-4	1	2	1	1 1 - 2 1 3 2 3 3 2 -								-	-		
CO-5	1	2	1	1	-	2	1	3	2	3	3	2	-	-	
			1	L: Weak	ly relate	d, 2: Mo	oderatel	y relate	d and 3:	Strong	ly relate	d			
		то	PICS TO	BE COV	<b>ERED</b>										
1.	Intro	duction	to Natio	onal Serv	vice Sche and Nee	eme (NS	S) and it	s Object	ives mmunit	'N					
3.	Proj	ect Planr	ning and	Manage	ement fo	or Comn	nunity Se	ervice	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	. y					
4.	Lead	lership D	evelopr	nent and	d Teamv	vork									
5.	Cult	ural Sens	sitivity a	nd Inter	acting w	ith Dive	rse Com	imunitie	s						
6. 7	Com Envi	municat	ion and	Problem	n-Solving and Sug	g SKIIIS TO tainahle	or Comn Practic	nunity El es	ngageme	ent					
8.	Heal	th, Hygie	ene, and	l Commi	unity We	ell-being	. i ructic	<b>C</b> J							
9.	The	Role of A	Arts and	Culture	in Comr	nunity D	evelopr	nent							
10	. Refle	ecting or	n Comm	unity Se	rvice Exp	perience	s and Pe	ersonal (	Growth						
Suggest	: Activi	ties												(30P	)
1.	<b>Com</b> stud wast	munity ents and e manag	<b>Cleanlin</b> I resider gement.	ess Driv nts in cle	r <b>e:</b> Orgai aning pu	nize a cle ublic spa	eanlines ices and	s drive in creating	n the loc g awaren	al comr iess abc	nunity, i out clean	nvolving liness a	g nd		
2.	Hea basio	th Awar c health	eness C check-u	<b>amp:</b> Co ps, distri	onduct a ibute he	health a alth-rela	awarene ated info	ess camp prmation	where p , and pr	oarticipa omote	ants can the impo	provide ortance o	of		
3.	tree abou	ronment planting ut enviro	tal Cons , creatir	ervation ng green I issues.	n <b>Projec</b> spaces,	t: Initiato or imple	e an env ementin	ironmer g recycli	ntal cons ng progi	ervatio rams, to	n projec o raise av	t, such a varenes	IS S		

4.	Teaching Assistance in Local Schools: Collaborate with local schools to provide teaching assistance conduct educational workshops and help students with their studies										
5	Empowerment Workshops: Organize workshops for women youth or other marginalized										
J.	groups to empower them with skills and knowledge relevant to their needs, such as vocational										
	training or financial literacy										
6	Cultural Exchange Program: Arrange a cultural exchange event where NSS participants and										
0.	local community members can share their traditions dances music and food fostering										
	mutual understanding and appreciation										
7	Blood Donation Camp: Partner with local healthcare institutions to organize a blood donation										
	camp to address blood shortages and raise awareness about the importance of donating										
	od.										
8.	Community Survey and Needs Assessment: Conduct a comprehensive community survey to										
	understand the needs and priorities of the local residents, guiding the selection of future										
	service projects.										
9.	Awareness Campaigns: Create awareness campaigns on critical social issues like gender										
	equality, education, or substance abuse through street plays, posters, and interactive										
	sessions.										
10.	Disaster Preparedness Workshop: Conduct workshops on disaster preparedness, including										
	first aid training and emergency response, to equip the community with necessary skills.										
11.	Senior Citizens' Engagement: Plan activities and events to engage and support senior citizens,										
10	such as organizing social gatherings or providing assistance with daily chores.										
12.	Digital Literacy Initiatives: Set up digital literacy workshops to help community members,										
10	especially elders and underserved individuals, to learn basic computer and internet skills.										
13.	and community bonding.										
14.	Skill Development Sessions: Arrange skill development workshops in collaboration with local										
	experts to teach practical skills like tailoring, painting, or handicrafts.										
15.	Awareness on Government Schemes: Educate the community about various government										
	schemes and programs that they may be eligible for, to ensure they can avail themselves of										
	the benefits.										
REFERENCI	E BOOKS										
1	National Service Scheme Manual, Government of India.										
2	Orientation Courses for N.S.S. Programme officers, TISS.										
3	Case material as Training Aid for field workers, Gurmeet Hans.										
4	National Service Scheme Manual, Government of India.										
5	Training Programme on National Programme scheme, TISS.										
6	Social Problems in India, Ram Ahuja										
7	Social service opportunities in Hospitals, Kapil K. Krishan, TISS.										

## Semester-III

COURSE TITLE	PARTIAL DIFFEREN	ITIAL EQUATIONS	AND TRANSFORMS	CREDITS	4					
COURSE CODE	EMA51003	COURSE CATEGORY	L-T-P-S	3-1-0-2						
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3					
ASSESSMENT SCHEME										

CIA														ESE	
First Periodical Assessment	Second     Seminar/       Periodical     Assignments/       Assessment     Project       15%     10%											nce	End Exa	Semes	ter on
15%		15%			10%			5%			5%			50%	
Course Description	To m trans	ake th forms	e stude and its	ent un applio	dersta cations	nd the	basic c	oncep	ts of pa	artial d	lifferen	tial eq	uations	and	
Course Objective	2	<ol> <li>To present the main results in the context of partial differential equations and to study numerical methods for the approximation of their solution</li> <li>To introduce the wave equation including time and position dependence</li> <li>To comprehend the mechanisms of heat transfer under steady and transient conditions.</li> <li>To enable the students to study the concept of Fourier Transform</li> <li>To convert a discrete-time system into the difference equation using the Z Transform.</li> </ol>													
Course Outcome	1. 2. 3. 4. 5.	<ol> <li>Upon completion of this course, the students will be able to</li> <li>Formulate and solve standard types of partial differential equations.</li> <li>Solve the Wave and Heat equations.</li> <li>Obtain the solution of two dimensional heat equations.</li> <li>Apply Fourier transform to find the definite integrals.</li> <li>Compute the solution of the difference equation using Z-Transform.</li> </ol>													
Prerequisites	: Basic	s in Di	fferen	tial Eq	uation	s.									
CO, PO AND F	PSO M	APPIN	G				1								
со	РО- 1	РО- 2	РО- 3	РО- 4	РО- 5	РО- 6	РО- 7	РО- 8	РО- 9	РО- 10	РО- 11	PO- 12	PSO- 1	PSO- 2	
CO-1	3	3	2	2	2	3	1	-	1	1	-	-	1	2	
CO-2	3	3	2	2	2	1	-	-	1	1	-	-	2	1	

CO-3	3	3	2	2	2	1	-	-	1	1	-	-	1	1
CO-4	3	3	2	2	2	1	-	-	1	1	-	-	2	2
CO-5	3	3	2	2	2	1	-	-	1	1	-	-	1	2
	1: Weakly related, 2: Moderately related and 3: Strongly related													
MODULE 1: PARTIAL DIFFERENTIAL EQUATIONS (9												9L+3T)		

Formation of functions - So Lagrange's lir constant coer Suggested Re	CO-1 BTL-3								
MODULE 2: C	(9L+3T)								
Classification dimensional (without proc Suggested Re	CO-2 BTL-3								
MODULE 3: T	WO DIMENSIONAL HEAT FLOW EQUATION	(9L+3T)							
Steady state s and infinite p Suggested Re	CO-3 BTL-3								
MODULE 4: F	OURIER TRANSFORM	(9L+3T)							
Fourier Integral Theorem (without proof) - Fourier transform pair - Sine and Cosine transforms - Properties - Transforms of Simple functions - Convolution theorem - Parseval's identity.CC BTSuggested Reading: Basic integration .BT									
MODULE 5: Z	(9L+3T)								
Z-Transform · Formation of Suggested Re	CO-5 BTL-3								
TEXT BOOKS									
1.	P. Sivarama Krishna Das and C. Vijayakumar. L (2017) Transforms and partial differential equations, 1 Pearson Publication.								
2.	Grewal. B.S (2012) Higher Engineering Mathematics, 42nd Edition, Khanna Publishers, Delhi, 2012								
3.	Chandrasekaran A (2015) A Text Book of Transforms and Partial Differential Equations, Dhanam Publication.								
REFERENCE B	OOKS								
1.	BalLN.P and Manish Goyal (2007) A Textbook of Engineering Mathematics, 7 Publications Pvt Ltd.	7th Edition, Laxmi							
2.	Datta.K.B (2013) Mathematical Methods of Science and Engineering, Cengage Learning India Pvt Ltd, Delhi.								
3.	Veerarajan. T (2012) Transforms and Partial Differential Equation", Tata McGraw Hill Education Pvt. Ltd., Second reprint , New Delhi.								
E BOOKS									

1.	https://link.springer.com/book/10.1007/978-1-4614-4809-9
2.	https://s2pnd-matematika.fkip.unpatti.ac.id/wp-content/uploads/2019/03/Walter-A-Strauss-
	Partial-differential-equationsan-introduction-Wiley-2009.pdf
MOOC	
1.	nptel.ac.in/courses/122107037/

COURSE T	TLE	Pl	JBLIC S	CREDITS	1					
COURSE CODE GLS51		400	00 COURSE CATE			HS	L - T – P – S	0-0-3-1		
Version	01	Approval Details		42 nd	ACM, 26 th	Oct. 2024	LEARNING LEVEL	BTL -4		
				AS	SESSMEN	T SCHEME				
CIA									ESE	
First Periodical Assessment	Se Peri Asse	Second Periodical Assessment		Practical Assessments as approved by the Department Examination Committee "DEC"		Observation / lab records as approved by the Department Examination Committee "DEC"		Attendance	Practical	
15 %	1	15 % 10		10 %	'n	5	<b>%</b>	5 %	50 %	
Course Description	This emp anx spec in t orga pres Thre rece	This course is an introduction to speech communication leading to group discussion that emphasizes the practical skill of public speaking, including techniques to lessen speaker anxiety and the use of visual aids to enhance speaker presentations. Civility and ethical speech-making are the foundations of this course. Its goal is to prepare students for success in typical public speaking situations and to provide them with the basic principles of organization and research needed for effective speeches. Students will learn effective self- presentation techniques, encompassing body language, attire, and verbal communication. Through practical exercises and mock sessions, students will gain hands-on experience and receive constructive feedback								
Course Objectiv	By t 1. D eler 2. Er of t and 3. A ye such spec 4. D grov resp 5. C rele of t	the end of evelop the nents to ef nhance au he target a l interests. Acquire the n as provid cial occasio evelop sk up dynami ponses. Develop pr evant source he speeche	this co ability fective dience udience capal ding inf ons. ills the cs, bui cs, bui cs, bui cs oficier ces ofin es and	urse, stu to critic ely analy analysis ce andd bility to formatic rough r lding cc at resea nformat group d	udents will cally evalu vse their o s skills to u esign spee organise on, persua esearch a esearch a insensus a urch skills ion on a w iscussions	be able to: ate speeche verall effect understand content in sive argume nd prepar nd negotiat by critical vide range c	es by assessing l tiveness. the preference iscussions that a manner that ents, or fulfilling ation of discus tion through eff ly analysing ar of topics to bols	both verbal and r es, needs, and ch align with their e achieves specifie g the unique requ ssion topics, un fective verbal and interpreting of ter the credibility	non verbal aracteristics expectations c objectives, uirements of derstanding d non verbal diverse and y and depth	
Course	Upo	on complet	ion of	this cou	rse, the st	udents will	be able to			

Outco	Outcome 1. Evaluate speeches based on a variety of verbal and non-verbal criteria.													
2. Analyse the audience and design speeches to reflect the analysis.														
3.Show increased confidence in their ability to handle interview and group disc										ussion				
scenarios, reducing anxiety and stress.														
		4.F	Assess I	nsigntri topic	in quest	tions th	lat rene	ect their	r under	standing	g and i	nterest	in the	role of
alscussion topic.														
Presequisites: Plus Two English-Intermediate Level														
со	PO1	PO2	РОЗ	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO11	PO12	PSO 1	PSO 2
<b>CO1</b>										2		2	1	0
	-	-	-	-	-	-	-	-	-	5	-	2	1	1
CO2	-	-	-	-	-	-	-	-	-	3	-	2	T	1
соз	_	-	-	-	_	-	-	_	2	3	-	2	0	1
CO4	_	_	_	_	_	_	_	_	2	3	_	2	1	0
со <del>т</del>										2		-	1	1
<u>CO5 2 3 - 2 </u>														
1: Weakly related, 2: Moderately related and 3: Strongly related											(9P)			
														(31)
Intro	duction	to the	e Art o	of Speal	king – A beard	Having	simple of volu	e great me to ac	commu Id credit	nication	and re	emoving	g the	CO-1
to ad	ld emot	ion to ye	our voic	e		-03age				Sinty &	connuel		anty	DIL-2
Spea	king Ski	ills (Acti	vities):	Self-Intr	oductio	n-Speal	c for 60	seconds	& Real I	life situa	tions			
мо	DULE 2	: Design	ing and	d Enhan	cing Pu	blic Spe	aking Sl	kills						(9P)
Publ	ic Speak	ing and	Audien	ce Analy	/sis- Acc	quire kn	owledge	e – Skill i	n real lif	e prese	ntation -	– Techn	iques	CO-2
for C	onduct	ing Aud	ience A	nalysis–	Adapti	ng Spee	ech Con	itent- Vi	sual aid	s – Org	anising S	Speeche	es for	BTL-3
Information, Persuasion, and Special Occasions- Art of speech – Organisational Structures for														
Informative Speeches– Adapting Speech Organization to Special Occasions – Introduction and basic														
skills of an EmceeDealing with -Nervousness-Audience Content-Fear- Feedback-Personality														
knowledge on current events														
Speaking Skills (Activities): Team Presentation-Role Plays - Monologues- Recitations. Group Debates -														
Impromptu Speaking														
MODULE 3 :Speaker's Tool Kit (9									(9P)					
Brilliant ways to start any presentation -Designing- Making it Real Importance of Planning Importance										ance	CO-3			
of Structuring-Refining & Sketching the Draft-How to put together a great Presentation Preparation –										BTL-3				
rurpose of the Speech - Selecting the subject – Waking an Outline – Research Analysis Methods for														
- Rehearsing														
Speaking Skills (Activities): On the spot topic speech for 5 minutes-Mock Interviews – Panel sessions														
MODULE	4 : Principles and its applications for GD	(9P)												
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------	--	--	--	--	--	--						
Group Discussion Fundamentals: Purpose and Format of Group Discussions- Techniques to Generate Ideas- Roles in a Group Discussion-Evaluating Group Performance - Effective Participation in Group Discussions: Initiating the Discussion-Building on Others' Ideas-Disagreeing Respectfully-Summarising Points Understanding Group Dynamics: Types of Group Members-Leadership in Group Discussions-Managing Dominant Participants- Encouraging Quiet Participants Speaking Skills (Activities): Fostering Active Engagement through Fishbowl Discussion														
MODULE 5 : Navigating through Group Discussion														
Mock Gro Reflectio Response Time-Prio <b>Speaking</b>	oup Discussions: Simulated Group -Discussions-Peer Feedback Sessions-Instructor Feedback- n and Improvement. Time Management in Interviews and Discussions: Structuring- es-Managing - Discussion pritising Key Points-Avoiding Rambling - g Skills (Activities): Conducting mock PI and GD sessions and providing constructive feedback.	CO-5 BTL-4												
TEXT BO	oks													
1	Carnegie, Dale and Esenwein, J. Berg. (2018) The Art Of Public Speaking. Rupa Publications	India,												
REFEREN	CE BOOKS													
1.	Peale, Norman Vincent.(2017) The Power of Positive Thinking, Fingerprint Publishing.													
2.	Carnegie, Dale (2015). The Art of Public Speaking, Mittal Books Publishing House.													
3	The Ted Talks:The official Ted Guide To Public Speaking Paperback-2018													
4.	Shankar, G. (2019). GD Guide: To Excel in Group Discussion. Independently Published.													
5.	S. Hundiwala. (2019). A Complete Kit for Group Discussion. Arihant Publications India Limit	ed.												
E Books														
1.	https://www.managementhelp.org/public-speaking													
2.	https://gtu.ge/Agro-Lib/successful-public-speaking.pdf													
3.	(Mock Group Discussion(GD) 1   IIM Interview Questions and Answers. YouTube) Mock Group Discussion(GD) 1   IIM Interview Questions and Answers													
4.	(Group Discussion "Will Artificial Intelligence take away jobs?" YouTube) Group Discussion "Will Artificial Intelligence take away jobs?"													
моосо	Courses													
1	https://www.coursera.org/learn/public-speaking													
2	https://onlinecourses.nptel.ac.in/noc22_hs134/preview													

COUI TITI	RSE LE	-	THERMODYNAMICS AND HEAT TRANSFER CREDITS 4											
COUI COE	RSE DE	E	AT5100	)2	CA	COURSE ATEGOR	Y	F	РС	L-1	Г-Р-S		2-1	-2-2
VERS	ION		1.0		AF C	PPROVA	L.	36 [™]	АСМ	LEA	RNING EVEL		ВТ	°L-3
ASSESS	MENT S	SCHEME												
						CIA		-				_	ESE	
Firs Perioo Assessi (Theo	st dical ment ory)	Second Periodical Assessment (Theory) Practical Assessments Practical Assessments Department Examination Committee "DEC"										The	eory	Practical
159	%		15%         10%         5%         5%         25 %         25%											
Coui Descrij	rse ption	This course Thermodynamics deals with the heat, work and energy of a system. It also deals with the concepts and application of thermodynamics related to various laws which includes first and second law of thermodynamics. This course also deals the applications in Engineering point of view. More over the course provides a detail discussion on Rankine cycle, Air compressors, Refrigeration and the concepts of heat transfer.												
Course Objectiv	ves	1. T 2. T 3. T 4. T 5. T	o apply o analy o ident o analy o apply	the cor ze the s ify and o ze the p the co	ncepts o econd l describ perform ncepts	of first a law of tl e the va ance of of Heat	nd seco hermoo pour p recipro Transfe	ond law dynamic ower cy ocating er	of ther s with r cles air com	modynai espect e pressors	mics. ngineer and ref	ing co rigera [.]	mpone tion.	nts
Course Outcom	nes	Upon 1. / 2. A 3. k 4. A 5. A	comple Apply th nalyze dentify nalyze Apply th	tion of the conce the seco and des the perf e conce	this cou ept of fi ond law cribe th forman pts of H	irse, the rst and of ther ne vapo ce of re leat Tra	e studer second modyn ur pow ciproca insfer	nts will l law of aamics er cycle ting air	be able thermo s compre	to dynamic essors an	s. d refrige	eratio	n.	
Prerequ	isites:	Nil												
CO, PO	AND PS	SO MAP	PING											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	РО 12	PSO1	PSO2
CO-1	3	3	3	3	3	1	1	-	1	-	1	1	2	2
CO-2	3	3	3	3	3	1	1	-	1	-	1	1	2	2
CO-3	3	3	<u>3 3 3 3 1 1 - 1 - 1 1 2 2</u>										2	
CO-4	3	3	3	3	3	1	1	-	1	-	1	1	2	2
CO-5	3	ے ا ۱	3 Maaklu	3 Corrola	3 tod 2	Moder	1 atoly C	- orrelata	1 Chach	- - Strong	1 ly Corre	1 hotel	2	2
		1 -	vveakiy	correia	.eu, 2 -	woder	aleiy U	uneiate	u anu 3	- suong	iy corre	iated		

Module 1 – Basic Concepts and FIRST LAW OF THERMODYNAMICS	(6L+3T+6P)
Thermodynamic System, thermodynamic equilibrium, state, property, process, cycle, Zeroth law of thermodynamics, energy, work, heat, first law of thermodynamics, application of first law of thermodynamics to closed and open systems, steady flow process, Engineering application of steady flow energy equation.	CO-1
Practical Component:	BTL-3
Solution of SFEE for various applications in MATLAB.	
Equipment /Software : MATLAB	
Module 2 – SECOND LAW OF THERMODYNAMICS	(6L+3T+6P)
Limitations of first law, statements of second law of thermodynamics, Clausius inequality, heat engine, heat pump, refrigerator, Carnot cycle, Carnot theorem, entropy, temperature - Entropy diagram, entropy changes for a closed system. Third Law of Thermodynamics. <b>Practical Component:</b> Performance test on an Internal Combustion Engine <b>Equipment/Software : I C Engine Test Rig</b>	CO-2 BTL-3
Module 3 – VAPOUR POWER CYCLE	(6L+3T+6P)
Formation of steam and its thermodynamic properties, Dryness fraction, Quality of steam-by- steam tables and Mollier chart – Rankine cycle, Reheat Cycle- Regenerative cycle - Work done.	CO-3 BTL-3
Module 4 – RECIPROCATING AIR COMPRESSORS, REFRIGERATION CYCLES	(6L+3T+6P)
Single acting and double acting air compressors, work required effect of clearance volume, volumetric efficiency, isothermal efficiency, multistage compression, condition for minimum work. Fundamentals of refrigeration, C.O.P, simple vapour compression refrigeration system, simple vapour absorption refrigeration system, (Descriptive only), Refrigerants <b>Practical Component</b> Study of Refrigeration and air conditioning systems <b>Equipment /Software</b> 1. Refrigeration set up 2. Air conditioning set up	CO-4 BTL-3
Module 5 – Heat Transfer	(6L+3T+6P)
<ul> <li>Modes of heat transfer, Fourier's law of conduction, one dimensional steady state conduction through plane and composite walls, cylinders. Free and forced convection, dimensionless numbers, thermal boundary layer, heat transfer co-efficient, simple problems overall heat transfer coefficient, heat exchangers, LMTD, concept of radiation- Stefan Boltzmann law, Black body and Grey body radiation.</li> <li><b>Practical Component</b> <ol> <li>To find the thermal conductivity for the given material</li> <li>To find the heat transfer in Parallel flow and Counter flow exchangers.</li> </ol> </li> <li><b>Equipment /Software</b> <ol> <li>Thermal Conductivity apparatus</li> <li>Pipe Flow heat exchanger apparatus</li> </ol> </li> </ul>	CO-5 BTL-3
TEXT BOOKS	

1	Moran, Michael J., Howard N. Shapiro, Daisie D. Boettner, and Margaret B. Bailey. Fundamentals of
1.	engineering thermodynamics. John Wiley & Sons, 2018.
2.	Nag, P. K. "Engineering thermodynamics." New Delhi (2017).
REFER	RENCE BOOKS
1	Cengel, Yunus A., Michael A. Boles, and Mehmet Kanoğlu. Thermodynamics: an engineering approach. Vol.
1.	5. New York: McGraw-hill, 2011.
2.	Rao, Y. V. C. An introduction to thermodynamics. Universities Press, 2004.
E BOO	DKS
1.	https://www.mheducation.co.in/engineering-thermodynamics-9789352606429-india
2.	https://www.laxmipublications.com/servlet/lpgetbiblio?bno=000172&pageName=Author
MOO	C
1.	https://nptel.ac.in/courses/127106135
2.	https://www.edx.org/course/thermodynamics
3.	https://www.coursera.org/learn/thermodynamics-intro

COURSE TITLE	AUTOMOT	CREDITS	3									
COURSE CODE	EAT51003	COURSE CATEGORY	РС	L-T-P-S	2-0	0-2-2						
VERSION	1.0	APPROVAL DETAILS	36 [™] ACM	LEARNING LEVEL	IING EL BTL-4							
ASSESSMENT SC												
	ESI	E										
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessme nts	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	Theory	Practical						
15%	15%	10%	5%	5%	25 %	25%						
Course Description	CourseThe course provides an overall insight about construction, working of SI and CI Engines. Also provide in-depth analyses of combustion of SI and CI Engines. Testing Methods of Fuels and Engines along with its significances will be educated to the learners. Finally, course also provide detailed insights about advance technologies in the domain of IC Engines and Fuels.											
Course Objectives	<ol> <li>Students sł engines</li> <li>Students sh</li> <li>Students sh</li> <li>Students sh</li> <li>Students sh</li> <li>Students sh</li> </ol>	<ol> <li>Students should explain the constructions and working principles of automotive engines</li> <li>Students should analyze the significance of SI Engine Combustion</li> <li>Students should analyze the significance of CI Engine Combustion</li> <li>Students should evaluate the fuel and engine testing procedures</li> <li>Students should elucidate the advance engine and combustion technologies</li> </ol>										

Course       Upon completion of this course, the students will be able to         Course       1. Explain the constructions and working principles of automotive englished         Outcomes       2. Analyze the significance of SI Engine Combustion         3. Analyze the significance of CI Engine Combustion         4. Evaluate the fuel and engine testing procedures         5. Elucidate the advance engine and combustion technologies												ve engi	nes					
Prerequis	Prerequisites: Nil																	
CO, PO AND PSO MAPPING																		
COs	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO1 PSO2					
CO-1	3	2	2	2	2	2	2	1	2	1	1	3	3	3				
CO-2	3	2	2	2	2	2	2	1	2	1	1	3	3	3				
CO-3	3	2	2	2	2	2	2	1	2	1	1	3	3	3				
CO-4	3	2	2	2	3	3	3	1	2	1	1	3	3	3				
0-5	3	1 \		2 orrolat	3	3 Modora	3		Z danda	L Strong		3 alatad	3	3				
Madula 1	luchua				eu, z - r	viouera		Telate				elateu	(6)	+6D)				
History-Construction and Working of IC Engines-Combustion-Cycle-Engine Efficiency -Torque and Power Output -Valve and Port Timing -Air Fuel Ratio Lab Component: Introduction to Engine Components - Valve and Port Timing Diagram, TDC Marking								с В (6)	0-1 TL-4 +6P)									
Introducti - Knocking OBD Tool: <b>Lab Comp</b> Performa	ion - Air g Comb s <b>ponent:</b> nce Tes	r Fuel li pustion	nductic - Desig	on Syste gn of Co linder S	em - Ign ombust 61 Engine	ition Sy ion Cha e - Mor	ystem - amber - re Test o	Stages Coolin	of Con g and le Cylin	hbustion Lubricati der SI Er	in SI Er on Syst	ngine em -	C B ⁻	0-2 TL-4				
Module 3	– Com	nressio	n Ignit	ion Eng	vine								(6L	.+6P)				
Introducti Stages of Cooling at Lab Comp Performa	ion - Air Combu nd Lubr <b>conent:</b> nce Tes	r & Fue istion ir ication	I Induc n CI Eng Systen ngle Cy	tion Sys gine - K n - OBD linder (	stem - I nocking Tools	njectior g Comb e - Perf	n Syster ustion -	m –Con · Desigr ce Test	nmon r n of Co on Mu	ail inject mbustior Iti Cylind	ion syst n Cham er Cl Er	em - ber -	C B	0-3 TL-4				
Module 4	– Fuels	s and E	ngine 1	Testing									(6L	.+6P)				
Fuel Properties - Characterization – Engine Testing Procedure - Performance Parameters -         Emission Parameters Combustion Parameters         Lab Component:         Viscosity Measurement - Heating Value Measurement - Fuel Characterization Study-Emission         Measurements - Combustion Testing									ers - ssion	C B'	0-4 TL-4							
Module 5	– Adva	anced E	ingine ⁻	Techno	logy								(6L	+6P)				
GDI Engin Multi Fue	ies – Hi I Engine	CCI Eng es - Lov	gines - v Carbo	Low Te on Fuels	mperat and Re	ure Co egulatic	mbustio on - Eng	on Con ine and	cepts - I Fuel N	Control Aodificat	Strateg ion	gies -	C B	O-5 TL-4				

Lab Cor	nponent:									
Heat Ba	Heat Balance Sheet Calculation - Testing of Dual Fuel Engines									
TEXT B	DOKS									
1.	Ganesan V, "Internal Combustion Engines", Tata McGraw-Hill, 2003.									
2.	Heywood J. B, "Internal Combustion Engine Fundamentals", McGraw Hill Book Co. NY,	, 1989								
REFERE	NCE BOOKS									
1	Internal Combustion Engine Handbook, 2 nd English Edition, Richard Van Basshuysen, F	red Schaefer SAE								
1.	International ISBN of 978-0-7680-8024-7									
2.	Bosch Automotive Handbook, 10 th Edition Robert Bosch ISBN of 978-0-7680-9567-8									
3.	Mathur M. L and Sharma. R. P, "A Course in Internal Combustion Engines", Dharpat Ra	i & Sons, 1993.								
4.	Pundir B. P., "IC Engines Combustion and Emissions", Narosa Publishing House, 2010.									
E BOOK	XS									
1.	https://myxfpzg.files.wordpress.com/2015/08/robert-bosch-automotive-electronics-h	nandbook-pdf.pdf								
2.	http://opac.vimaru.edu.vn/edata/EBook/NH2014/CSDL_CS2014_2/HH0074.pdf									
MOOC										
1.	https://nptel.ac.in/courses/112104033									
2.	https://nptel.ac.in/courses/112103262									

COURSE TITLE	MATERIALS AI	ND MANUFACTUR COMPC	RING PROCESS OF AUT	OMOTIVE	CREDITS	3						
COURSE CODE	EAT51004	COURSE CATEGORY	РС		L-T-P-S	2-0-2-2						
VERSION	1.0	APPROVAL DETAILS	36 th ACN	Λ	LEARNING LEVEL	BTL-3						
ASSESSMEN	T SCHEME											
	CIA ESE											
First Periodical Assessmen t (Theory)	Second Periodical Assessment (Theory)	Practical Assessme nts	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	e Theory	Practical						
15%	15%	10%	5%	5%	25%	25%						
Course Descriptio n	This course giv	ves knowledge on	materials , manufactu	ring process	of automotive	components.						
Course Objectives	<ol> <li>To familia process</li> <li>To gain k materials</li> <li>To develo</li> <li>To attain l</li> <li>To develo</li> </ol>	rize on the const mowledge on the p knowledge on the knowledge on cast p knowledge on p	titutions of alloys, ph e selection criteria of ne mechanical propert ting & machining proc owder metallurgy tech	ase diagram materials a ies and testir ess of various nnology	s and various nd properties ng of materials s automotive co	heat treatment of nonmetallic omponents						

Course Outcor	e nes	<ol> <li>Upon completion of this course, the students will be able to</li> <li>Familiarize on the constitutions of alloys, phase diagrams and various heat treatment process</li> <li>Gain knowledge on the selection criteria of materials and properties of nonmetallic materials</li> <li>Develop knowledge on the mechanical properties and testing of materials</li> <li>To obtain knowledge on casting &amp; machining process of various automotive components</li> <li>Attain knowledge on to familiarize on powder metallurgy technology</li> </ol>												rocess terials its
Prerequisites: Nil														
CO, PO AND PSO MAPPING														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO 11	PO 12	PSO 1	PSO 2
CO-1	2	1	1	-	1	-	-	-	-	-	-	1	2	1
CO-2	1	2	1	-	-	-	-	-	-	2	-	2	1	1
CO-3									2	2				
CO-4	2	1	-	-	-	-	-	-	-	-	-	1	1	1
CO-5     1     1     3     -     -     -     -     2												1	1	
		1 - \	Veakly (	Correlat	ed, 2 - I	Modera	tely Cor	related	and 3 -	Strongly	/ Correla	ated	-	
MODU	LE 1 – C	ONSTIT	UTION	OF ALLC	OYS AND	O PHASE	DIAGR	AMS					(6L	+6P)
Isomorphous, eutectic, peritectic and eutectoid reactions, Iron - Iron carbide equilibrium diagram. Classification of steel and cast iron, properties and application. Heat Treatment- Annealing, Normalizing, hardening and tempering, Case hardening, carburising, nitriding, cyaniding, carbonitriding - Flame and Induction hardening. Experiment: Machining Operations in Lathe (Preparation of Steel Samples for Tensile Testing) MODULE 2 - SELECTION OF MATERIALS										C( B' (6L	D-1 TL-3 +6P) D-2			
piston Materia <b>Experin</b>	ring, co als- Pro <b>nent:</b> D	perties ifferent	g rod, c and auto Heat Tr	rank sh omotive eatmen	aft, cra e applica t Proce	nk case, ations o sses of S	, cam, c f PE, PP, Steel.	am shaf , PS, PV(	t, engir C, PMM	ne valve A, PET,	NON-1 PC, PA, /	Metallic ABS.	ВТ	۲L-3
MODU	le 3 – N	/IECHAN	ICAL PR	OPERT	IES AND	) TESTIN	IG						(6L	+6P)
Mechar tension Izod an <b>Experin</b>	nism of , comp d charp <b>nent:</b> N	plastic c ression by, fatigu Aicrostru	leforma and she ie and c ucture E	tion, sli ar loads reep tes valuatio	p and tw s - Hard st. on of He	vinning ness tes eat Trea	- Types sts (Brin ted and	of fractu Iell, Vick Untrea	ire - Tes ers and ted Stee	iting of r I Rockw els	naterial ell) Imp	s under act test	C( B1	D-3 [L-3
MODU	LE 4 – C	ASTING	AND M	ACHINI	NG								(6L	+6P)
Sand casting of cylinder block and liners - Centrifugal casting of flywheel, piston rings, permanent mould casting of piston, pressure die casting of carburetor and other small auto parts. Machining of connecting rods - crank shafts - cam shafts - pistons - piston pins -piston rings - valves. <b>Experiment:</b> Evaluation of Tensile Strength of Heat Treated and Untreated Steels										C( B1	D-4 [L-3			
MODULE 5 - POWDER METALLURGY											(6L-	+6P)		
Proces lining n Experi	s flow on aterial <b>ment:</b> F	chart - Pr s for clu abricati	roductic tches a on of Fi	on of me nd brak ber Reir	etal pow es - Tes nforced	ders an ting and Polyme	d their r inspect ric Com	aw mat tion of P posites	erials - I 'M parts	Manufa s.	cture of	friction	C( B1	D-5 [L-3

1	Kenneth G.Budinski and Michael K.Budinski "Engineering Materials" Prentice-Hall of India Private Limited,
1.	4th Indian Reprint 2015.
2.	Heldt.P.M., High Speed Combustion Engines, Oxford publishing co., New York, 2010.
REFE	RENCE BOOKS
1.	William D Callister "Material Science and Engineering", John Wiley and Sons 2012
2.	Raghavan.V.Materials Science and Engineering, Prentice Hall of India Pvt. Ltd., 2014
3.	Haslehurst.S.E., Manufacturing Technology, ELBS, London, 2010.
4	Rusinoff., Forging and forming of metals, D.B, Taraporevla Son & co Pvt ltd,
4.	Mumbai, 2005
E BOC	DKS
1.	http://www.cognella.com/pdf/Mechanical-Testing-of-Engineering-Materials_sneak_preview.pdf
2.	http://weldguru.com/OLDSITE/mechanical-properties-of-metals.html#table
2	http://ceb.ac.in/knowledge-center/E-
5.	BOOKS/The%20Automotive%20Development%20Process%20-%20Daniel%20Sorensen.pdf
1	https://www.niir.org/books/book_pdf/101230/niir-complete-book-on-production-
4.	automobile-components-allied-products.pdf
MOO	<u>c</u>
1.	http://www.icterm.net/assets/Instron%20Materials%20Test%20Guide.pdf
2	https://www.nde-
۷.	ed.org/EducationResources/CommunityCollege/Materials/Mechanical/Mechanical.htm
3.	https://www.mooc-list.com/course/advanced-manufacturing-process-analysis-coursera
4.	https://www.mooc-list.com/course/advanced-manufacturing-enterprise-coursera

COURSE TITLE	I	ENVIRONMENTAL SCIENCE AND CREDITS 2 SUSTAINABLE DEVELOPMENT											
COURSE CODE	GGE51003	COURSE CATE	GORY ES			L-T-P-S	2-0-0-2						
Version	1.0	Approval De	tails	36 th ACM		LEARNING LEVEL	BTL-3						
ASSESSMENT S	CHEME	EME											
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Quiz e approve Depar Examin Committe	e Test / tc., as d by the tment nation ee "DEC"	A	ttendance	ESE						
15%	15%	10%	59		5%	50%							
Course Description	To expose the st	To expose the students to the basics of environmental science and sustainable development.											

<ol> <li>To make the students aware of the natural resources and to educate them to understand the need for preserving the resources.</li> <li>To provide knowledge on the various aspects of environmental pollution and issues</li> <li>To provide basic knowledge and concepts of sustainability.</li> </ol>													o d issues			
	4. To educate the students about the concepts of sustainable habitat.															
		5.	5. To give a broad knowledge on environmental management system.													
			Upon completion of this course, the students will be able to													
		1.	Recognize the effects of over exploitation of natural resources and their impact on day-to-													
day life on earth.																
Co	ourse	2.	Apply t	he susta	inable s	solution	s for en	vironme	ental po	llution a	and issue	es.				
Out	tcome	3.	Implen	nent the	concep	ts of su	stainabi	lity in th	ne produ	uct deve	lopmen	ent.				
		4.	Use ap	propriat	e metho	ods for a	designin	ig green	house a	and maintaining sustainable cities,						
			transpo	ort syste	m, indu	stries, e	etc.									
		5.	Manag	e the en	vironm	ent for s	sustaina	ble proc	duct dev	velopme	ent.					
Prerec	quisites	Basic l	knowled	ge of sc	ience a	nd envir	ronmen	t.								
СО, РС	O AND P	SO MA	PPING													
~~~~	PO -	<b>DO 3</b>	00.3	DO 4			DO 7			PO -	PO-	PO-	PSO-	PSO-		
	1	PO-2	10-3	PU-4	PU-5	PU-6	PU-7	PO-8	PO-9	10	11	12	1	2		

со	PO - 1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO - 10	PO- 11	PO- 12	PSO- 1	PSO- 2
CO-1	2	2	2	-	-	1	3	-	-	-	-	2	1	1
CO-2	2	2	2	-	-	1	3	-	-	-	-	2	2	2
CO-3	2	2	2	-	-	1	3	-	-	-	-	2	1	1
CO-4	2	2	2	-	-	1	3	-	-	-	-	2	1	1
CO-5	2	2	2	-	-	1	3	-	-	-	-	2	2	2

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: NATURAL RESOURCES

(6L)

Introduction - Forest resources: Use and over-exploitation – Water resources: Use and overutilization – Mineral resources: Use and exploitation – Food resources: World food problems, effects of modern agriculture – Energy resources: conventional and nonconventional, solar energy, fuel cells, wind energy, hydro plants, bio-fuels, Energy derived from oceans, geothermal energy – Land resources: Use and over-exploitation – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study – Documentation of nearby environmental assets – river / forest / grassland / hill / mountain.

MODULE 2: ENVIRONMENTAL POLLUTION AND ISSUES							
Air pollution, effects of air pollutions; Water pollution – sources, sustainable waste water	CO-2						
treatment; Solid waste - sources, impacts, zero waste concept, 3R concept, Global							

environmental issues – Resource degradation, climate change, global warming, ozone layer depletion – Regional and local environmental issues – Carbon credits and carbon trading, carbon foot print.	BTL-3
Field Study - Observe a pond nearby and analyze the different measures that can be adopted for its conservation.	
MODULE 3: SUSTAINABILITY	(6L)
Introduction, need of sustainability – Social, environmental and economic sustainability concepts – sustainable development, Nexus between technology and sustainable development, challenges for sustainable development – multilateral environmental agreements and protocols – clean development mechanism (CDM) – Environmental legislations in India – water act, air act.	CO-3 BTL-3
Field Study - Assessment of sustainability in your neighborhood in education / housing / water resources / energy resources / food supplies/ land use / environmental protection, etc.	
MODULE 4: CONCEPTS OF SUSTAINABLE HABITAT	(6L)
 Green buildings: material for sustainable design, green building certification, methods for increasing energy efficiency of buildings – sustainable urbanization - sustainable transport – Industrialization and poverty reduction – Industrial processes: material selection, pollution prevention, industrial ecology, industrial symbiosis. Assignment – Explore the different methods that can be adopted for maintaining a sustainable transport system in your city. 	CO-4 BTL-3
MODULE 5: ENVIRONMENTAL MANAGEMENT	(6L)
Environmental management: Principles and strategies, Indicators of environmental quality – economic valuation - environmental cost-benefit analysis – Fiscal incentives in pollution control and management – Environmental management system: ISO 14000, Life Cycle Analysis (LCA) – scope and goal, bio-mimicking – Environmental Impact Assessment (EIA) – Procedures of EIA in India. Assignment – Conducting an EIA study of a small project (example, construction of house, road, bridge, etc.) in your local area.	CO-5 BTL-3
TEXT BOOKS	
Basu, M., Savarimuthu, X. (2017). <i>Fundamentals of Environmental Studies</i> , Cambridge Unit Edition.	versity Press, 1 st
2. Bhavik R. Bakshi (2019). Sustainable Engineering: Principles and Practice, Cambridge Univ Edition.	versity Press, 1 st
3. Mulligan, C. (2020). Sustainable Engineering: Principles and Implementation, CRC Press, 1 st	Edition.
REFERENCE BOOKS	

1.	asewar, K. L., Rao, S. N. (2022). Sustainable Engineering, Energy, and the Environment nallenges and Opportunities, CRC Press, 1 st Edition.										
2.	Singh, J.S., Singh, S.P., Gupta, S. R. (2017). Ecology, Environmental Science and Conservation. S. Chand										
	lishing Company, New Delhi,										
ЕВ	E BOOKS										
1	https://www.hzu.edu.in/bed/E%20V%20S.pdf										
2	https://library.oapen.org/handle/20.500.12657/33379										
мо	oc										
1	https://www.my-mooc.com/en/categorie/environmental-science										
2	https://www.coursera.org/specializations/sustainable-cities										

		DESIGN PROJECT-I									
COURSE CODE	EAT51800	COURSE CATEGORY		EEC	L-T-P-S	0-0-2-6					
Version	1.0	Approval Details	36	th ACM	LEARNING LEVEL	BTL-3					
ASSESSMENT SCHEME											
First Review	Second Review	Third Review	Report & Viva Voce								
20%	20%	10%	50%								
Course Description	This course provides the student significant design experience with the knowledge and skills required to analyse the basic real time problem statement. This course provides an exposure to teamwork to emulate a typical professional design environment. Simulations are to be used both in the execution of the design methodology and the management of the design project.										
Course Objective	 The course will enable To develop literat To identify a prostatement To enrich the corr 	the students to under ture survey and report oject and execution on nmunication and team	rstand: preparat of prelimi manage	ion skills inary solution ment skills	to address th	ne problem					
3. To enrich the communication and team management skills 3. To enrich the communication and team management skills Upon completion of this course, the students will be able to 1. Identify a real time problem by intensive literature survey 2. Selection of appropriate methodology with the required modern tools 3. Design & Analyse the solution through appropriate Measurement and scie calculations											

СО, РО	CO, PO AND PSO MAPPING														
со	РО- 1	РО- 2	PO - 3	РО- 4	РО- 5	РО- 6	РО- 7	РО- 8	РО- 9	PO - 10	PO- 11	PO- 12	PSO- 1	PSO- 2	
CO-1	3	3	2	1	3	2	1	3	3	3	3	2	1	2	
CO-2	3	3	2	1	3	2	1	3	3	3	3	2	2	3	
CO-3	3	3	2	1	3	2	1	3	3	3	3	2	3	2	

Weightage of Assessment:

Review / Examination Scheme	Weightage
First Review	20%
Second Review	20%
Third Review	10%
End Semester Viva Voce	50%

A committee will be constituted by the HoD for Review process

Assessment Rubrics

Parameter	Weightage (%)
Title & Objectives	5.0
Review of Literature (RL)	10.0
Design / Implementation	10.0
Methodology	5.0
Planning of Project Work	5.0
Testing Environment / Test Cases	5.0
Analytical thinking [*]	5.0
Technical Knowledge [*]	5.0
Presentation [*]	10.0
Demonstration [*]	5.0
Individual Roles Distribution [*] (Individual Objectives in the project work)	5.0
Individual Contributions [*] (Towards the individual objectives in the project work)	5.0
Deliverables	5.0
Team- work	10.0
Report / Thesis	5.0
Peer Assessment*	5.0

* - Attributes for individual contribution.

COURSE	TITLE		(To be	carried e	IN out in valuate	FERNSH summe ed in 3 ^{re}	and	CRE	DITS		1				
COURSE	CODE		EAT518	301	cou	JRSE C	ATEGO	RY	EE	С	Ŀ	T-P-S		0-0-0-	2
Versi	on		1.0		A	oprova	l Detail	s	36 ^{тн} А	СМ	LEA	RNING EVEL	i	BTL-4	1
ASSESSMENT SCHEME															
Visit Report, Feedback of the employer, Presentation & Viva Voce, MCQ Assessment															
	100%														
Course This course aims to inculcate the application of knowledge & skill learned through classro												sroom			
Descrip	otion	practices. It demands the academic component consisting of research, reflection, written and oral skills of the learner.													
		The	The course will enable the students to 1. Explore career alternatives prior to graduation.												
Cour	se		 Explore career alternatives prior to graduation. Integrate theory and practice. 												
Objec	tive		 Assess interests and abilities in their field of study. 												
			4. Bu	ild a re	cord of	work e	experie	nce.		,					
		Upo	n comp	letion	of this o	course,	the stu	dents	will be a	able to					
Cour		1. Choose appropriate modern tools used in the field of Automobile engineering to													
Outco	ome		ma D D D	anage t	he resc	ources e	effectiv	ely by a	applyin	g innov	ative id	eas			
			 Demonstrate ethical conduct and professional accountability while working in a team for the henefit of society. 											team	
			3. Co	mmuni	cate ef	fective	.y. ly and t	o write	e the sci	ientific	report	of the	learnin	gs	
Prerequi	sites: B	asic kn	owled	ge in M	easure	ments,	Data A	nalysis	s, Interj	pretatio	on.			<u> </u>	
<u>CO, PO A</u>	ND PSC	O MAP	<u>PING</u>												
	PO	PO	PO	PO	РО	PO	PO	PO	PO	PO	PO	PO	PS	PS	
CO	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	0-1	0-2	
CO-1	2	2	3	3	2	2	1	2	-	-	2	-	1	3	
CO-2	2	2	3	3	2	-	1	2	2	2	-	-	2	1	
CO-3	2	2	3	3	2	-	1	2	3	3	3	2	1	1	

Weightage of Assessment:

Assessment Scheme	Weightage					
Presentation & Viva voce	50 %					
Report	20 %					
Feedback of the Employer	30%					

A committee will be constituted by the HoD with Internship coordinator as head for learning assessment process

Assessment Rubrics

Performance	Excellent(5)	Good(4)	Fair(3)	Poor(2)		
Indicators						
Requirement analysis and clarity on problem statement(5)	Requirement well understood and problem statement well defined	Requirement well understood but problem statement not well defined	Understood the requirement and not defined properly	Not properly understood the requirements and problem statement not defined properly		
Relevance with Industry /Societal problem(5)	Relevant	Relevant to industry with small modifications	Partially relevant	Irrelevant		
Project timeline scheduled(5)	Scheduled and followed strictly	Scheduled and but not followed strictly	Scheduled but not followed	Not Scheduled and not followed		
Usage of latest application and software(5)	latest applications and software's are used	Moderate usage of new technology	Slightly outdated	NO latest applications and software's used		
Design and code efficiency(5)	Excellent design of experiment and all possible outcomes are handled	Effective design but all possible outcomes are not handled	Satisfactory Design	design		
Report Preparation(10)	Excellent documentation	Good documentation	Average documentation	Poor documentation		
Presentation skills, Fluency and comprehensibility(5)	Excellent communication skills and good comprehensibility	Good confidence , lack of communication skills and average comprehensibility	Less confidence, vocabulary need to be improved and poor comprehensibility	Poor skills		
Slide organization and contents time conscious(5)	Content is organized properly and effective time management	Content is organized properly but not effective time management	Content is not organized properly	Poor organization and least time management		
Feedback from Industry mentor(5)	Regular /novel idea/Excellent execution of project	Regular /Novel idea/Good execution of project	Regular /existing idea/Good execution of project	Irregular /existing idea/Poor execution of project		

Semester-IV

COUR	RSE TITI	.E		PROBA	BILITY	AND S	TATISTI	CS		CREDI	rs		4		
COUR	RSE COE	DE E	MA5100)7	COUR	SE DRY		BS			L-T-P-S			3-1-0-2	
Ve	ersion		1.0		Approv Detai	val Is	3(5 th ACN	1	LEAR	NING L	EVEL		BTL-3	
ASSES	SSMEN ⁻	г ѕсн	EME												
						CIA								ESE	
First Periodical Assessment		t I	Second Periodica Assessm nt	al A:	Semina ssignme Projec	ar/ ents/ ct	Surp Qu appro Dej Exa Co	orise Te iz etc., oved by partme minati mmitte "DEC"	st / as / the nt on ee	Attendance		Er E	End Semester Examination		
15% 15%					10%			5%			5%		50%		
Co Dese	CourseTo make the student understand the foundations of probabilistic and statistical analysisDescriptionmostly used in varied applications in engineering and science														
Cours Objec	Course Objective1. To describe the concept of probability and random variable 2. To identify the standard distribution variables. 3. To interpret the concepts of discrete and continuous random variables 4. To provide the types of hypothesis testing 5. To establish optimal process performance														
Cours Outco	se ome		Upo Forn Cond I. Iden prob B. Com I. Class 5. Com	n comp nulate ditiona tify the lems. pute the sify the pute a	e standa theorer probal standa ne cova test of nd inter	of this ons about oility. and dist riance hypoth	course, ut the c ribution and cor nesis an roportio	the stu oncept ns and a relation of inter on of va	dents v of pro apply th n. pret sta ariance	will be a bability hem ap atistica for AN	able to and Ca propria and pi OVA cla	alculate ately in ractical	e prob real t signif tion	abilities i ime icance.	using
Prere	quisite	s: Bas	ics of Sta	atistics											
CO, P	O AND	PSO N	ΛΑΡΡΙΝ	G											
со	РО- 1	РО- 2	РО- 3	РО- 4	РО- 5	РО- 6	РО- 7	РО- 8	РО- 9	РО- 10	РО- 11	РО- 12	PS 0- 1	PSO-2	
CO- 1	3	3	-	-	-	-	-	-	-	-	-	-	-	-	
CO- 2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	
CO- 3	3	3	2	-	-	-	-	-	-	-	-	-	-	-	
CO- 4	3	3	2	2	-	-	-	-	-	1	1	1	-	-	

CO- 5	3	3	2	2	-	-	-	-	-	1	1	1	-	-					
			1: W	eakly r	elated,	2: Mo	deratel	y relate	ed and	3: Stro	ongly related								
MOD	ULE 1:	PROBA	BILITY	AND RA	ANDON	/I VARI	ABLES						(9L+3	ST)					
Axioms of Probability- Bayes' Theorem -Random variables – Moments – Moment generating functions. Suggested Reading: Basic Probability												CO-1 BTL-3							
MOD	MODULE 2: STANDARD DISTRIBUTIONS												(9L+3	Т)					
Binom distrik	Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions												CO BTL	-2 -3					
MOD	ULE 3:	TWO-D	IMENS	IONAL	RANDO		RIABLE	S					(9L+3	BT)					
Joint of Correl	distrib lation e sted l	ution – and Reg Reading	Margin gressior : Rando	al and o n om Vari	conditio ables	onal dis	stributio	on – Co	-varian	ce –			CO- BTL	-3 -3					
MOD	ULE 4	: TESTIN	IG OF H	IYPOTH	IESIS								(9L+	3T)					
Samp Test a mean Sugge	ling di nd Ch s– sing s ted l	stributio i-square gle prop Reading	ons – Te e Test – oortion a : Sampl	esting c Large s and diff ing Pro	f Hypo sample: ference blems	thesis - s– Sing e in pro	-Small s le mear portion	sample: n– Diffe is.	s– t Tes erence i	t, F n		CO-4 BTL-3							
MOD	ULE 5	:DESIGN	I OF EX	PERIM	ENTS						(9L+3T)								
Analy desigr desigr Sugge	sis of n n– Two n s ted l	variance o Way C Reading	e– One V lassifica	Way Cla ation – sis of va	assifica Randoi ariance	tion–Co mized k	omplete block de	ely Ran esign –	domize Latin Sc	d block quare			CO- BTL	-5 -3					
TEXT	воок	S																	
1.		J. S. Mil Tata M	lton and cGraw I	d J. C. A Hill, 4th	rnold (Editio	2007) <i>l</i> n, New	<i>ntrodu</i> Delhi.	ction to	Probal	bility ar	nd Stati	istics,							
2.		R.A. Joł 7th Edi	nnson,a tion, Pe	ndC. B. arson E	Gupta ducati	(2015) on, Asia	<i>Miller</i> a.	and Fre	eund's F	Probabi	ility and	l Statis	tics fo	or Enginee	er,				
3.		A. Chan Queuin	ndrasek g Theor	aran, a Ƴ, Dhai	nd G.Ka nam Pu	avitha (Iblicatio	2014) <i>F</i> ons, Che	Probabi ennai.	lity, Sta	itistics ,	Randoi	m Proci	esses	and					
4.		R. K. Ba Second	nsal, A. Editior	K. Goe , Pears	l and N on Pub	I. K. Sha dicatior	arma (2 1.	016) <i>N</i>	IATLAB	and its	Applic	ations i	n Eng	ineering,					
REFER	RENCE	BOOKS																	
1.		M. R. S and Pro	piegel, . oblems	J. Schill of Prob	er and ability	R. A. Sr and Sta	inivasa itistics,	n (2004 Tata M) Schau cGraw	ım's Οι Hill Edi	utline o tion.	f Theor	Ϋ́						
2.		J. L. Dev Cengag	vore (20 e Learn	012) Pro ing, 8th	obabilit n Editio	ty and S on, New	Statistic Delhi	s for Ei	ngineer	ing and	I the Sc	iences,							
3.		D. G. D. Florida.	uffy (20	13) Ad	vanced	Engine	ering N	/latherr	atics w	ith MA	TLAB, 1	Third Ec	dition	, CRC Pre	ss,				
E BOC	OKS																		

1.	http://wiki.stat.ucla.edu/socr/index.php/Probability_and_statistics_EBook
моос	
1.	https://archive.nptel.ac.in/courses/111/105/111105090/

COU	RSE		PROFESSIONAL EDITING AND PROJECT WRITING CREDITS										1			
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						ASSESS	MENT	SCHEME								
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15	5%		15 %		10 %			5 %		5	5%		50%			
Cou Descri	irse iption	Pr w ar pr w	Professional Editing and Project Writing is a course to help students develop their editing and writing skills for professional purposes. Topics include document structure, editing for clarity and accuracy, content types and project management. Students will edit documents, prepare presentations and develop writing projects. The course aims to help students understand the writing process and become more proficient in editing and writing for professional purposes.													
Cou Objec	urse ctives	1 2 3 4 5	. To Cop . To und . To carr . To unde . To iden	vedit writ erstand an v out a co erstand th tify the m	ten text nd respe nstructi le editor larket ar	s profe ect the ve and rial and nd read	ssional role of approp produ lership	ly and a the auth priate str ction pro of a text	opropri nor in tl ructura ocesses t	ately he editir l edit of for proc	ng proce written ducing b	ess texts books a	nd othe	r texts		
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Prereq	uisite	s: Inte	rmediate	e Level												
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CO1	-			2	-	-	-	-	1	3	-	2				
CO2	-			2	-	-	-	-	1	3	-	2				
CO3	-			2	-	-	-	-	1	3	-	2				
CO4	-			2	-	-	-	-	1	3	-	2				
CO5	-			2	-	-	-	-	1	3	-	2				
	1: Weakly related, 2: Moderately related and 3: Strongly related															
MODU	JLE 1–	INTR	ODUCTIO	ON TO PR	OFESSIO	ONAL E	DITING	AND P	ROJECT	WRITIN	IG		(6L)		

Writing: Academic writing and kinds, Non-academic writing and kinds, Ways to an Effective Writing, Review/Research/Project Writing. Editing: Basics of Editing and Steps Involved in Editing. Traits of an Editor and Copy Editor. Basics of Proof-reading	CO-1 BTL-2
MODULE 2 – MECHANICS OF WRITING- GRAMMAR, PUNCTUATION AND STYLE	(6L)
Reviewing the fundamentals of grammar, understanding common grammatical errors, Spelling, Punctuation, Capitalization, Italics, Names of Persons, Number, Vocabulary, Appropriate use of Abbreviations, Established Symbols. Dos & Don'ts of writing, Common Errors/Words often Confused. Exploring different writing styles, their appropriate usage and applying consistent style throughout a document	CO-2 BTL-3
MODULE 3 – RESEARCH AND WRITING	(6L)
Elements of Writing: Selecting a Topic, Conducting Research, Using Sources, Evaluating and Incorporating Sources, Developing Ideas, Gather data, Incorporate it into a project, Writing Clear and Effective Sentences and Paragraphs, Developing Unity, Coherence, Revisions; Format of Manuscripts, Academic Honesty and Plagiarism.	CO-3 BTL-3
MODULE 4 – DOCUMENTATION	(6L)
Documenting Sources, APA Style, Parenthetical documentation, List of works Cited, Figures, Charts and Tables, Endnotes, Footnotes, Citations components, Bibliography, and Appendices.	CO-4 BTL-3
MODULE 5 – EDITING	(6L)
Editing, Functions of Editing, Copy Editing, Editing and Review, Developing Editorial Skills and Editorial Functions	CO-5 BTL-4
TEXT BOOKS	
1 Dade, P. (2020). The Oxford Guide to Effective Writing and Speaking. Reference Review London.	s, OUP.
2. Montagnes, I. (2018). Editing and publication: A training manual. Int. Rice Res. Inst	
REFERENCE BOOKS	
1. Strunk Jr, W., & White, E. B. (2007). The Elements of Style Illustrated. Penguin.	
 Blumenstock, N. A. (1984). The Chicago Manual of Style. By the University of Chicago Pr University of Chicago Press, 1982. ix, 740 pp. 	ess. Chicago:
3. Lester, J. D., & Lester, J. D. (2005). Writing research papers: A complete guide. New Yorl Pearson/Longman.	K :
4 Saller, C. F. (2016). The subversive copy editor. In The Subversive Copy Editor, Second E University of Chicago Press.	dition.
E Books	
1. https://edisciplinas.usp.br/pluginfile.php/3928474/mod_resource/content/1/Introduct Academic%20Writing.pdf	ion%20to%20
2. https://www.routledge.com/rsc/downloads/A_Practical_Guide_to_Academic_Writing onal_Students-A_Routledge_FreeBookFINAL_VERSIONpdf	_for_Internati
MOOC Courses	
1 https://www.coursera.org/specializations/academic-english	
2 https://www.coursera.org/learn/introduction-to-academic-writing	

	SE E	MECHANICS OF SOLIDS AND FLUIDS CREDITS 4													
COUR	SE E	EAT51005 COURSE CATEGORY PC L-T-P-S 2-1-2-2													
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15%	,	15% 10% 5% 5% 25% 25%												5%	
Cours Descript Course Objectiv	e e	The first stress a The sec concep The cou 1. To 2. To it. 3. To	st part and stra cond pa ots and urse sho identif disting derive	of the ain in sc art of the kinetics ould en y the co uish the the tor	course blid mat ne cours and kin able th oncepts e types sional e	Solid M erials u se Fluid hematic e stude of simp of bean	lechani nder ax Mecha s of flu nts to ole stres ns and s	cs aims ial, trar nics ain d flow. sses and solving olve the	to pro asverse ns to p d strair proble e nume	ovide an and tor rovide a ns for loa ms while erical pro	introd sional n intro ads in a e trans oblems	uction t loads. duction xial dire verse loa	to analy to fluic ection. ads acti	rsis of d flow ng on ad on	
		4. To	arts. apply t	he con	cept of	fluid flo	w.		ı.						
Course Outcom	e	5. 10 Upon c 1. Ap 2. Ide 3. Dis 4. Ap 5. Est	omplet opply the entify th scuss by oply the timate	ion of 1 princip ne proc y solvin basic c losses c	this cou bles to s edure t g solid b concepts on flow	rse, the olve sol o solve oodies s s of fluid through	w throu id bodi solid bo subjecte d flow n circula	agn pipe nts will es subje odies su ed to to ar condu	be able be able ected to bjecte rsional uit.	e to o simple d to trar loading	e stress nsverse	es Ioading	5		
Prerequi	isites:														
со, ро А	AND PS		PING												
CO -	PO -	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO -	PO-	PO-	PSO	PSO	
PO	1	2	3	4	5	6	7	8	9	10	11	12	-1	-2	
CO-1	3 2	3 2	2	0	1	0	0	2	2	1	0	3 2	2	0	
CO-2	3	3	3	0	1	0	0	2	2	1	0	3	2	0	
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CO-5	3	3	0	0	0	0	0	2	2	0	0	3	2	0	
		1:	: Weak	ly relat	ed, 2: N	1oderat	ely rela	ited an	d 3: Sti	rongly re	elated				
MODULI	E 1:	STRE	SS, STR	AIN AN	ID DEFC	ORMATI	ON OF	SOLIDS				(6	L+ 3T+6	iP)	

Concept of stress-strain, Hooke's law, T	ension, Compression and Shear, stress-strain	
diagram, Poisson's relation, volumetric	strain, Elastic constants and their relation.	
Stress in simple and composite bars sub	ejected to axial loading and temperature.	
Practical component:		CO-1
Tension Test on Mild Steel Rod		BTL-3
Compression Test on Wood or Concrete	e block	
Suggested Readings:		
Laws of mechanics, System of forces –	parallelogram, triangle and polygon law of Mechanical properties of Materials	
MODULE 2: TRANSVERSE LOADING O		
MODULE 2. TRANSVERSE LOADING O	N BEANS SHEAR FORCE AND BENDING MON	IEINT (OL+ ST+OP)
Types of Beams, Transverse loading on	beams snear force and bending moment in	
beams – cantilever, simply supported, c	vernanging beam subjected to concentrated	
Practical component:	lent and point of contra nexure.	CO 3
Varification of Maxwell's Designated The	arom for deflection of beam	
Ponding Test on Mild Steel Pod	eorem for deflection of beam.	DIL-3
Suggested Readings:		
Theory of simple bending and its assume	ntions	
MODULE 2: TOPSION SPRINGS AND C		
THE CHARTER AND C		(01+ 51+0P)
Ineory of torsion and assumption – for	sion of circular shafts, solid & hollow – strain	
energy in torsion. Power transmission	, strength and stiffness of shafts. Types of	
springs, stiffness stresses and deflection	n in nelical spring and leaf spring.	60 3
Practical component:		CO-3
Torsion test on Mild Steel Rod	arian	BIL-3
Compression Test on open coll Helical s	pring	
Suggested Readings:	s and suspension systems in vehicles	
Applications of Torsional loads on shart	s and suspension systems in vehicles	
		((), ())
MODULE 4: FLUID FLOW CONCEPTS A	ND BASIC EQUATIONS	(6L+ 3T+6P)
MODULE 4: FLUID FLOW CONCEPTS A Flow characteristics, concepts of system	ND BASIC EQUATIONS m and control volume – continuity equation	(6L+ 3T+6P)
MODULE 4: FLUID FLOW CONCEPTS A Flow characteristics, concepts of system – Application of control volume to conti	ND BASIC EQUATIONS m and control volume – continuity equation nuity – Energy Equation – Bernoulli equation	(6L+ 3T+6P)
MODULE 4: FLUID FLOW CONCEPTS A Flow characteristics, concepts of system – Application of control volume to contri and Momentum Equation –simple prob	ND BASIC EQUATIONS m and control volume – continuity equation nuity – Energy Equation – Bernoulli equation lems.	(6L+ 3T+6P)
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MODULE 4: FLUID FLOW CONCEPTS A Flow characteristics, concepts of system – Application of control volume to contri and Momentum Equation –simple prob Practical component: Calibration of Venturi Meter.	m and control volume – continuity equation nuity – Energy Equation – Bernoulli equation lems.	(6L+ 3T+6P) CO-4 BTL- 3
MODULE 4: FLUID FLOW CONCEPTS A Flow characteristics, concepts of system – Application of control volume to conti and Momentum Equation –simple prob Practical component: Calibration of Venturi Meter. Calibration of Orifice Meter.	MD BASIC EQUATIONS m and control volume – continuity equation nuity – Energy Equation – Bernoulli equation lems.	(6L+ 3T+6P) CO-4 BTL- 3
MODULE 4: FLUID FLOW CONCEPTS A Flow characteristics, concepts of system – Application of control volume to contri and Momentum Equation –simple prob Practical component: Calibration of Venturi Meter. Calibration of Orifice Meter. Calibration of Rotometer	MD BASIC EQUATIONS m and control volume – continuity equation nuity – Energy Equation – Bernoulli equation lems.	(6L+ 3T+6P) CO-4 BTL- 3
MODULE 4: FLUID FLOW CONCEPTS A Flow characteristics, concepts of system – Application of control volume to conti and Momentum Equation –simple prob Practical component: Calibration of Venturi Meter. Calibration of Orifice Meter. Calibration of Rotometer Suggested Readings: Properties of fluids Units and dimension	n and control volume – continuity equation nuity – Energy Equation – Bernoulli equation lems.	(6L+ 3T+6P) CO-4 BTL- 3
MODULE 4: FLUID FLOW CONCEPTS A Flow characteristics, concepts of systed – Application of control volume to conti and Momentum Equation –simple prob Practical component: Calibration of Venturi Meter. Calibration of Venturi Meter. Calibration of Orifice Meter. Calibration of Rotometer Suggested Readings: Properties of fluids, Units and dimension	n and control volume – continuity equation nuity – Energy Equation – Bernoulli equation lems.	(6L+ 3T+6P) CO-4 BTL- 3
MODULE 4: FLUID FLOW CONCEPTS A Flow characteristics, concepts of system – Application of control volume to contri and Momentum Equation –simple prob Practical component: Calibration of Venturi Meter. Calibration of Orifice Meter. Calibration of Rotometer Suggested Readings: Properties of fluids, Units and dimension MODULE 5: FLOW THROUGH CIRCULAN	nnD BASIC EQUATIONS m and control volume – continuity equation nuity – Energy Equation – Bernoulli equation lems. ns.	(6L+ 3T+6P) CO-4 BTL- 3 (6L+ 3T+6P)
MODULE 4: FLUID FLOW CONCEPTS A Flow characteristics, concepts of system – Application of control volume to contri and Momentum Equation –simple prob Practical component: Calibration of Venturi Meter. Calibration of Orifice Meter. Calibration of Rotometer Suggested Readings: Properties of fluids, Units and dimension MODULE 5: FLOW THROUGH CIRCULAN Fluid flow – Laminar and Turblent flow	n and control volume – continuity equation nuity – Energy Equation – Bernoulli equation lems. ns. R CONDUITS	(6L+ 3T+6P) CO-4 BTL- 3 (6L+ 3T+6P)
MODULE 4: FLUID FLOW CONCEPTS A Flow characteristics, concepts of system – Application of control volume to conti and Momentum Equation –simple prob Practical component: Calibration of Venturi Meter. Calibration of Orifice Meter. Calibration of Rotometer Suggested Readings: Properties of fluids, Units and dimension MODULE 5: FLOW THROUGH CIRCULAN Fluid flow – Laminar and Turblent flow pipe roughness – Friction factor –Mood	n and control volume – continuity equation nuity – Energy Equation – Bernoulli equation lems. ns. CONDUITS through circular tubes. Darcy Equation on y diagram, Minor loss.	(6L+ 3T+6P) CO-4 BTL- 3 (6L+ 3T+6P)
MODULE 4: FLUID FLOW CONCEPTS A Flow characteristics, concepts of systed – Application of control volume to conti and Momentum Equation –simple prob Practical component: Calibration of Venturi Meter. Calibration of Orifice Meter. Calibration of Orifice Meter. Calibration of Rotometer Suggested Readings: Properties of fluids, Units and dimension MODULE 5: FLOW THROUGH CIRCULAN Fluid flow – Laminar and Turblent flow pipe roughness – Friction factor –Mood Practical component:	n and control volume – continuity equation nuity – Energy Equation – Bernoulli equation lems. ns. R CONDUITS through circular tubes. Darcy Equation on y diagram, Minor loss.	(6L+ 3T+6P) CO-4 BTL- 3 (6L+ 3T+6P) CO-5
MODULE 4: FLUID FLOW CONCEPTS A Flow characteristics, concepts of system – Application of control volume to contri and Momentum Equation –simple prob Practical component: Calibration of Venturi Meter. Calibration of Orifice Meter. Calibration of Rotometer Suggested Readings: Properties of fluids, Units and dimension MODULE 5: FLOW THROUGH CIRCULAN Fluid flow – Laminar and Turblent flow pipe roughness – Friction factor –Mood Practical component: Determination of Friction coefficients in Suggested Readings:	nand control volume – continuity equation nuity – Energy Equation – Bernoulli equation lems. ns. A CONDUITS through circular tubes. Darcy Equation on y diagram, Minor loss.	(6L+ 3T+6P) CO-4 BTL- 3 (6L+ 3T+6P) CO-5 BTL- 3
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MODULE 4:FLUID FLOW CONCEPTS AFlow characteristics, concepts of system- Application of control volume to contriand Momentum Equation –simple probPractical component:Calibration of Venturi Meter.Calibration of Orifice Meter.Calibration of RotometerSuggested Readings:Properties of fluids, Units and dimensionMODULE 5: FLOW THROUGH CIRCULAIFluid flow – Laminar and Turblent flowpipe roughness – Friction factor –MoodPractical component:Determination of Friction coefficients inSuggested Readings:Flow characteristics and its applicationsTEXT BOOKS1Ramamurtham .S and Naraya2Bansal. R.K. Strength of Mate	AND BASIC EQUATIONS m and control volume – continuity equation nuity – Energy Equation – Bernoulli equation lems. ns. A CONDUITS through circular tubes. Darcy Equation on y diagram, Minor loss. n pipe. nan .R. Strength of material, Dhanpat Rai Pvt. rial, Lakshmi publications Pvt. Ltd., New Delhi,	(6L+ 3T+6P) CO-4 BTL- 3 (6L+ 3T+6P) CO-5 BTL- 3 Ltd., New Delhi, 2001. 2004.
MODULE 4:FLUID FLOW CONCEPTS AFlow characteristics, concepts of system- Application of control volume to contriand Momentum Equation –simple probPractical component:Calibration of Venturi Meter.Calibration of Orifice Meter.Calibration of RotometerSuggested Readings:Properties of fluids, Units and dimensionMODULE 5: FLOW THROUGH CIRCULAIFluid flow – Laminar and Turblent flowpipe roughness – Friction factor –MoodPractical component:Determination of Friction coefficients inSuggested Readings:Flow characteristics and its applicationsTEXT BOOKS1Ramamurtham .S and Naraya3Bansal .R.K. Fluid Mechanics a	AND BASIC EQUATIONS m and control volume – continuity equation nuity – Energy Equation – Bernoulli equation lems. ns. A CONDUITS through circular tubes. Darcy Equation on y diagram, Minor loss. n pipe. nan .R. Strength of material, Dhanpat Rai Pvt. rial, Lakshmi publications Pvt. Ltd., New Delhi, nd Hydraulic Machines Laxmi publications (P)	(6L+ 3T+6P) CO-4 BTL- 3 (6L+ 3T+6P) CO-5 BTL- 3 Ltd., New Delhi, 2001. 2004. Ltd., New Delhi, 2014.

1	Kumar .K.L., Engineering Fluid Mechanics, Eurasla publishers Home Ltd., New Delhi, 2006.
2	Ramamurthan .S. Fluid Mechanics and Hydraulics Dhanpat Rai and Sons, Delhi, 1988.
E BOOH	KS
1	https://www.kobo.com/us/en/ebook/fluid-and-solid-mechanics
MOOC	
1	https://nptel.ac.in/courses/112/107/112107146/
2	https://nptel.ac.in/courses/112/105/112105171/

COURSE TITLE	ΑυτοΜοτιν	/E CHASSIS AND DRIVEL	INE SYSTEM	CREDITS		3						
COURSE CODE	EAT51006 COURSE CATEGORY PC L-T-P-S 2-0-2-2											
VERSION	1.0 APPROVAL DETAILS 36 th ACM LEARNIN G LEVEL BTL-3											
ASSESSMENT	SCHEME											
		CIA			I	ESE						
First Periodical Assessment	Second Periodical Assessment	Weekly assignment/ lab record and viva as approved by the Department Examination Committee "DEC"	Surprise Test / Quiz/Lab., as approved by the Department Examination Committee "DEC"	Attenda nce	Theory	Practical						
15%	15%	10%	5%	5%	25 %	25%						
Course Description	This course will p vehicle body typ including drivelir	provide basic knowledge es. In addition, the cours ne, braking, suspension a	on automotive cl se deals with com and steering syste	nassis and its ponents asso ms.	s structure: ociated wit	s including h chassis:						
Course Objectives	 To invest To identify To discuss a To classify a To impart k 	igate new and emerging various front axles and s bout various types of pr ind describe different ty nowledge on detailed co	technologies in a teering systems opeller Shaft, diff pologies of suspen oncept and types of	utomotive c erential and nsion system of braking sy	hassis Rear Axles ns stems	;						
Course Outcomes	Upon the completion of this course, the students will be able to 1. Identify and select a suitable chassis for a vehicle 2. Analyze steering effort and rolling motion for steering mechanism 3. Apply driving forces and develop transmission lines for maximum torque transfer 4. Identify suitable suspension and materials for a vehicle 5. Design and identify suitable braking system for a vehicle											
Prerequisites:	Nil											

0	PO1	PO2	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	PSO	PSO	
cos	POI	FUZ	3	4	5	6	7	8	9	10	11	12	1	2	
CO-1	3	3	3	1	2	2	1	2	-	-	2	3	3	3	
CO-2	3	3	3	2	2	2	-	2	-	-	2	3	3	1	
CO-3	3	3	3 2	2	2	2	-	2	-	-	1	3	3	3	
CO-4	े २	3 3	े २	2	2	2	1	2	-	-	2	े २	े २	2	
1 - Weakly Correlated, 2 - Moderately Correlated and 3 - Strongly Correlated												5	2		
Module 1 – Introduction to Chassis												(6L+6P)			
Types of chassis layout with reference to power plant locations and drives, vehicle frames, various types of frames, constructional details, materials, testing of vehicle frames, unitized												~~~			
frame body construction and vehicle body styles.												CO	-1		
Lab Practice:												BTI	L-1		
Measurement of Chassis dimensions, study of different types of chassis															
Medule 2 Front Aulo and Steering Study of different types of classis											(61+	6P)			
Module	e 2 – Fro	ont Axie	e and Si	teering	System								(01)	.,	
Types o	of front	axles, c	onstruc	tion de	tails, m	aterials	, front	wheel g	eometr	y: casto	or, caml	ber,			
king pir	n inclina	ition, to	e-in. co	ondition	is for tr	ue rollir	ng moti	on of w	heels d	uring st	eering,				
differer	g geome nt types	etry, Ac	ring ge	in steer ar boye	ing sysi	ing link	nstruct ages an	ionai de Id lavou	etalls of	steerin	g linkag ius wh	ges,	~~~~		
wobble	, power	r assiste	d steer	ing, ste	ering o	f crawle	er tracto	ors and	Electro	nic Stee	ering		CO-2		
System				0,	C						U		BTI	-3	
Lab Pra	ctice:														
Disman	tling an	d asser	nbling o	of front	axle, st	eering	system,	measu	rement	of fron	it whee	I			
geomet	try.														
Module	e 3 – Dr	ive Line	!										(6L+	6P)	
Hotchk	iss drive	e, torqu	e tube	drive ar	nd radiu	ıs rods,	propell	er shaf	t, unive	rsal joir	nts, fror	t			
wheel o	drive, di	fferent	types o	of final o	drive, do	ouble re	eductio	n and tv	win spe	ed final	drives,				
differer	ntial prii	nciple, (ks. diffe	constru	ction de	etails of	differe	ntial ur	nit, non	-slip dif	ferentia	al,	on	со	-3	
rear ax	es. type	es of rea	ar axles	. rear a	xle hou	sing. co	nstruct	ion of d	lifferent	t types	of axle	011	DTI	2	
housing	gs, mult	i axle ve	ehicles,	wheels	and ty	res.				/ [ы		
Lab Pra	ctice:														
Disman	tling an	id asser	nbling o	of final	drive, d	ifferent	ial, rea	r axle, v	vheels a	and tyre	es.				
Module	e 4 – Su	spensio	on Syste	em									(6L+	6P)	
Need o	fsusper	nsion sy	stem, t	ypes of	susper	ision, si	uspensi	on sprir	ngs, con	structio	onal det	ails			
and cha	aracteri	stics of	leaf, co	il and to	orsion b	oar sprii	ngs, rub	ber sus	pensio	n, pneu	matic				
suspens	sion, sh	ock abs	orbers,	indepe	ndents	suspens	sion, sei	mi-activ	e and a	ictive su	uspensi	on	CO	-4	
system.										BTI	-2				
Law Flactuce.															
shock a	bsorbe	id asser rs.	noling (of suspe	ension s	ystems	- ieat sp	oring, co	sprin sprin	g, torsi	on bar a	and			
Module	e 5 – Bra	aking Sy	ystem										(6L+6P)		
Classifi	cation o	fbraka	s drum	hrakor	and di	sc brak		tructio	nal dota	aile the	ory of		CO	-5	
braking	, conce	pt of du	ial brak	e syste	m, park	ing brai	ke, mat	erial, hy	/draulic	system	n, vacuu	m	BTI	-2	

assist retare	ed system, air brake system, antilock braking system, retarded engine brakes, eddy ders and electronic braking system.
Lab P	ractice:
Disma	antling and assembling of drum brakes, disc brakes and other brake systems.
TEXT	BOOKS
1.	James D. Halderman, 'Automotive Chassis Systems', Pearson Series, 2017
2.	Kirpal Singh – 'Automobile Engineering, Vol.1'- Standard Publishers Distributors , New Delhi.
3.	N.K. Giri – Automobile Engineering - Khanna Publishers – 2015
REFE	RENCE BOOKS
1.	D. G. Thomas, Fundamentals of Vehicle Dynamics, 2nd edn. Society of Automotive Engineers, 2021
2.	Heldt.P.M, "Automotive Chassis", Chilton Co., New York, June 2012
3.	Tim Gilles, "Automotive Chassis", CENGAGE Delmar Learning, 2004.
E BOO	OKS
1.	https://shop.elsevier.com/books/the-automotive-chassis-engineering-principles/reimpell/978-0-7506-5054-0
2.	https://link.springer.com/book/10.1007/978-3-030-35635-4
3.	https://link.springer.com/book/10.1007/978-94-017-8533-4
MOO	C
1.	https://www.mtu.edu/engineering/graduate/certificates/vehicle-dynamics/
2.	https://www.coursera.org/lecture/intro-self-driving-cars/lesson-1-introduction-to-lateral-vehicle- control-pTs75
3.	https://nptel.ac.in/courses/107106080/

COURSE TITLE	TWO AND (In	THREE-WHEELER EV TE	CHNOLOGY urse)	CREDITS		3					
COURSE CODE	EAT51007	COURSE CATEGORY	PC	L-T-P-S	2	2-0-2-2					
VERSION	1.0	APPROVAL DETAILS	36 th ACM	LEARNING LEVEL	BTL-3						
ASSESSMEN	T SCHEME										
		CIA				ESE					
First Periodical Assessment	Second Periodical Assessment	Weekly assignment/ lab record and viva as approved by the Department Examination Committee "DEC"	Surprise Test / Quiz/Lab as approved by the Department Examination Committee "DEC"	Attendanc e	Theory	Practical					
15%	15%	10%	5%	5%	25 %	25%					
Course Descriptio n	This course w flag ship Engir	This course will enable the students to develop students' skills making them competent and a flag ship Engineer in the EV market.									

Cours Objec	se tives	 To To To To To To To 	o recall o identi o recogi o descri o evalua	concep fy Batte nize on be the o nte the f	ts of ele ry Tech motor a charging troubles	ectric ve nologie and con g techno shootin	ehicle & es trollers ologies g techn	perforr iques	nance c	of electr	ic vehic	les.		
Cours Outco	se omes	 Upon completion of this course, the students will be Recall concepts of electric vehicle & performance of electric vehicles. Identify Battery Technologies Recognize on motor and controllers Describe the charging technologies Evaluate the troubleshooting techniques 												
Prerec	quisites	: Nil	Nil											
СО, РС	D AND I	PSO MA	'SO MAPPING											
COs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO1 0	PO 11	PO 12	PSO 1	PSO 2
CO-1	2	0	0	0	1	0	0	0	0	0	0	0	1	1

CO-2

CO-3

CO-4	0	0	0	0	1	0	0	0	0	0	0	0	1	2
CO-5	0	0	3	0	1	0	0	0	0	0	0	0	3	3
		1 - W	/eakly C	orrelate	ed, 2 - N	/loderat	tely Cor	related	and 3 -	Strong	y Corre	lated		
Modu	le 1 – E	LECTRIC		LES									(6L+	-6P)
Compa sizing Lab : [its cor	aring IC - Well to Dismant	E and E o Whee ling of E ts	lectric \ l conce Electric	/ehicles pt - Reg Vehicle	– Histo enerati and its	ry, Imp ve brak compo	act on E ing – Ty nents, A	Environi vpes of I Assemb	ment – EV. ling of E	EV Pow	er train Vehicle	s & its and	CC BT)-1 L-3
Module 2 – BATTERY TECHNOLOGY Terminology and Description about Integral part of a BEV. Battery Technology and Innovation													(6L+	-6P)
Terminology and Description about Integral part of a BEV, Battery Technology and Innovation in Automotive Batteries for Dynamic Applications. Lab : Testing of the EV Battery Module 3 – MOTOR AND CONTROLLERS													CC BT	D-2 'L-3
Module 3 – MOTOR AND CONTROLLERS												(6L+	-6P)	
Propu Electro Vehicl Lab: T	lsion Sy onics Co e to grid esting c	ystem ontrolle d (V2G) of HUB N	– Tract r-Fast (techno Motor	tion Mo charging logy.	otor / g and it	Hub N s limita	lotor, I ations -	Battery Smart	Manag chargin	gement g and a	Systen applicat	n and ions -	CC BT	D-3 'L-3
Modu	le 4 – C	HARGIN	NG TECH	INOLO	GY								(6L+	-6P)
Module 4 – CHARGING TECHNOLOGY EV Charging – External and On Board Chargers. Various Methods of Charging-AC charging - Type 1,2,3. Lab : Testing of charging EV system													CC BT)-4 L-3
Module 5 –Future trends in electric cars													(6L+	6P)
Module 5 –Future trends in electric cars Wireless and on-road charging of EV- Battery swap technology- Autonomous driving- Charging EVs from renewable.												CC BT)-5 L-4	

Lab : Fault diagnostics of a EV system						
TEX	ГВООКЅ					
1.	Longo, Stefano, et al. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles. United State Press, 2018.	es, CRC				
2.	James Larminie and John Loury, "Electric Vehicle Technology-Explained", John Wiley & Sc	ns Ltd., 2013.				
REFE	ERENCE BOOKS					
1.	Robert Bosch Automotive Handbook, 10th Edition (2018)., BOSCH 10, ISBN of 978-0-7680	-9567-8.				
2.	Tom Denton., "Electric and Hybrid Vehicles" 2020.					
E BO	OKS					
1.	https://shorturl.at/ahvAJ					
2.	https://shorturl.at/arxzH					
MO	DC					
1.	https://elearn.nptel.ac.in/shop/iit-workshops/completed/e-mobility-and-electric-vehicle engineering/)-				
2.	https://nptel.ac.in/courses/108106170					

П

COURS	E TITLE				DE	SIGN PI	ROJECT	2			CRE	CREDITS 1							
COURS	e codi	E EA	T51802		CO CA	URSE	(EEC	:		L-T-	-P-S	0-0	-2-6					
Version	1	1.0)		Ар	proval I	Details	36t	h ACM		LEA LEV	RNING 'EL	BTL	4					
ASSESS	MENT	SCHEN	IE										•						
First R	Review	, ,	Second	Review Third Review Project Report & Viva Voce															
20)%		20	%		10%	6				50%								
Course Descrip	tion	ski ex Sir tes se	Ils requiposure for a second s	ired to to emula tools t agemen roblem	ate a ty o be us nt skills	se the pical pr ed in th s are ut	real tin ofessior e execu ilised to	ne pro nal deve tion of develo	blem st elopmer the desi op an in	atemen nt of sol ign metl novativ	it. This ution as nodolog e, econ	course s a team gy. The i omic so	provid Appro esourd olution	des an opriate ces and to the					
Course Objecti	ve	Th 1. 2. 3.	e cours Explo Demo probl Elucio	e will er re the li onstrate em state late the	hable th teratur projec ement comm	ne stude re study ct identi unicatic	ents to: and rep fication on and t	oort pre and ex eam ma	eparatio (ecution anagem	n skills of feas ent skill	ible so s	lution t	o addre	ess the					
Course Outcom	ıe	Ur 1. 2. 3.	oon com Identi Select Desig	pletion fy a rea tion of a n & ana	of this I-time approp Iyse th	course, problem riate me ne soluti	the stu h by inte thodolo on thro	dents v ensive l ogy by u ugh app	vill be a iteratur using mo propriat	ble to e survey odern to e Mease	/ ools uremer	its and o	calculat	tions					
Prerequ	uisites:	Desigr	Project	t-1															
CO, PO	AND P	SO MA	PING																
COs	PO -1	PO- 2	PO - 3	РО- 4	РО- 5	РО- 6	РО- 7	PO- 8	РО- 9	PO - 10	PO- 11	PO- 12	PSO -1	PSO -2					

CO-1	3	3	2	2	3	2	2	3	3	3	3	1	1	1
CO-2	3	3	3	2	3	2	2	3	3	3	3	1	2	1
CO-3	3	3	3	2	3	2	2	3	3	3	3	1	1	1

Weightage of Assessment:

Review / Examination Scheme	Weightage
First Review	20%
Second Review	20%
Third Review	10%
End Semester Viva Voce	50%

A committee shall be constituted by the HoD for the Review.

Assessment Rubrics

Parameter	Weightage (%)
Title & Objectives	5.0
Review of Literature (RL)	10.0
Design / Implementation	10.0
Methodology	5.0
Planning of Project Work	5.0
Testing Environment / Test Cases	5.0
Analytical thinking [*]	5.0
Technical Knowledge*	5.0
Presentation [*]	10.0
Demonstration [*]	5.0
Individual Roles Distribution [*] (Individual Objectives in the project work)	5.0
Individual Contributions [*] (Towards the individual objectives in the project work)	5.0
Deliverables	5.0
Team- work	10.0
Report / Thesis	5.0
Peer Assessment [*]	5.0

* - Attributes for individual contribution.

EVALUATION PARAMETERS FOR ASSESSMENT

To be followed same as approved for Design project 1

COURSE TITLE Personality Development and Soft Skill Tec										ques	es CREDITS 2				2	
COUR	RSE CO	DDE	I	ETP5185	53	COURS	E CATEG	ORY	EEC		L	- T – P – S	S	0-0-3-2		
Versio	on	1.0	A	pproval	Details		41 A	CM Dt.	13 Jul 2	4	LEA	RNING L	EVEL	BTL	-4	
							ASSESS	SMENT	SCHEME							
			C	CIA										ESE		
F Per Asse	First iodica ssme	il int	Secor Period Asses t	nd dical ssmen	A a	Pract ssessm pprovec Depart Examin ommitte	ical ents as l by the ment ation e "DEC"	C rr ti E	Observat ecords a he Depa Examinat DEC"	ion / lab is approv rtment tion Con	ved by nmittee	Attenda	nce	Practica	I	
15%	%		:	15%		10 %	6		5%	1		5	%	50%		
Cou Descri	irse iption	1	This perso soft s of life	course onal and skills, pr e.	aims t I profes oviding	o enhar ssional g studen	nce stuc growth. I ts with t	lents' u It delve he knov	indersta s into th wledge a	nding a ne intrica nd tools	nd app acies of s neces	lication f persona sary to e	of ess ality d xcel ir	sential sk evelopme i various a	ills for ent and aspects	
Course 1.To understand the concept of self-awareness and its importance in personal and professional development. 2.To recognize the significance of setting clear, specific, and achievable goals inpersonal and professional contexts. 3.To explore a variety of time management techniques, such as prioritization, goalsetting, and task scheduling. 4.To learn strategies for managing and regulating emotions effectively in varioussituations. 5.To acquire skills in critical thinking, problem-solving, and decision-making tonavigate complex challenges and opportunities.											nd ing, s.					
Co Oute	urse come		Upor 1. Ide eff 2. De the 3. An eff 4. De eff 5. Ap	n comple entify th icacy. monstra eir value alyze th iciency evelop s fective c ply effe entors, a	etion of leir stre ate the s and lo n acade tronger ommur ective r and pee	this cou engths a ability t ong-tern ty to m emic, pr interpe hication, network rs to sup	urse, the nd area o priorit n aspirat anage tl ofession ersonal r leading ing skill oport pe	studen s for gr tize goa tions. heir tim al, and relation to enha s, builc rsonal a	ts will be rowth, le ls based ne effect persona ships ch anced co ling and orga	e able to eading t on imp tively, ro I tasks. aracteri Ilaborat I nurtur nization	o impr ortance esulting zed by ion and ring rel al grow	oved sel e, urgeno g in incro empath Iteamwo ationshi th.	f-conf cy, anc eased p y, unc ork. os wit	idence ar I alignmer productivi lerstandir h stakeh	nd self- nt with ity and ng, and olders,	
Prereo	uisite	es: P	lus Tw	o Englis	h-Interr	nediate	Level									
CO, P		D PS		PPING												
CO/ PO	РО	01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1	2 PSO1	PSO2	
CO1	-		-	-	-	-	-	-	2	1	2	-	3	1	1	
CO2	-		-	-	-	-	-	-	2	2	2	-	3	1	1	
CO3	-		-	-	2 2 2 - 3 ⁰ ¹										1	

CO4	-	-	-	-	-	-	-	-	1	2	2	3	1	2
CO5	-	-	-	-	-	-	-	-	2	2	2	3	1	1
	1		1: W	eakly re	lated, 2	: Mode	rately re	lated ar	nd 3: Sti	rongly re	elated	1		
MODU	JLE 1 : S	ELF AW	ARENES	S AND A	TTITUD	E							(9P)	
Underst through positive workpla through Practicu 2.Prepa Method	tanding SWOT thinkir ace-Etiqu Johari Johari um: 1. St re a cas I.	Yourse Method ag – Po uette au Window sudents se study	If: Perso d- Self-C ositive s nd man y. will be a y on the	onality A Groomin self-talk ners in asked to e persor	Assessmin ng-Perso –self-e the cla enact a nality tr	ent Test nal Brai steem a iss, pub role pla aits of t	: – Undending – and posolic and plic and y of a site the stuce	erstandi Attitud sitive at profess cuation t lents in	ng of the e Buildi ttitude sional p to build college	e Self- So ing: The - Attitu laces–So a positiv by SWC	elf Analy power ide at elf-analy ve attitu DT Analy	ysis of the ysis de. ysis	CO-1BTI	2
MOD	ULE 2: (GOAL SE	TTING										(9P)	
GOAL Goals a – Goal Practio list the to set	SETTING as comm s at the cum: 1. e steps y SMART	6: What hitment workpla dentify ou wou goal of e	is goal? – Usefu ace – Ca three g Id take t each typ	- What I Guideli scading oals you to reach e for the	are SM/ ne for g goals – need to that ult e curren	ART goal oal setti Types of o set to t imate go t acade	ls? - Hov ng – Tryi goals take you oal. 2.St mic year	v does S ing perso toward udents v	MART g onal and ls your c will be a	goal sett I profess Iream jo Isked	ing worl sional go bb. Then	k? - bals	CO-2BT	L-3
MOD	ULE 3: T	IME AN	D STRES	S MAN	AGEME	NT							(9P)	
MODULE 3: TIME AND STRESS MANAGEMENT Time Management: What is time management? Prioritization – Time stressors – Time stealers – Coming out of Procrastination-Eisenhower Matrix– Strategies for effective time management – productivity pyramid – The four Ds of time management. Stress Management– Understanding stress-Identifying Stressors- Effects and Symptoms of Stress, Techniques of Stress Management Practicum: 1. Read Stephen Covey's demonstration of the concept of time and prepare the schedule based on your daily activity. 2.Prepare a case study based on Time management during chess game									ers ent of	CO-3BT	L-3			
MODL	JLE 4: E		NAL INT		NCE								(9	P)
EMO aware the of manag Practic organi	rional eness, - E Id, re-fr gement. cum: Pr izational	INTELLI Emotion eezing epare a setting	GENCE: al intell the nev case s	What is igence a v– emo tudy of	Emotic nd char tional in why co	nal Inte nge man ntelligen ncept c	illigence agemen ice – Er of emoti	? Enhan t –Rewi notiona onal int	icing yo ring the I Intelli celligenc	ur emot Brain: u gence T ce is im	ional se unfreezi est -Cri portant	elf- ng sis on	CO-4BTI	
MODU	JLE 5: LI	EADERS	HIP ANI	CHAN	GE MAN	IAGEME	NT						(9P)
LEADERSHIP: Qualities of a leader – Leadership and assertiveness – problem –solving and decision-making – Creative Thinking-Approaches to problem – solving and decision-making – Brainstorming –Cause-and-effect analysis- Building Self Confidence – Overcoming fear and anxiety- Understanding Change Management Practicum: 1. Identify any one individual from around you who you think is a good leader. How many of the above qualities does he/she possesses? Give evidence for each quality. 2.Visualization Relaxation exercises.									and g – and ow	CO-5BTI	4			
TEXT E	BOOKS											I		
1	Pillai, Unive	Sabina. ersity Pro	, & Fern ess. Indi	andez <i>, i</i> a.	Agna. (2	018). <i>So</i>	ft Skills (& Emplo	oyability	Skills. C	ambridg	ge		
REFER	ENCE BO	DOKS												
1. Mitra K Barun. (2011). Personality Development and Soft Skills. Oxford University Pr Delhi. Dhanavel. S P (2018). English and Soft Skills. Orient Black Swan. India.									Press. N	lew				

2.	Goldsmith, Marshall & M.S. Rao.(2020) Soft Skills: <i>Enhancing Employability</i> . Dream tech Press. India.
E Books	5
1.	http://dspace.vnbrims.org:13000/jspui/bitstream/123456789/4733/1/Leadership%20The%2 OPower%20of%20Emotional%20Intellegence.pdf
моос	Courses
1.	https://www.coursera.org/specializations/people-and-soft-skills-for-professional-success

cou	COURSE TITLE LOGICAL REASONING AND VERBAL ABILITY CREDITS								S	1					
COU	JRSE CO	DE	ETP	51852	C	OURSE	E		EEC		L-T-P-	S	1-	0 -2- 1	
١	/ersion		1	L.O	A	pprova Details	al	4 Dt. :	1ACM 13 Jul 24	4	LEARN G LEV	IN EL	B	TL 3	
						CIA							E	SE	
Firs Perioo Assess	First Periodical assessment 15% Course			Pi Asse	ractical essmen	ts	Observation / lab records as approved by the Department Examination Committee "DEC"				Atten nce	da 1	ſheory	Prac	tical
159	%	1	5%		10%			5%			5%		25%	25	5%
Cou Descri	urse iption	This place langu profi	10% 5% 25% 25% This course is an in-depth exploration of reasoning and verbal aptitude, essential skills for placement. Students will engage with a variety of verbal reasoning problems, logical puzzles, and anguage comprehension exercises designed to enhance their analytical capabilities and linguistic proficiency. 1 Develop the skilitute engly a variety of verbal matching information.												
Cou Obje	urse ctive		2. Pra 3. Stre 4. Eng rea	ctice sol engthen age wit soning.	ving ve abilitie h variou	rbal rea s in rea us form	asoning ading co 1s of logi	puzzles mprehe ical reas	and pro ension a soning, i	oblems. nd text includin	ual anal g deduo	ysis. ctive an	d induct	ive	
Cou Outc	urse come		At t 1. App 2. Sim 3. Ana tab 4. Solv 5. Dec	the end plify arith plify and alyze an les. ve geom tipher qu	of the c metic o d solve d inter netric pi uantitat	peratic equation pret data roblem tive pro	the stud ons to sc ons and ata pres s involvi oblems v	ents wi olve con inequa ented i ing shap with effo	II be abl nplex pr lities. n variou bes, volu ective st	le to: roblems us form umes, a trategie	ats, inc nd area s and lo	luding s.	charts,	graphs,	and
Prerec	quisites	: Plus T	Plus Two English-Intermediate Level												
СО, Р	O AND	PSO M	APPING												
CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	-	-	-	-	-	-	-	2	1	2	-	3	1	2	

SEMESTER V

CO2	-	-	-	-	-	-	-	2	2	2	-	3	1	1			
CO3	-	-	-	-	-	-	-	2	2	2	-	3	1	2			
CO4	-	-	-	-	-	-	-	-	1	2	2	3	1	1			
CO5	-	-	-	-	-	-	_	_	2	2	2	3	1	2			
			1:	Weakly	related	d. 2: Mo	oderate	lv relate	ed and 3	3: Stron	glv rela	ted					
						.,		,			8.7.0.0						
MODU	LE 1 : G	ieneral	Mental	Ability	·I									(3L + 6P)			
Analog Sequer	y- Cla tial Ou	ssificati tput Tra	on-Seri icing-Di	es Cor rection	npletio Sense-L	n-Codin .ogical N	g, Dec Venn Di	oding- agram-/	Blood Alphabe	Relati et Test-	ons-Pu Numbe	zzle te r, Rank	est- ing	CO-1	-		
and Tin	ne Sequ	ience Te	est											BTL-2			
MODU	LE 2 : G	eneral N	Mental	Ability-	1									(3L + 6P)			
Mathe	matical	Operat	ions-Lo	gic Seq	uence c	of Word	ls-Arith	metical	Reason	ing-Inse	erting th	ne miss	ing	CO-2			
Verifica	Character-Data Sufficiency – Decision Making- Assertion and Reason, Situation Reaction Test- Verification of the truth of the Statement													BTI-3			
MODU	MODULE 3 : Logical Reasoning -I													(3L + 6P)			
Logic-	Logic- Statement: Arguments- Statement: Assumptions-Statement: Course of Actions-Statement:													CO-3			
Conclus	sions- [Deriving	Conclu	usion fr	om the	e Passa	ge- The	eme De	tection	- Quest	ion: St	atemer	nts-				
Series-	Analogy	-Classif	ication											BTL-3			
MODU	LE 4 : L	ogical F	Reasoni	ng -II		_					<u> </u>			(3L + 6P)		
Analyti	ical Re	asoning	-Mirror	& W vrfoldir	ater In	nages-E	mbeddo	ed tigu	res-Cor	npletioi ntical fi	n of Ir	ncomple Cuboc a	ete	CO-4			
Dice-Co	onstruct	tion of T	riangle	s and So	quares-l	igure f	ormatio	on and A	Analysis		guies-	cubes a	iiiu	BTL-3	3		
MODU	LE 5 : Ve	erbal Ab	oility										(3L + 6P)			
Readin Antony speech	g Comp ms-Filli -Identif	orehens ng the k ying spe	ion-Sen planks-C elling er	tence C)ne wor rors-Ari	omplet d subst ranging	ion-Sen itution- the sen	tence co Idioms Itences	orrectio and Phi in a logi	on-spott rases-Fi ical way	ing erro Iling wit	ors-Sync h corre	onyms a ct parts	and s of	CO-5 BTL-	; 3		
TEXT BO	ООК																
1 Sharma, Arun & Upadhyay, Meenakshi (2020). How to Prepare For Verbal Ability Comprehension. New Delhi: McGraw Hill.												bility A	and Rea	ading			
REFERE	NCE BC	ОК															
	Agga	rwal, RS	(2018)	A Mod	ern App	proach t	to Verba	al & Noi	n-Verba	l Reaso	ning. Ne	ew Delł	ni: S. Ch	and.			
1.	1.																

COURSE TITLE	AUTOMO	DTIVE SYSTEM DI	ESIGN	CREDITS		4
COURSE CODE	EAT51008	COURSE CATEGORY	РС	L-T-P-S	2-1	-2-2
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	ВТ	'L-4
ASSESSMENT SCH	EME					
		CIA			E	SE
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the	Attendance	Theory	Practical

					De Exa Co	partme aminatio ommitte "DEC"	nt on ee							
1	.5%		15%	ś	:	10%		5%		5%		25%	2	.5%
This course gives in-depth knowledge on design of cylinder, pistor									iston,	oiston p	in, pisto	on		
Description rings, connecting rod, crankshaft, valves, flywheel, chassis frame,								me, su	spensio	n spring	gs,			
Dest	inption	fro	ont axle	and ste	ering s	ystem.								
		1.	To de	esign cy	linder a	and pist	on							
Course	2. To design connecting rod and crank shaft													
Course 3. To design valves and flywheel														
Objecti	ve	4.	To de	esign ch	assis fr	ame an	d suspe	ension co	ompoi	nents				
		5.	To de	esign fro	ont axle	e and ste	eering s	system						
		Up	on com	pletion	of this	course	, the st	udents v	vill be	able to				
		1.	Gain	knowle	dge on	design	of cylin	der, pist	ton, p	iston pin	and pi	ston rin	gs	
Course		2.	Acqu	ire knov	wledge	on desi	gn of c	onnectir	ng rod	and crai	nk shaf	t		
Outcon	ne	3.	Obta	in know	ledge o	on desig	n of va	lves, val	ve spr	ings and	flywhe	el		
		4.	Attai	n knowl	edge o	n desigr	n of lade	der type	chass	is frame	and sus	spensior	compo	onents
		5.	Obta	in the k	nowled	lge on c	lesign p	rocedu	re of f	ront axle	and st	eering s	ystems	
СО, РО		SO MAF	PPING	[]	1	r	1	1		-	1	1	1	T
со	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	-1	-2
CO-1	2	1	1	1	1	-	-	-	-	-	-	2	2	1
CO-2	3	3	2	2	-	-	-	-	-	2	-	3	1	2
CO-3	3	2	1	1	-	1	-	-	-	-	-	2	2	1
CO-4	2	3	2	2	-	-	-	-	-	-	-	2	1	1
CO-5	2	2	1	1	-	-	-	-	-	<u> </u>	-	2	2	2
			1: Weal	kly relat	ed, 2: I	Modera	tely re	lated an	d 3: S	trongly r	elated	10		-
MODU	JLE 1: D	ESIGN			ND PIS		<u> </u>					(6L+ 31+6P)		
Choice	of mate	erial for	cylinde	er and p	iston; c	iesign o	t cylind	er, pisto	on, pis	ton pin a	ind			
piston i	nngs.													
	Jerimer Mode	lling of	auliada	-								CO 1		
1. 2	Mode		niston	ſ								CO-1		
2.	Mode		niston	nin and	niston	rings						•	516-2	
Softwa	re/Faui	inment	Requir	ed	piston	iiig5								
Solid w	orks M	ndelling	softwa	re										
MODU	LE 2: DE			NECTINO	G ROD		ANKSH	IAFT				(61	+ 3T+6	P)
Materia	al for co	onnecti	ng rod	– desigr	n of Co	nnectin	g rod s	mall en	d. big	end, sha	ank	(
design,	design	of big e	nd cap a	and bolt	s; mate	erial for	cranksl	haft, des	ign of	cranksh	aft.			
Lab Exp	perimer	nts	•					,	0					
1.	Mode	lling of	Connec	ting roo	b									
2.	Mode	lling of	Crank s	haft								I	31L-3	
Softwa	re/Equi	pment	Require	ed										
Solid w	orks Mo	delling	softwa	re.										
MODU	LE 3: DE	SIGN O	F VALV	'ES AND	FLYWI	HEEL						(6L+ 3	ST+6P)	
Design	of inlet	and Ex	haust va	alves, va	alve spr	ings; de	esign of	flywhee	el.					
Lab Exp	perimer	nts												
1.	Mode	lling of	inlet ar	ıd exhai	ust valv	ves							CO-3	
2.	Mode	lling of	flywhe	el								I	BTL-4	
Softwa	re/Equi	ipment	Requir	ed										
Solid w	orks Mo	odelling	softwa	re.										
MODULE 4: DESIGN OF CHASSIS FRAME AND SUSPENSION										(6L+	3T+6P)			

Study of loads, moments and stresses on Chassis frame members, design procedure	
of ladder type chassis frame, design procedure of leaf spring, coil spring and torsion	
bar spring.	
Lab Experiments	CO-4
1. Modelling of chassis frame	BTL-4
2. Modelling of leaf spring, coil spring	
Software/Equipment Required	
Solid works Modelling software	
MODULE 5: DESIGN OF FRONT AXLE AND STEERING SYSTEM	(6L+ 3T+6P)
Study of loads on front axle, design procedure of front axle; Condition for true rolling	
motion, Ackermann steering principles, calculation of turning circle radius.	
Lab Experiments	CO-5
1. Modelling of front axle	BTL-A
2. Modelling of steering system	DIL-4
Software/Equipment Required	
Solid works Modelling software	
BOOKS	
1. Giri.N.K- "Automobile Mechanics"- Khanna Publisher, New Delhi- 2012	
 R.S Khurmi and J.K Gupta, "Machine Design", Eurasia Publishing hot 2015 	use Pvt Ltd, New Delhi,
REFERENCE BOOKS	
1 Julian Happian, <i>An Introduction to Modern Vehicle Design</i> -Smith. Editi International, 2014.	on, Publisher, SAE
2 John Fenton, Handbook of Vehicle Design Analysis, Published by Societ	y of Automotive
Engineers Inc, 2016	
E Resources for Reference	
1. <u>http://ebooks.asmedigitalcollection.asme.org/book.aspx?bookid=277</u>	
2. http://160592857366.free.fr/joe/ebooks/Mechanical%20Engineering%	20Books%20Collection
MOOC	

IVIECI	HANICS OF MACH	MECHANICS OF MACHINES CRE						
EAT51009	COURSE CATEGORY	РС	L-T-P-S	2-0-2-2				
1.0	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3				
EME								
	CIA			ES	E			
Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	Theory	Practical			
15%	10%	5%	5%	25%	25%			
This course inclu	udes the various r	nechanisms invol	lved in the mac	hines and the	ir			
applications.								
 To analyze To apply th To design a To evaluate To design a 	the types of med the concept of frict and analyze a gear the balancing of	hanism involved i ion in various dri r train for automo reciprocating an	in automobiles ves obile application d rotary masses	n s	cations			
	EAT51009 1.0 ME Second Periodical Assessment (Theory) 15% This course inclu applications. 1. To analyze 2. To apply th 3. To design a 4. To evaluate 5. To design (EAT51009 COURSE CATEGORY 1.0 Approval Details ME CIA Second Periodical Assessment (Theory) Practical Assessments 15% 10% This course includes the various r applications. 10% 1. To analyze the types of mect 2. To apply the concept of frict 3. To design and analyze a gear 4. To evaluate the balancing of 5. To design Cam profile for variants	EAT51009 COURSE CATEGORY PC 1.0 Approval Details 36 th ACM Image: Second Periodical Assessment (Theory) Practical Assessments Observation / lab records as approved by the Department Examination Committee "DEC" 15% 10% 5% This course includes the various mechanisms invo applications. 5% 1. To analyze the types of mechanism involved i 3. To design and analyze a gear train for automode for evaluate the balancing of reciprocating an 5.	EAT51009COURSE CATEGORYPCL-T-P-S1.0Approval Details36th ACMLEARNING LEVELImage: Second Periodical Assessment (Theory)Practical AssessmentsObservation / lab records as approved by the Department Examination Committee "DEC"Attendance15%10%5%5%This course includes the various mechanisms involved in the mac applications.S%1To analyze the types of mechanism involved in automobiles 2.To design and analyze a gear train for automobile application4To evaluate the balancing of reciprocating and rotary masses 5.To design Cam profile for various applications, governors for	EAT51009COURSE CATEGORYPCL-T-P-S2-0-31.0Approval Details36th ACMLEARNING LEVELBTLMECIAESCIACIASecond Periodical Assessment (Theory)Practical Assessment (Theory)Practical AssessmentsObservation / lab records as approved by the Department Examination Committee "DEC"Attendance15%10%5%5%25%This course includes the various mechanisms involved in the machines and the applications.Intervent of friction in various drives1.To analyze the types of mechanism involved in automobiles2.2.To apply the concept of friction in various drives3.3.To design and analyze a gear train for automobile application 4.To evaluate the balancing of reciprocating and rotary masses5.To design Cam profile for various applications, governors for various applications			

		U	pon cor	npletio	n of this	course	, the st	udents v	will be a	ble to				
Course		2	. DISC	uss on v tify fric	tion in v	mechar	nsms in equipm	appiica	tions. lo porfe	rming	the one	ration		
Outcon	ne	2	Forn	nulate a	und desi	on the	gear tra	in with	respect	to a na	ine ope irticular	annlica	tion	
outcon		4	. Desi	gn bala	ncing w	eight ag	s per th	e movei	ment of	the ea	uipmen	t.	cion.	
5. Apply the utilization of cams and governors with respect to automotive.														
CO, PO AND PSO MAPPING														
	PO	PO-	PO-									PSO	PSO	
0	-1	2	3	4	5	6	7	8	9	10	11	12	-1	-2
CO-1	3	2	1	1	1	1	1	3	1	1	2	2	2	2
CO-2	2	2 3 1 1 2 2 3 3 1 2 2									1	2		
CO-3	3	2	0	1	2	2	2	3	3	1	2	2	2	1
CO-4	1	3	1	1	1	1	2	3	3	1	2	2	1	2
CO-5	3	1	1	1	2	2	2	3	3	1	2	2	2	2
			1: Wea	akly rela	ated, 2:	Moder	ately re	lated a	nd 3: St	rongly	related			
MODU	LE 1: 1	MECHA	NISMS										(6L	+ 6P)
Machin	e & St	ructure	e – Kiner	natic lir	ık, pair	and cha	iin – Gru	ublers c	riteria –	- Constr	ained n	notion –		
Degree	s of fr	eedom	- Slider	crank a	and crai	nk rock	er mech	nanisms	– Invei	rsions –	Applic	ations –		
Kinema	tic an	alysis c	of simpl	e mech	anisms	– Dete	erminat	ion of	velocity	and a	ccelera	tion for		
simple	mecha	anisms.												
	Tost	nu. Tudy vai	rious tvi	nes of k	inomati	cs links	nairs	-hains &	e mach:	nicme				
1.	Tost	tudy vai	ferent t	vnes of	chains	and the	, pairs, i ir inver	sions	x meena	, , ,			C	0-1
3.	To fi	nd the	velocitv	and ac	celeratio	on of va	arious li	nks/poi	nts in sl	ider-cra	ank Med	chanism	B	۲L-3
	using	g Klein's	s constr	uction r	nethod			,						
Equipm	nent R	equired	1:											
1.	Slide	er crank	mechai	nism										
2.	Doul	ble rock	ker mecl	hanism										
MODU	153.1	PICTIO	N										(6)	CD)
Friction	in sc		d nut –	Pivot a	nd coll	ar – Th	rust ha	aring_ F	Rolt and	trone	drivos	Ratio of	(017	· OF J
tension	s – Fff	ect of c	entrifug	r Not a val and i	nitial te	nsion –	Conditi	on for n	naximu	m nowe	er transi	mission		
Lab Exp	perime	ent:	entinue	, ar arra r		1151011	contaite		na Anna	m pom				
3.	Calc	ulation	of powe	er trans	mission	throug	h flat be	elt drive	:					
4.	Calc	ulation	of powe	er trans	mission	throug	h V belt	drive					C	0-2
Equipm	nent R	equired	1										В	L-3
1.	Flat	Belt driv	ve set u	р										
2.	V be	lt drive	set up											
MODU	LE 3: C	IEARS			1.1	6							(6L	+ 6P)
Gear pr	otile a	ind geo	metry –	Nomer	nclature	ot spui	r and he	elical ge	ars – Ge	ear trair	ns: Simp	ie,		
compoi	und ar	na epi-c	yclic gea	ar trains	s - Dete	rminati	on of sp	eed and	a torqu	e				
	Color	ent: ulating	goor rot	io for cl	iding m	och goa	rboy							• •
2	Calci	ulating	gear rat	io for c	nstant	mesh a	ii box rear hoy						B	0-3 []_3
2. Calculating gear ratio for constant mesh gear box								2.3						
1.	Slidi	ng mesi	h gear b	ох										
2. Constant mesh gear box														
MODU	LE 4: B	ALANC	ING										(61	.+ 6P)
Static a	nd dy	namic k	balancin	ng – Sin	gle and	severa	l masse	s in diff	ferent p	lanes –	Balanc	ing of		
recipro	cating	and rot	tary ma	sses - p	rimary k	balancir	ng and s	econda	ry balar	ncing				
Lab Exp	perime	ent:												.4
1.	Bala	ncing of	f shaft										RT	
2.	Bala	ncing of	f crank s	shaft										- •
Equipm	nent R	equired	1											
1.	Shaf	t												

	2.	Crank	shaft					
МО	DUI	.E 5: C/	AM AND GOVERNOR	(6L+ 6P)				
Cams – Types of cams – Design of profiles – Knife edged, flat faced and roller ended followers with and without offsets for various types of follower motions. Governors - Basics of governors and its types.								
Lab	Ехр	erimen	t:	CO-5				
	1.	Study	on different cams and followers	BTI-3				
	2.	Study	on different governors	DIES				
Equ	ipm	ent Red	quired:					
	1.	Cams						
	2.	Gover	nors					
BOO	KS							
	1. Ballaney.P.L, "Theory of Machines", Khanna Publishers, New Delhi, 2012							
	2. R.S. Khurmi and J.K. Gupta, "Theory of Machines", S.Chand & Co-2015							
REFE	REN	CE BOO	KS					
	1		Rao J.S and Dukkipati, R.V, "Mechanism and Machine Theory", Second Edition, Eastern Ltd., 2012.	Wiley				
	2		Malhotra, D.R and Gupta, H.C, "Theory of Machines", SatyaPrakasam, Tech. Ind	dia				
			Publications.					
ER	leso	urces fo	or Reference					
1	htt	ps://ftp	.idu.ac.id/wp-					
	cor	ntent/u	ploads/ebook/tdg/DESIGN%20SISTEM%20DAYA%20GERAK/Theory%20of%20Ma	achines%20a				
	nd	%20Me	chanisms%20(%20PDFDrive%20).pdf					
2	htt	ps://wv	vw.academia.edu/43543661/R_S_KHURMI_A_Textbook_of_Theory_of_Mach					
MO	00							
1	htt	ps://wv	vw.classcentral.com/course/swayam-kinematics-of-mechanisms-and-machines-	13022				
2	htt	ps://un	academy.com/course/theory-of-machines-473/KW3UHY0N					

COURSE TITLE	AUTOMOTIVE	CREDITS	3						
COURSE CODE	EAT51010	COURSE CATEGORY	COURSE PC CATEGORY		2-0-2-2				
VERSION	1.0	APPROVAL DETAILS	36 th ACM	LEARNIN G LEVEL	BTL-3				
ASSESSMENT	SCHEME								
		CIA			ESE	<u> </u>			
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	Theory	Practi cal			
15%	15%	10%	5%	5%	25%	25%			
Course	This course will expla	ain with lead acid	l battery and access	ories, construct	the starting	system			
Description	and charging system	, to recognize au	tomotive electronic	cs, sensors and a	activators				
Course Objectives	 To recall the lead acid battery and accessories. To identify the starting system. To recognize on charging system. To describe automotive electronics. To choose sensors and activators. 								
Course Outcomes	Upon completion of 1. Discuss on t 2. Identify the	this course, the he fundamental starting system.	students will be the lead acid batte	ry and accessori	es.				

3.	Apply concept on charging system.
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4. Develop automotive electronics.

5. Discuss on sensors and activators.

Prerequisites: Nil														
CO, PO AND PSO MAPPING														
COs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO1	PO 11	PO	PSO 1	PS O2
CO-1	1	0	0	0	1	0	0	0	0	0	0	0	1	1
CO-2	1	0	0	0	0	0	0	0	0	0	0	0	1	2
CO-3	0	0	0	0	0	1	0	0	0	0	0	0	1	0
CO-4	0	0	0	0	1	0	0	0	0	0	0	0	1	2
CO-5	0	0	3	0	1	0	0	0	0	0	0	0	0	3
		1 - We	akly Co	rrelated	l, 2 - Mo	oderate	ly Corre	elated a	nd 3 - S	trongly	Correla	ated		
Module	e 1 – BA	TTERIE	S AND A	ACCESS	ORIES								(6L+6	P)
Principle and construction of lead acid battery, characteristics of battery, rating capacity and efficiency of batteries, various tests on batteries, maintenance and charging. Lighting system: insulated and earth return system, details of head light and side light, LED lighting system, headlight dazzling, current trends in the lighting system and preventive methods - Horn, wiper system Lab : Testing of Lead acid battery									tem: tem, lorn,	CO-: BTL-	L 3			
Module 2 – STARTING SYSTEM										(6L+6	P)			
Condition at starting, behaviour of starter during starting, series motor and its characteristics, principle and construction of starter motor, working of different starter drive units, care and maintenances of starter motor, starter switches.										itics, and	CO- BTL-	2 -3		
Module	e 3 – CH	ARGIN	G SYSTE	M									(6L+6	P)
Generation of direct current, shunt generator characteristics, armature reaction, third brush regulation, cut out, Voltage and current regulators, compensated voltage regulator, alternators principle and constructional aspects and bridge rectifiers, new developments.									rush ator, s.	CO- BTL-	3 -3			
Module	e 4 – FU	NDAMI	ENTALS	OF AU	гомот	IVE ELE	CTRON	ICS					(6L+6	P)
Current trends in automotive electronic engine management system, electromagnetic interference suppression, electromagnetic compatibility, electronic dashboard instruments, onboard diagnostic system, security and warning system. Lab : Fault finding of relay & fuses in car using Off Board Diagnostics Systems (OBDS).									netic ents,	CO-4 BTL-	4 3			
Module	e 5 – SE	NSORS	AND AC	TUATO	RS								(6L+6I	P)
Types of sensors: sensor for speed, throttle position, exhaust oxygen level, manifold pressure, crankshaft position, coolant temperature, exhaust temperature, air mass flow for engine application. Solenoids, stepper motors, relay.									for	CO-! BTL-	5 4			
Lab : Fa	ult find	ing loca	tion of	sensor	in car	using C	BDS							
TEXT BOOKS														

1.	William B. Ribbens., "Understanding Automotive Electronics an Engineering Perspective" Eighth Edition. 2017
2.	Tom Denton., "Automobile Electrical and Electronic Systems" 5th edition 2017.
REFE	RENCE BOOKS
1.	Robert Bosch Automotive Handbook, 10th Edition (2018)., BOSCH 10, ISBN of 978-0-7680-9567-8.
2.	Tom Denton., "Electric and Hybrid Vehicles"2020.
E BO	OKS
1.	https://shorturl.at/qFJRT
2.	https://shorturl.at/kq019
MOC	DC C
1.	https://shorturl.at/tFQW1
2.	https://nptel.ac.in/courses/108106170

COURSE TITLE		DESIGN PROJECT-3		CREDITS	1									
COURSE CODE	EAT51803	COURSE CATEGORY	EEC	L-T-P-S	0-0-2-6									
Version	1.0	Approval Details	36th ACM	LEARNING LEVEL	BTL-4									
ASSESSMENT	SCHEME													
First Review	Second Review	Third Review	Project F	Report & Viva V	Voce									
20%	20%	10%		50%										
Description	required to ana Practical founda based on engine understand the Simulation tools team managem selected problem	alyse the real time problem sta ation for understanding the diffe eering knowledge. This course i importance of engineering con to be used in the execution of ent skills are utilized to devel m.	atement and gives erent types of socia s suitable for gene cepts and its relev f the design metho lop an innovative,	a strong Eng al problems an ral engineering ant application odology. The re economic sol	ineering and d its solution g students to ns. Different esources and lution to the									
Course Objective	 The course will of Explore the Demonstration problem station Elucidate the 	enable the students to: literature study and report prep te project identification and e atement te communication and team ma	paration skills xecution of feasib nagement skills	le solution to	address the									
Course Outcome	Upon completio 1. Identify 2. Selection 3. Design	 Elucidate the communication and team management skills Upon completion of this course, the students will be able to Identify a real-time problem by intensive literature survey Selection of appropriate methodology by using modern tools Design & analyse the solution through appropriate Measurements and calculations 												
Prerequisite	es: Design Project	: -2												
CO, PO	CO, PO AND PSO MAPPING													
--------	------------------------	-----------	-----------	----------	-----------	----------	----------	----------	----------	------------	-----------	-----------	-----------	-----------
	PO - 1	PO - 2	PO - 3	РО- 4	PO - 5	РО- 6	РО- 7	РО- 8	РО- 9	PO - 10	PO- 11	PO- 12	PSO- 1	PSO- 2
CO-1	3	3	2	2	3	2	2	3	3	3	3	1	1	1
CO-2	3	3	3	2	3	2	2	3	3	3	3	1	2	2
CO-3	3	3	3	2	3	2	2	3	3	3	3	1	1	1

Weightage of Assessment:

Review / Examination Scheme	Weightage
First Review	20%
Second Review	20%
Third Review	10%
End Semester Viva Voce	50%

A committee shall be constituted by the HoD for the Review.

Assessment Rubrics

Parameter	Weightage (%)
Title & Objectives	5.0
Review of Literature (RL)	10.0
Design / Implementation	10.0
Methodology	5.0
Planning of Project Work	5.0
Testing Environment / Test Cases	5.0
Analytical thinking [*]	5.0
Technical Knowledge [*]	5.0
Presentation*	10.0
Demonstration*	5.0
Individual Roles Distribution [*] (Individual Objectives in the	5.0
project work)	
Individual Contributions [*] (Towards the individual objectives in the project work)	5.0
Deliverables	5.0
Team- work	10.0
Report / Thesis	5.0
Peer Assessment*	5.0

* - Attributes for individual contribution.

EVALUATION PARAMETERS FOR ASSESSMENT

To be followed same as approved for Design project 1

COURS		=			ENT	REPRE	NEURSH	IIP			CRE		2		
		-									5115				
COURS	E COD	E	EGE5	L004	COURS	SE CATE	GORY		ES		L-T-	P-S	2-	0-0-6	
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CourseNoders policies were briefed in the Module II. Detailed procedure of preparing a bus plan will be taught in the Module III, mobilization of various resources will be discussed the Module IV. Finally, Module V will provide insights about monitoring and evaluation business								urship. s stake siness sed in tion of							
 The course aims to utilize the basic concepts of Entrepreneurship The course also equips the students to Identify the internal and externation environments of new businessventure The course aims to prepare organizational goals of new business The course also trains the students to build strategic approaches to succeed in th start-up 								tternal							
Co Out	urse come		Upon co 1. Uti 2. Ide 3. Pre 4. Bu 5. Ass	mpletic ize the ntify th pare or ld strate ess the	on of this basic cor e interna ganizatio egic appr progress	course, ncepts o al and ex nal goal oaches of a ne	the stu f Entrep xternal ls of nev to succo w busin	Idents v preneur enviror w busin eed in tl less ven	vill be al ship iments ess he start ture an	of new of new -up d promo	busines ote sust	ss ventur ainabilit	e y		
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Charac Sugges 1. Knov	Characteristics of Successful, Entrepreneur – Knowledge and Skills of Entrepreneur.CO-1Suggested Readings:BTL-31. Knowledge and Skills of EntrepreneurBTL-3									:0-1 TL-3					
MODU	LE 2: E	NTR	EPRENE	JRAL EN	VIRONM	1ENT	_				. =		(6L)	
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Sugges	ted Re	adir nd S	igs: tate Gov	rnmon	t Inductri	al Polici	es						BTL	3	
MODU	LE 3: B	USI	NESS PLA	N PREP	ARATION	N							(6L)	

Sources of Product for Business - Prefeasibility Study - Criteria for Selection of Product - Ownership - Capital - Budgeting Project Profile Preparation - Matching Entrepreneur with the Project - Feasibility Report Preparation and Evaluation Criteria. Suggested Readings:								
1. Criteria	a for Selection of Product							
MODULE	4: LAUNCHING OF NEWVENTURE	(6L)						
Finance a - Growth Suggeste	and Human Resource Mobilization Operations Planning - Market and Channel Selection Strategies - Product Launching – Incubation, Venture capital, IT startups. d Readings:	CO-4 BTL-3						
MODULE	5: MANAGEMENT OF NEW VENTURE	(6L)						
Monitorii Units- Eff Suggeste 1. Monito	ng and Evaluation ofBusiness - Preventing Sickness and Rehabilitation of Business fective Management of small Business. d Readings: pring and Evaluation ofBusiness	CO-5 BTL-3						
BOOKS								
1.	Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi, 2001.							
2.	S.S.Khanka, Entrepreneurial Development, S.Chand and Company Limited, New Delhi,	2001						
REFERENCE	BOOKS							
1	Mathew Manimala, Entrepreneurship Theory at the Crossroads, Paradigms & Praxis, ,2nd Edition ,2005	Biztrantra						
2	Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation and Review Tata McGraw-Hill, 1996.	rs,						
3	P. Saravanavel, Entrepreneurial Development, Ess Pee kay Publishing House, Chennai -1	1997.						
4	Donald F Kuratko, T.V Rao. Entrepreneurship: A South Asian perspective. Cengage Learn	ing.2012						
E Resou	rces for Reference							
1.	https://epgp.inflibnet.ac.in/ahl.php?csrno=23 (Management P-01, M-02)							
2.	https://epgp.inflibnet.ac.in/ahl.php?csrno=23 (Management P-01, M-13)							
3.	https://epgp.inflibnet.ac.in/ahl.php?csrno=23 (Management P-01, M-14)							
4	https://epgp.inflibnet.ac.in/ahl.php?csrno=23 (Management P-01, M-21)							
5	https://epgp.inflibnet.ac.in/ahl.php?csrno=23 (Management P-01, M-30)							
MOOC								
1.	https://onlinecourses.nptel.ac.in/noc21_mg70/preview							
2.	https://onlinecourses.nptel.ac.in/noc22_ge03/preview							

COURSE TI	PR	OBLEM S	OLVING TECH	CREDI	TS	1			
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First Periodical Assessment	See Peri Asses	cond odical ssment	Prac Assess	ctical sments	Obse record by the Ex Com	ervation / lab ls as approved e Department amination nittee "DEC"	Atten dance	Theory	Practical
15%	1	5%	10	0%		5%	5%	25%	25%

Cou Descri	urse iption	This reas succ prob on c of th prof	reasoning skills, essential for competitive exams, academic pursuits, and professional success. The quantitative aptitude section covers fundamental mathematical concepts, problem-solving techniques, and data interpretation. The verbal reasoning section focuses on critical thinking, comprehension, and effective communication. Through a combination of theoretical knowledge and practical exercises, students will gain the confidence and proficiency required to tackle various aptitude tests.											
Cou Obje	irse ctive	2. 3. 4. 5.	 To provide a thorough grounding in basic mathematical concepts and principles essential for quantitative aptitude. To enhance students' ability to solve a variety of quantitative problems efficiently and accurately. To develop skills in interpreting and analyzing data presented in various formats such as charts, graphs, and tables. To cultivate critical thinking and logical reasoning abilities necessary for verbal reasoning tasks. To develop proficiency in solving various types of puzzles and logical reasoning problems. 											
Cou Outc Prerequ	At the end of the course the students will be able to: 1. Demonstrate a solid understanding of fundamental mathematical concepts and their applications. 2. Solve quantitative problems with accuracy and speed. 3. Interpret data from various sources and making informed decisions based on that data. 4. Exhibit strong critical thinking and logical reasoning skills required for verbal reasoning tasks. 5. Solve puzzles and logical reasoning problems.													
CO AN	DPON	/IAPPIN	IG											
co/	PO	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	PS	PS
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		:	1: Weak	dy relat	ted, 2:	Modera	ately re	ated ar	nd 3: St	rongly	related			
MODU	LE 1: N	umber	System)									(3L +	· 6P)
													C	0-1
Numbe Mean &	Number System, Problems with HCF and LCM - Divisibility Rules – Progression: AP, GP & HP – Mean & Averages- Allegations & Mixtures – Percentages - Maths using BODMAS Rule													
MODU	MODULE 2: Profit & Loss (21 ± 60)													
		Since												°O-2
Profit & Time &	& Loss - Work -	Intere: - Time,	st: Simp Speed a	ole Inter & Distai	rest & (nce - Pi	Compou roblems	ind Inte on Tra	rest – F ins- Tri _l	Ratio, Pi gonome	roportio etry	on & Va	iriation	-	-U-Z
MODU	E 2 . I -	an it.											<u> </u>	1L-3
INODUL	LE 3 : LO	garithi	TIS										(3L +	02)

Logarith	ms - Permutations & Combinations- Probability - Surds & Indices - Decimal Fractions -	CO-3					
Spatial A	bility - Functions – Graphs - Data Interpretation on Multiple Charts	BTL-3					
MODULE	4 : Quadratic Equations	(3L + 6P)					
Quadrat	Quadratic Equations- Set Theory- Conditional Syllogisms - Statements and Conclusions -						
Stateme	Statements and Assumptions- Geometry-Mensuration – Pipes & Cisterns - Sequence – Series						
MODULE	MODULE 5 : Inequalities						
Inequalities- Image Based Problems- Clocks & Calendars - Problems on Ages - Factor Theorem - Power Theorem - Remainder Theorem -Coordinate Geometry							
TEXT-BO	ОК						
1	Sharma, Arun (2022). <i>Quantitative Aptitude for Competitive Examinations (11th Ed</i>). McGraw Hill.	New Delhi:					
REFEREN	CE BOOK						
	Agarwal, RS (2022). How to Prepare for Quantitative Aptitude. New Delhi: S Chand.						
1.							

COUR	SE TITLE	Е (Т	o be ev	aluatec	l l in 5 th s aff	NTERN semeste ter 4 th s	SHIP – 2 er. To be emester	carrie	d out in	summe	er CI	REDITS		1
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Ver	rsion		1.0)	Ap	proval	Details		36 th /	ACM	L	EARNIN LEVEL	IG	BTL-4
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	100%													
Cor Descr	urse ription	This clas refl	This course aims to inculcate the application of knowledge & skill learned through classroom practices. It demands the academic component consisting of research, reflection, written and oral skills of the learner.											
Cor Obje	urse ective	 The course will enable the students to Explore career alternatives prior to graduation. Integrate theory and practice. Assess interests and abilities in their field of study. Build a record of work experience. 												
Cor Oute	urse come	Upo 1. 2. 3.	on comp Choose engine Demou for the Comm	oletion of e appro eering to nstrate e benefi unicate	of this c priate r o manag ethical t of soc effecti	course, modern ge the r conduc iety. vely and	the stud tools us esource t and pr d to writ	ents w ed in t s effec ofessio e the s	ill be at he field tively b nal acc cientific	ole to of Elec y applyi ountabi c report	tronics ng innc lity whi of the	and Co ovative i ile work learning	mmun deas ing in a gs	ication a team
Prerequ	uisites:	Basic k	nowled	ge in M	easure	ments,	Data An	alysis,	Interp	retation				
<u>CO, PO</u>	AND PS	SO MAI	<u>PPING</u>											
	PO-	PO-	PO	PO-	PO-	PO-	PO-	PO-	PO-	PO	PO-	PO-	PS	PS
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CO-3	2	2	3	3	2	-	1	2	3	3	3	2	1	1

Weightage of Assessment:

Assessment Scheme	Weightage
Presentation & Viva voce	50 %
Report	20 %
Feedback of the Employer	30%

A committee will be constituted by the HoD with Internship coordinator as head for learning assessment

process

Assessment Rubrics

Performance	Excellent(5)	Good(4)	Fair(3)	Poor(2)
Indicators				
Requirement analysis and clarity on problem statement(5)	Requirement well understood and problem statement well defined	Requirement well understood but problem statement not well defined	Understood the requirement and not defined properly	Not properly understood the requirements and problem statement not defined properly
Relevance with Industry /Societal problem(5)	Relevant	Relevant to industry with small modifications	Partially relevant	Irrelevant
Project timeline scheduled(5)	Scheduled and followed strictly	Scheduled and but not followed strictly	Scheduled but not followed	Not Scheduled and not followed
Usage of latest application and software(5)	latest applications and software's are used	Moderate usage of new technology	Slightly outdated	No latest applications and software's used
Design and code efficiency(5)	Excellent design of experiment and all possible outcomes are handled	Effective design but all possible outcomes are not handled	Satisfactory Design	Irrelevant design
Report Preparation(10)	Excellent documentation	Good documentation	Average documentation	Poor documentation
Presentation skills ,Fluency and comprehensibility(5)	Excellent communication skills and good comprehensibility	Good confidence , lack of communication skills and average comprehensibility	Less confidence, vocabulary need to be improved and poor comprehensibility	Poor skills
Slide organization and contents time conscious(5)	Content is organized properly and effective time management	Content is organized properly but not effective time management	Content is not organized properly	Poor organization and least time management
Feedback from Industry mentor(5)	Regular /novel idea/Excellent execution of project	Regular /Novel idea/Good execution of project	Regular /existing idea/Good execution of project	Irregular /existing idea/Poor execution of project

SEMESTER-VI

COURSE TITLE	VEH	HICLE DYNAMIC	CREDITS		4					
COURSE CODE	EAT51011	COURSE	L-T-P-S		2-1-2-2					
Version	1.0	VEL	BTL-3							
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	ASSESSMENT SCHEME									
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First Per Assess (The	riodica sment ory)	ıl	Second Periodical Assessment (Theory)		Practical Assessments		Ol lai aj s D E: (bservation / b records as pproved by the Department xamination Committee "DEC"		Attenda	ance	Theory	Pra	octical
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			static a	nd dyna	amic pe	rforman	ce of a	vehicle	at vario	ous road	and sp	peed con	ditions	
 analysis. 2. To apply various Suspension systems, selection of springs and damp 3. To interpret the stability of vehicles on curved track and slope, gy and cross wind handling. 4. To discuss tyres, ride characteristics and effect of camber, camber the stability of vehicle handling under different steering conditions stability 											simulation damper pe, gyro mber thr ditions a	on and rs. scopic ust. nd dire	modal effects ctional	
of vehicles. Course Outcome Upon completion of this course, the students will be able to 1. Discuss on vibration effects in vehicles and how to handle it properly 2. Apply the principles and types of suspension and the new technologies maximize its effectiveness. 3. Apply the concept of stability of vehicles on curved track and slope, gyn and cross wind handling. 4. Analyze the ride characteristics and effect of camber, camber thrust. 5. Develop vehicle handling concepts under different steering conditions stability of vehicles.									properly. pologies ppe, gyrc nrust. ditions a	needed scopic nd dire	to effects ctional			
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CO-2	3	2	3	2	3	-	2	-	-	-	-	2	1	2
CO-3	2	3	2	3	2	-	2	-	-	-	-	3	2	1
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Classification of vibration, definitions, mechanical vibrating systems, vibration and human comfort. Free, forced and damped vibrations - Magnification and Transmissibility. Vibration absorber. Model of an automobile, one degree of freedom, two degree of freedom systems Column														
MODU	JLE 2: 9	SUSPE	NSION										(6L+ 31	Г+6Р)
Require suspens	ments ion spi	. Sprin ring ra	g mass te. Calco	trequen ulation (icy. Whi of effect	eel hop, tive sprii	wheel ng rate.	wobble Vehicle	, wheel susper	l shimm nsion in	y, Choi fore an	ce of Id aft	CO BTL	-2 -3

directions. Hy compensated, side forces. Lab Experimen 1. Measurem 2. Whirling o	draulic dampers and choice of damper characteristics. Independent, rubber and air suspension systems. Roll axis and vehicle under the action of hts lent of displacement, velocity and acceleration f Shafts- to determine critical speed	
Software/Equi 1. Whirling o	pment Required of shaft	
MODULE 3: S	TABILITY OF VEHICLES	(6L+ 3T+6P)
Load distributi transfer during equations of m Lab Experimen	CO-3	
	emeasurement	BTL-3
Software/Equi	pment Required	
1. Camber ang	le measuring device	
Types Relative	RES a marite and demerite Ride characteristics. Behaviour while cornering slip	(OL+ 31+OP)
angle, cornerin	g force, power consumed by a tyre. Effect of camber, camber thrust.	
1. Introd	CO-4 BTL-3	
Software/Equi	pment Required	5.20
1. MAT Lab		
MODULE 5: VE	HICLE HANDLING	(6L+ 3T+6P)
MODULE 5: VI	EHICLE HANDLING ler steer, steady state cornering. Effect of braking, driving torques on steering.	(6L+ 3T+6P)
MODULE 5: VI Over steer, und Effect of cambo	EHICLE HANDLING ler steer, steady state cornering. Effect of braking, driving torques on steering. er, transient effects in cornering. Directional stability of vehicles.	(6L+ 3T+6P)
MODULE 5: VI Over steer, und Effect of cambo Lab Experimen 1. Moda	EHICLE HANDLING der steer, steady state cornering. Effect of braking, driving torques on steering. er, transient effects in cornering. Directional stability of vehicles. ts I Analysis of given structure	(6L+ 3T+6P) CO-5 BTL-3
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MODULE 5: VI Over steer, und Effect of cambo Lab Experimen 1. Moda Software/Equi 1. LS Dyna / TEXT TEXT BOO 1. 2. REFEREFERENC 1 2 E Resources for 1. 2.	HICLE HANDLING ler steer, steady state cornering. Effect of braking, driving torques on steering. er, transient effects in cornering. Directional stability of vehicles. ts I Analysis of given structure pment Required Adams DKS Thomas D. Gillespie, "Fundamentals of vehicle dynamics",2012 J. Y. Wong, 'Theory of Ground Vehicles', John Wiley and Sons Inc., New York, 2 E BOOKS Hans Pacejka, Tire and Vehicle Dynamics, Elsevier, 2012. Garrett T K, Newton K and Steeds W, "Motor Vehicle", ButterWorths & Co., Pu New Delhi, 2001. r Reference The Motor Vehicle, Automobile engineering, Authors: T. K. Garrett, Kenneth Newton, William Steeds Publisher: Butterworth-Heinemann, 2001 ISBN 0750644494, 9780750644495 Theory of Ground Vehicles, Fifth Edition.	(6L+ 3T+6P) CO-5 BTL-3 2013 Jblishers Ltd.,
MODULE 5: VI Over steer, und Effect of cambo Lab Experimen 1. Moda Software/Equi 1. LS Dyna / TEXT TEXT BOO 1. 2. E Resources for 1. 2. 2.	HICLE HANDLING ler steer, steady state cornering. Effect of braking, driving torques on steering. er, transient effects in cornering. Directional stability of vehicles. ts I Analysis of given structure pment Required Adams DKS Thomas D. Gillespie, "Fundamentals of vehicle dynamics", 2012 J. Y. Wong, 'Theory of Ground Vehicles', John Wiley and Sons Inc., New York, 2 E BOOKS Hans Pacejka, Tire and Vehicle Dynamics, Elsevier, 2012. Garrett T K, Newton K and Steeds W, "Motor Vehicle", ButterWorths & Co., Pu New Delhi, 2001. Reference The Motor Vehicle, Automobile engineering, Authors: T. K. Garrett, Kenneth Newton, William Steeds Publisher: Butterworth-Heinemann, 2001 ISBN 0750644494, 9780750644495 Theory of Ground Vehicles, Fifth Edition. By J. Y. Wong · 2022; ISBN:9781119719700, 1119719704 Desenvert 600 Devision 110	(6L+ 3T+6P) CO-5 BTL-3 2013 Jblishers Ltd.,
MODULE 5: VI Over steer, und Effect of cambo Lab Experimen 1. Moda Software/Equi 1. LS Dyna / TEXT TEXT BOO 1. 2. E Resources for 1. 2.	EHICLE HANDLING Ider steer, steady state cornering. Effect of braking, driving torques on steering. er, transient effects in cornering. Directional stability of vehicles. ts I Analysis of given structure pment Required Adams DKS Thomas D. Gillespie, "Fundamentals of vehicle dynamics",2012 J. Y. Wong, 'Theory of Ground Vehicles', John Wiley and Sons Inc., New York, 2 DEBOOKS Hans Pacejka, Tire and Vehicle Dynamics, Elsevier, 2012. Garrett T K, Newton K and Steeds W, "Motor Vehicle", ButterWorths & Co., Pu New Delhi, 2001. reference The Motor Vehicle, Automobile engineering, Authors: T. K. Garrett, Kenneth Newton, William Steeds Publisher: Butterworth-Heinemann, 2001 ISBN 0750644494, 9780750644495 Theory of Ground Vehicles, Fifth Edition. By J. Y. Wong · 2022; ISBN:9781119719700, 1119719704 Page count:600; Published:19 April 2022; Format: Hardback Publisher: Wiley: Language: English: Authors: L X. Woorg	(6L+ 3T+6P) CO-5 BTL-3

моос	
1.	http://nptel.ac.in/courses/107106080/
2.	https://www.mooc-list.com/course/vehicle-dynamics-ii-cornering-iversity

COURS	E	Design and Simulation of Electric and Hybrid Vehicles CREDITS											3			
COUR	SE	EAT5	1012	0	OURSE			РС		L-T-P	-S		2-0-2-2	2		
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ASSESSI	IENT	SCHEME														
					CIA								ESE			
First		50			Observation / lab											
Periodi	ral	Peri	Periodical		Periodical		Practica	l r	ecords	as appr	oved	Attend	lanc			Practica
Assessm	ent	Asses	Ass	sessmer	nts	by the [Departn	nent	e	ane	Theo	у .	I			
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15%		1	5%		10%		Commi	5%		5%		25%		25%		
Cours	۵	The cou	se nro	/ides a	detailer	linforn	nation a	bout de	esign ar	nd simul	ation	of variou	is comi	23/0		
Descript	ion	of electric and hybrid vehicles. Torque and Energy Consumption of Electric and										ctric and	Hvbrid	Vehicle		
	_	(EHV) will be educated to the learners. Design of Energy storage and manage										l manage	ement s	systems		
		were ta	ught to	the s	tudents	. Final	ly cours	e also	provid	e detail	ed in	sights al	out de	esign of		
		controll	ers and	safety	systems	s of EH	V									
Course		1. Students should calculate total torque and energy required to propel ar										n EHV				
Objective	es	2. Students should Design and Simulate an Energy Storage System for an EHV														
	3. Students should analyze the Design procedure of Energy Manageme									nagemen	t Syste	n of an				
		A Students should evaluate the Design Procedure of Various Controllars a										and Saf	≏tv			
		Systems of an EHV										cty				
		5.	Studer	its shou	ıld expla	ain the	design	proced	ure of (Charing	Statio	on of an E	HV.			
Course		Upon co	ompletio	on of th	is cours	se, the	student	s will b	e able t	to						
Outcome	es	1. Calculate total torque and energy required to propel an EHV														
		2. Design and Simulate an Energy Storage System for an EHV														
		3. Analyze the Design procedure of Energy Management System for an EHV														
		4. 5	Evalua	te the d	Design i ssign nr	ocedur	of Ch	aring St	control	ners and Ar an FE	1 Sale IV	ty syster		NEHV		
Prereguis	sites: '	J. Two and	Three-	wheele	r EV Te	chnolo	gv									
CO, PO A	ND PS	O MAPP	ING				07									
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CO-3	3	3	3	2	3	2	2	1	2	1	1	3	3	3		
CO-4	<u>ר</u>	3	3	2	2 2	2	2	1	2	1	1	3 2	3	3		
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Module 1 – Motor Torque Calculations for Electric Vehicle									(101	.+5P)						
Types of	Resist	tance – C	alculati	on – To	otal Trad	ctive Fo	orce – T	orque (alculat	ion – Fr	ergy		С	D-1		
Consum	otion -	Selectio	n and s	zing of	Motor	- Comn	onents	izing — I	ocatio	ns - Mer	hani	cal and	BT	L-4		
Electrical	conn	ections		-115 01		comp	Sherit S	5 1	-550010							
Lab Com	pone	nt: Simul	ation o	f Electri	c Moto	r & Gei	nerator									

Softv								
Mod	ule 2 – Design of Energy Storage Solutions	(10L+5P)						
Cell Batte	Types - Charging and Discharging calculation - Cell Selection and sizing - Battery layout - ery Pack Configuration and Construction - Selection criteria.	CO-2 BTL-4						
Lab	Component : Simulation of Energy Storage System							
Soft	ware: MATLAB							
Mod	ule 3 – Design of Energy Management System	(10L+5P)						
Ener base	gy Management System - Rule based control and optimization-based control - Software- d high level supervisory control - Mode of power - Behavior of motor - Advance Features	CO-3 BTL-4						
Lab	Component: Simulation of Energy Management System							
Soft								
Mod	ule 4 – Design of Controllers and Safety Systems	(10L+5P)						
Cont Mana Lab	CO-4 BTL-4							
Soft	ware: MATLAB							
Mod	ule 5 – Design of Charing Station	(10L+5P)						
Char Safet	CO-5 BTL-4							
Lab	Component : Simulation of Various Components of Charging Station							
Soft	ware: MATLAB							
	TEXT BOOKS							
1.	 Amir Khajepour, Saber Fallah and AvestaGoodarzi, "Electric and Hybrid Vehicles Technologies, Modelling and Control: A Mechatronic Approach", John Wiley & Sons Ltd, 2014. 							
2.	Antoni Szumanowski, "Hybrid Electric Power Train Engineering and Technology: Modelling, Control, and Simulation", IGI Global, 2013.							
	REFERENCE BOOKS							
	Emadi, A. (Ed.), Miller, J., Ehsani, M., "Vehicular Electric Power Systems" Boca Raton, CRC Press, 2003							
	Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles", Springer, 2013							
	Ibrahim Dinçer, Halil S. Hamut and Nader Javani, "Thermal Management of Electric Vehicle Battery Systems", JohnWiley& Sons Ltd., 2016							
Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles_ Fundamentals, Theory, and Design, Second Edition", CRC Press, 2010								
E BOC	DKS							
	https://www.academia.edu/35166844/Basics of Electric Vehicles Design and Functi	on						
1.								
2.	https://www.researchgate.net/publication/297751735 Electric vehicle design modell mization/link/59fc1835458515d070628374/download	ing and opti						

моо	c
1.	https://www.coursera.org/certificates/power-electronics-motors-ev-iitbombay
2	https://onlinecourses.nptel.ac.in/noc21_ee112/preview

COURSE	E	CONTRO	L SYSTEM	I FOR AL	ломот	TIVE APP	LICATIO	NS CI	REDITS		:	3		
COURSE CODE	E	EAT5	1013	COUI CATE	RSE GORY		РС	L-	T-P-S		2-0-2-2			
Version		1.	.0	Appr Deta	oval ils	36	th ACM	LE	ARNING EVEL		BTL-4			
ASSESS	ASSESSMENT SCHEME													
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15%	, b	15	5%	1	0%		5%		5%	25	%	25%		
Cours Descrip	This course gives a strong theoretical foundation for understanding open loop and closed loop control system analysis and is suitable for general engineering students. It covers standard analytical tools such as Bode plot, Polar plot, root-loci and nyquist plots. Later part of the module focuses on formation of state space equation and analysis of observability and controllability.													
Course Objectiv	ve	 characteristics of control components To provide knowledge on Feedback control and stability analysis in Time and frequency domains. To develop a specific technical expertise in the analysis and design of Feedback Control Systems. To familiarize with the modeling of dynamical systems, to simulate and analyze the stability of the system using MATLAB. 												
Course Outcom	 e Upon completion of this course, the students will be able to 1. Analyze electromechanical systems using mathematical modelling and to build transfer function 2. Determine Transient and Steady State behavior of systems using standard test signals and compute Steady state error 3. Analyze the stability of the system using frequency response plots 4. Analyze the stability of the system by applying various stability criteria. 5. Model state space equation in various forms and analyze the observability and controllability of the system 													
CO, PO	AND F	SO MAPPI	ING											
со	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-	PO-	PO-	PSO-	
CO-1	2	2	_	2	1	-	_	-	-	- 10	-	- 12	1	
CO-2	2	3	3	-	-	-	_	-	_		-	1	2	
CO-3	3	3	3	2	2	-	_	_	_	-	-	2	2	
CO-4	3	3	3	2	2	-	-	-	-	_	-	2	1	
CO-5	3	3	3	3	1	-	-	-	-	-	-	1	2	
		1	: Weakly	related	, 2: Mod	lerately r	elated a	nd 3: St	trongly re	ated	1		<u> </u>	

MODULE 1: SYSTEMS AND THEIR REPRESENTATION (6L	+ 6P)
Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and	
thermal systems – Transfer function – Synchros – AC and DC servomotors – Block diagram reduction	
techniques – Signal now graphs.	
Suggested Reduilings.	
	CO-1
1 Transfer function of AC Servomotor	BTL-4
2 Study of Synchros	
Software/Equipment Required	
1 Two Phase AC Servomotor Kit	
2 Synchro Transmitter and Receiver Pair	
MODULE 2: TIME RESPONSE ANALYSIS	L+ 6P)
Time response – Time domain specifications – Types of test input – Land II order system response – Error	,
coefficients – Generalized error series – Steady state error – P. Pl. PID modes of feedback control.	
Suggested Readings:	
PID based speed control of DC motor	
Lab Experiments	
1. Analog Simulation of Type-0 and Type-1 system	CO-2
2. Design of P, PI and PID controllers	BTL-3
3. Determination of time domain specifications using MATLAB	
Software/Equipment Required	
1. Process Control Simulator Kit	
2. MATLAB Software	
MODULE 3: FREQUENCY RESPONSE ANALYSIS (6L-	+ 6P)
Frequency response – Bode plot – Polar plot - Determination of closed loop response from open loop	
response – Correlation between frequency domain and time domain specifications.	
Suggested Readings:	
1. Improvement of Steering Response Development Using Bode Plot	
2. Frequency Response Analysis using Lead, Lag and Lead-Lag Compensator	<u> </u>
Lab Experiments	
1. Frequency response analysis using Bode Plot and Polar Plot using MATLAB	DIL-4
2. Frequency Response Analysis using Lead, Lag and Lead-Lag Compensator	
Software/Equipment Required	
1. MATLAB Software	
2. Lead-Lag Compensator Network Kit	
MODULE 4: STABILITY OF CONTROL SYSTEM (6L+	6P)
Characteristics equation – Location of roots in S plane for stability – Routh-Hurwitz criterion – Root locus	
construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability criterion.	
Suggested Readings:	
Root locus approach in design of PID controller for cruise control application	CO-4
Lab Experiments	BTL-4
1. Response of first and second order system using MAILAB	
2. Stability analysis of linear system using MATLAB	
Software/Equipment Required	
	. (D)
MUDDLE 5: STATE SPACE ANALYSIS (6)	.+ 6P)
Introduction to state space Analysis – Phase variable and Canonical Forms – State Transition Matrix –	
solutions to state space equation – Discretization of state space equation, controllability and	
observability of systems.	
Suggested Readings:	CO-5
State space modeling of DC Motor using MATLAB	BTL-4
Lab Experiments	-
1. Digital Simulation of linear system using MATLAB/Simulink	
2. Digital Simulation of non-linear system using MATLAB/Simulink	
3. State space representation of a system using MATLAB	

Software/E	quipment Required							
MATLAB So	ftware							
BOOKS								
1.	K. Ogata, "Modern Control Engineering", 5th edition, Pearson Education, New Delhi, 2017.							
2.	I.J. Nagrath& M. Gopal, :Control Systems Engineering", New Age International Publishers,2018.							
3.	Ashish Tewari, "Modern Control Design with Matlab-Simulink", John Wiley, & Sons, New Delhi 2015.							
REFERENCE B	OOKS							
1	B.C. Kuo, "Automatic Control Systems", Prentice Hall of India Ltd., New Delhi, 2015.							
2	M. Gopal, "Control Systems, Principles & Design", Tata McGraw Hill, New Delhi, 2017.							
3	M.N. Bandyopadhyay, "Control Engineering Theory and Practice", Prentice Hall of India, 2016.							
4	M. Gopal, "Modern Control System Theory", New Age International Publishers, 2015.							
E Resource	s for Reference							
1.	https://easyengineering.net/control-systems-engineering-by-nagrath-nw/							
2.	http://docs.znu.ac.ir/members/pirmohamadi_ali/Control/Katsuhiko%20Ogata%20_%20Modern%20							
	Control%20							
	Engineering%205th%20Edition.pdf							
3.	https://pdfcoffee.com/control-systems-by-anand-kumar-pdf-free.html							
MOOC								
1.	https://onlinecourses.nptel.ac.in/noc19_de04/preview							
2.	https://onlinecourses.nptel.ac.in/noc22_ee31/preview							
3.	https://onlinecourses.nptel.ac.in/noc20_me25/preview							
4.	https://onlinecourses.nptel.ac.in/noc21_ee70/preview							
5.	http://nptel.ac.in/courses/108103007/							

COURSE TITLE	INTROE	CREDITS	3							
COURSE CODE	EAT51014	COURSE CATEGORY		РС	L-T-P-S	2-0-2-6				
Version	1.0	Approval Det	tails	36 th ACM	ACM LEARNING LEVEL		BTL-3			
ASSESSMENT SCH										
CIA										
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessmen ts ts Observation / lal records as approved by the Department Examination Committee "DEC		ervation / lab ecords as roved by the epartment camination mittee "DEC"	Attendance	Theory	Practical			
15%	15%	10%		5%	5%	25%	25%			
Course Description	Industry 4.0, a advancement in connectivity the integration of c interconnected facilitates imp departments, overview of the relevance for d and their impace	Industry 4.0, also known as the fourth industrial revolution, represents a significant advancement in digital technology compared to previous decades. It elevates the role of connectivity through the Internet of Things (IoT), real-time data accessibility and the integration of cyber-physical systems. Industry 4.0 introduces a more comprehensive and interconnected approach to manufacturing, bridging the physical and digital realms. This facilitates improved collaboration and accessibility across various aspects such as departments, partners, vendors, products and individuals. The course provides an overview of the major trends and fundamental concepts of Industry 4.0, highlighting its relevance for development. It also offers a detailed explanation of emerging technologies								
Course Objective	The course sho	uld enable the	stude	nts to						

								-			_				
			1. E	xplore	the fun	damen	tal con	cept in	Indust	ry 4.0 f	or vario	ous app	licatio	1 S.	
			2. G	ain kno	owledge	e on the	e conce	pt of se	ensors,	commu	inicatio	on and r	networ	king pro	otocol
			а	pplied	in indu	stries.									
			3. O	utline t	he use	of anal	ytics ar	nd data	manag	gement	in indu	ustrial I	оТ		
			4. E	numera	ate the	applica	ation of	compu	uting in	loT see	curity				
			5. D	evelop	soluti	on for	Real t	ime p	roblem	s and	analyz	e case	studie	s relat	ed to
industrial IoT															
			Upon	comple	tion of	this co	urse, tl	ne stud	ents w	ill be at	ole to				
1. Comprehend the basic concepts involved in industry 4.0															
2. Infer knowledge in the basics of sensors, communication									unicati	ion an	d net	works			
commercialized in industries.															
Course Outcome 3. Paraphrase the importance of Big Data analytics and data ma								mana	gement	t in indi	istrial				
								, mana	Bernein		astriar				
101 A Summarian the application of computing in LaTer with															
4. Summarize the application of computing in IOT security															
	•••		5. 11	lustrate	e the ap	-		naustr		with rea	ai-time	case st	uales.		
Prereq	uisite	s: Basi		edge o	r comp	uter ne	twork	and int	ernet						
CO, PO		PSU IV	IAPPIN	G									[[
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CO-1	3	3	3	3	2	-	1	-	2	3	3	-	2	2	
CO-2	3	3	3	3	2	-	1	-	2	3	3	2	2	2	
CO-3	3	3	3	3	2	-	1	-	2	3	3	-	2	2	
CO-4	3	3	3	3	2	-	1	-	2	3	3	-	2	2	
CO-5	3	3	3	3	2	-	1	-	2	3	3	2	2	2	
			1: W	eakly r	elated,	2: Mo	deratel	y relate	ed and	3: Stro	ngly re	lated		•	1
MODU	ILE 1:	INTRO	DUCTIO	Ν ΤΟ Ι	NDUST	RY 4.0								(6L+ 6	P)
The Fo	urth R	Revolut	ion, Glo	balizat	ion and	d Emerg	ging Iss	ues, LE	AN Pro	ductior	N Syster	ns,			
Introdu	uction	: Cybe	r Physi	cal Sys	tems a	nd Nex	kt Gene	eration	Senso	rs, Coll	aborat	ive			
Platfor	m and	d Produ	uct Lifeo	ycle M	anager	nent, A	ugmen	ted Re	ality an	d Virtu	al Real	ity,			
Artifici	al Inte	elligenc	e												
Sugges	sted R	eading	s:											CO-1	
Compa	rison	of Indu	ustry 4.0) Facto	ry and	Today's	s Factor	γ					I	BTL-3	
Lab Ex	perim	ents													
1.	Intr	oductio	on to Ai	rduino	. D:										
Z.	intr ro/Fo		on to ra	ispberr	у РГ										
Arduin		snhorn	nt Keq 7 Di	uireu											
MODU	ILF 2:		, ' ' TRIAL Id	ъT										(61+	6P)
lloT-Int	trodu	ction.	Industr	ial IoT	: Busi	ness N	/lodel	and R	eferen	ce Arc	hitectu	re.		(02.	
Topolo	gv. In	dustria	al IoT- I	avers:	lloT Se	nsing.	lloT Pro	ocessin	g. IIoT	Comm	unicati	on.			
lloT Ne	etwork	king.							0,			,			
Sugges	sted R	eading	s:												
Drivers	s, Enal	olers, C	ompell	ing For	ces and	l Challe	nges fo	or Indu	stry 4.0					CO-2	
Lab Ex	perim	ents	-						-				I	BTL-3	
1.	Inte	erfacing	g Arduir	no to Zi	gbee m	nodule									
2.	Inte	erfacing	g Arduir	no to Bl	uetoot	h modu	ule								
Softwa	are/Ec	Juipme	nt Req	uired											
Arduin	o, Zigl	bee. Bl	uetooth	า								1			

MODULE 3: B	G DATA AND IIOT ANALYTICS	(6L+ 6P)						
Big Data, Cha	acteristics and types of Big Data, Analysing of Data, Applications, Big							
Data tools, I	ntroduction to Machine Learning and Data Science, R and Julia							
Programming,	IIOT Analytics, Role of Analytics in IIOT, Data visualization Techniques.							
Suggested Re	adings							
Software Defi	ned Networking	CO-3						
Lab Experime	nts	BTL-3						
1 Meas	urement of temperature values of the process							
2 Meas	urement of pressure values of the process							
Software/Fou	inment Required							
Arduino/Rasn	perry ni/Node mcu							
MODULE 4: II	of SECURITY	(6I + 6P)						
Industrial IoT	Security Cloud Computing in IIoT Fog Computing in IIoT	(01) 017						
Suggested Rea	adings:							
Data Manager	nent using Hadoop							
Lab Experime	nts	CO-4						
Modules and	Sensors / Actuators Interfacing (IR sensor, Ultrasonic sensors, Soil	BTL-3						
moisture sens	or. Relay. Motor. Buzzer)							
Software/Equ	ipment Required							
Raspberry pi/node mcu, Relay, Motor, Buzzer, Sensors								
MODULE 5: APPLICATIONS AND CASE STUDIES (6L+ 6P)								
Industrial IoT-	Application Domains: Automobile, Oil, chemical and pharmaceutical							
industry Applications of UAVs in Industries Real case studies: Smart Home Smart								
Farm and Smart Car								
Suggested Peoplings								
Automobile M	anufacturing Industries	CO-5						
Lob Exporimo		BTL-3						
Smart home a	nnlications							
Software/Fau	inment Bequired							
Embedded PC	based development boards							
1								
1.	Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", Apr	ess, 2016.						
2.	Ismail Butun, "Industrial IoT : Challenges, Design Principles, Application	ons, and Security", first						
	edition, Springer, 2020.							
REFERENCE B	OOKS							
1.	Christoph Jan Bartodziej, "The Concept Industry 4.0: An Empirical Ar	alysis of Technologies						
	and Applications in Production Logistics", Springer, 2017.							
2.	Rajkamal, "Embedded System: Architecture, Programming and Design	", 3rd edition, McGraw						
	Hill Education, 2017.							
E RESOURCES	FOR REFERENCE							
1.	https://www.pdfdrive.com/industry-40-industrial-revolution-of-the-	21st-century-						
	e187573163.html							
2.	2 https://download.e-bookshelf.de/download/0007/6832/86/L-G-0007683286-							
	0014731014 pdf							
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MOOC								
1	L https://onlinecourses.nntel.ac.in/noc20_cs24/preview							
1.	https://onlinecourses.nptel.ac.in/noc20_cs24/preview							

COURSE	TITLE				DES	IGN PRO	DJECT-4	,			CR	EDITS		1
COURSE	CODE	EA	AT5180	5	COURS	E CATEC	GORY		EEC	2	L-1	-P-S	0-	0-2-6
Version			1.0		Approv	al Deta	ils	36 th	n ACM		LE/ LE	ARNING VEL	B	STL-5
ASSESSM	IENT SC	HEME												
First Re	view	Seco	nd Rev	iew	Thir	d Revie	w		Pro	ject Rep	oort & \	/iva Voo	e	
20%	6		20%			10%					50%			
Course Descripti	on	This co require founda engine import be use are uti	ourse p ed to an ation fo eering ki tance of d in the lised to	rovides alyse th r under nowled f engine execut develo	the stu ne real ti standin ge. This eering co ion of th p an inn	dent sig me prol g the di course s oncepts ne desig ovative	gnifican olem sta fferent suitable and its n metho , econol	t desigr atement types o for gen relevan odology mic solu	n experi and giv f social eral eng t applic . The re ution to	ence w ves a stro probler gineerin ations. sources the sele	ith the ong Eng ms and g stude Differen and tea ected pr	knowled ineering its solut nts to ui nt Simul im mana roblem.	dge and gand Pr tion bas ndersta ation to agemer	d skills actical sed on nd the pols to at skills
Course Objective		The co 1. Den produc 2. Enco course 3.Deve empha	ourse wi nonstra ct that h ourage es. elop pro asizing t	ll enabl te a wid nas pass multidis oblem so hem to	e the stu de range sed thro sciplinar plving, a prepare	udents t e of the ugh the y resear nalysis, e projec	to: skills le design, rch by ir synthes t report	earned of analysintegrati asis and e c, poster	during 1 is, testir ng the c evaluati	their cong and e concepts on skills al prese	urse of valuations learne and co ntation	study b on. d in a va mmunic	y delive arious ation sl	ering a kills by
Course Outcome	2	Upon o 1. Ider 2. Imp 3. Der	complet ntify and lement nonstra	tion of t d work f practica te the ir	his cour or the r al solution portar	rse, the eal life i ons to t nce of Ei	student needs o he socie ngineeri	s will be f the so etal prob ing conc	e able to ciety olem cepts an	o id its rel	evant a	pplicati	on	
Prerequi	sites: D	esign Pr	oject-3											
со, ро а	ND PSC) MAPP	ING	1	1	1								
	PO-1	PO-2	PO - 3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO - 10	РО- 11	PO- 12	PSO- 1	PSO- 2
CO-1	3	3	2	2	3	2	2	3	3	3	3	1	1	2
CO-2	3	3	3	2	3	2	2	3	3	3	3	1	2	1
CO-3	3	3	3	2	3	2	2	3	3	3	3	1	2	2

Weightage of Assessment:

Review / Examination Scheme	Weightage
First Review	20%
Second Review	20%
Third Review	10%

End Semester Viva Voce	50%

A committee shall be constituted by the HoD for the Review.

Assessment Rubrics

Parameter	Weightage (%)
Title & Objectives	5.0
Review of Literature (RL)	10.0
Design / Implementation	10.0
Methodology	5.0
Planning of Project Work	5.0
Testing Environment / Test Cases	5.0
Analytical thinking [*]	5.0
Technical Knowledge*	5.0
Presentation [*]	10.0
Demonstration*	5.0
Individual Roles Distribution [*] (Individual Objectives in the project work)	5.0
Individual Contributions [*] (Towards the individual objectives in the project work)	5.0
Deliverables	5.0
Team- work	10.0
Report / Thesis	5.0
Peer Assessment*	5.0

* - Attributes for individual contribution.

COURSE		PROFESSIONAL	SKILL A	AND ETHICS		CR	EDITS	Non Credit
COURSE CODE	ETP51854	COURSE CATEGORY	,	МС	L-1	' – P –	S	0-0-3-2
Version	1.0	Approval De	etails	41ACM Dt. 13 Jul 24	LEARN	ING L	EVEL	BTL – 3
		CIA						ESE
First Periodical Assessment	Second Periodical Assessment	Practical Assessments	Ob reco by t I Cor	servation / lab rds as approved he Department Examination mmittee "DEC"	Attenda	nce	Theor	y Practical
15%	15%	10%		5%	5%		25%	25%

Cours Descript	e ion	The Gr prepar covers commu interac needeo	oomin e the s esser unicatio tive se d to exc	g and N tudent ntial a on, res essions, cel in jo	Vlock In s for su aspects ume b , and re ob inter	tervie ccessf of uilding eal-wo	w Train ul camp persor g, and orld sce and pro	ing cou ous pla- nal gra intervia narios, ofessio	urse is a cemen ooming ew pre stude nal env	a focuse ts and p g, pro paratic nts wil vironme	ed 10-l profess fessior pn. Thr I gain ents.	nour pr sional c nal eti rough p the ski	ogram areers. iquette practica Ils and	desig This e, ef al exe conf	ned to course fective rcises, idence
Cours Objecti	e ve	1. 2. 3. 4. 5.	To er To im To cr To pr To pr	nhance nprove eate cu repare rovide p	persor verbal ustomis studen oractica	al gro and no ed res ts for v al expe	oming a on-verb umes a various rience	and pro bal com ind cov types o throug	ofession munica er lette of inter h mock	nal etic ation sl ers as p views. < interv	juette. kills. er job iews a	role. nd grou	ıp disci	ussior	15.
Cours Outcon	e ne	Upon c 6. Exhik envir 7. Com clarit 8. Form achie 9. Prepa 10. impro	omplet oit appronumer munica y, artic ulate v vemer are for Enga ove per	tion of ropriations. te effe ulation vell-str nts, and differe ge con rforma	this cou e perso ectively n, and a uctured l experi ent type fidentl nce.	and c and c pprop d, targ iences s of in y in n	he stud coming riate to eted re terview nock in	ents w ; and pi ntly in one. esumes vs (HR a terviev	ill be a rofessio verbal and co and Teo vs, rec	ble to onal att and no over let chnical eeiving	ire sui on-verl ter tha), knov and ir	table fo bal inte at highl wing wh acorpor	or vario eraction ight re nat each ating f	bus bu ns, er levan h asse feedb	isiness isuring t skills, esses. ack to
Prerequi	sites:	Plus Tw	o Engli	sh-Inte	rmedia	ite Lev	el								
CO, PO A	AND P		PPING	P		- P	Р	DO	Р	DO1		DO1	PSO	PSC)
CO/PO	PC 1	2	3	Ŏ 4	5	Ô	0 7	8	Õ	0	11 11	2	1	2	-
CO1	-	-	-	-	-	-	-	2	1	2	-	3	1	1	
CO2	-	-	-	-	-	-	-	2	2	2	-	3	0	1	
CO3	-	-	-	-	-	-	-	2	2	2	-	3	1	1	
CO4	-	-	-	-	-	-	-	-	1	2	2	3	1	1	
CO5	-	-	-	-	-	-	-	-	2	2	2	3	1	1	
			1: Wea	kly rela	ated, 2	: Mod	erately	relate	d and 3	: Stron	gly rel	ated			
Module	1 : Bl	JSINESS	ETHIC	S AND	ETIQU	ETTE									(9P)
Importar Personal to profes Dining Et	nce of hygie ssiona iquet	person ne and I behav tes	al groo groom 'ior-Bu:	ming-[ing tip: siness	Dressing s- Make etiquet	g for si eup an ites: D	uccess: d acces o's and	Busine ssories d don't	ss forr for a p s-Pract	nal anc professi tice for	l busin onal lo profe	ess cas ook- Int ssional	ual atti roduct dressi	ire- ion ng,	CO-1 BTL-2
Module	2: T	AILORIN	IG AND	O CUST	OMIZIN	IG RES	SUME T	O MEE	T JOB	ROLE IN	ICLUD	ING CO	VER LE	TTER	(9P)
Key com Action ve descripti Research	poner erbs ir on- C iing fo	nts of a Resum ustomiz or the cc	profess e-Resu ing co mpany	sional i me doʻ ver let vand g	resume 's and c ters fo aining c	- Tailo lon'ts- r spec details	ring yo Review ific rol of the	ur resu ving an es, Pre job des	ume fo d refini paratic scriptio	r differ ing stud on of (n	ent jok Jent re Checkli	profile sumes st and	es- Use as per Portfo	e of job lio,	CO-2 BTL- 3
Module	3: VE	RBAL AN		N-VER	BAL PRE	SENT		N THE	INTER	VIEW					9P)
Effective professic	spea onal s	king ski etting-	lls-Arti Makin	culatio g first	n and impres	clarity sion-	-Tone a Non-Ve	and pit rbal C	ch con ommui	itrol- Ir nicatio	ntroduo n: Imp	cing on ortance	eself i e of bo	n a ody	CO-3 BTL- 3

lang	uage-Eye contact, facial expressions, and gestures- Posture and handshake- Magics of smile in	
inter	view-Role-playing exercises to enhance non-verbal cues- Time management in interviews	
Mod	lule 4: INTERVIEW PREPARATION TECHNIQUES	(9P)
Over	view of different types of interviews: HR and Technical-Understanding what each type of	
inter	view assesses- Discussing frequently asked interview questions- STAR method for answering	CO-4
beha	avioural questions (Situation, Task, Action, Result)- Practice for answering common questions in	BTL-3
pairs	s, Removing Fear, nervousness and anxiety using relaxation method and breathing techniques	
Mod	lule 5 : MOCK INTERVIEWS AS PER JOB ROLE AND FEEDBACK	(9P)
Simu	lated one-on-one interviews as per job description with feedback-Role-playing in different	
inter	view scenarios (HR, Technical)- Time management in responses-Feedback to Each Student	
rega	rding merits and scopes for improvement, Advanced strategies for handling difficult interview	CO-5
ques	tions, Negotiation skills and salary discussions, Interaction with Alumni Ambassadors-Full length	BTL-3
Pane	el Interview Follow-Up Emails and Letters- Maintaining Professional Connections and networking	
TEXT	BOOK	
	Collins, Allan (2016). HR Interview Secrets: How to Ace Your Next Human Resources Interview	, Dazzle

Semester VII

COURSETIT	.E		ENG	LISH FO	OR COMP	ETITIVE EXAMINATIO	ONS		CREDITS	1		
COURSE	CODE		GLS51	.006	COURS	E CATEGORY	HS	HS L-T-P-S				
VERSION	1	L	APPR	OVALI	DETAILS	35 th ACM		LEAR	NING LEVEL	BTL-4		
ASSESSMENT	SCHE	ME										
				CIA					E	SE		
First Periodi Assessmen	cal t 4	Seco Perio Assess	ond dical sment	Pra Asse	octical esment	Surprise Test / Quiz., as approved by the Department Examination Committee "DEC"	Attendance Practical			Attendance Practical		Theory
15 %		15	%	1	0 %	5 %	5 9	%	25 %	25 %		
Course Description	TI CC CC ai	This compe compe compro ind exa	ourse p titive ex ehensior am strue	rovide ams, si n, and cture b	s studen uch as Eng critical th etter.	ts with the skills a glish grammar, vocab inking. It also helps tl	and strat ulary, rea hem to u	tegies Iding a Inderst	needed to nd writing ski and the Englis	succeed in Is, listening sh language		
Course Objective	1 le 2 tc 3 d 4	L. To evel and de 2. T o ques 3. A leman I. To	o provid nd empl bates. o prepa stions ba ssisting ds. o give st	e an e oy tho re the ased of studer udents	nvironme se abilitie students n them. nts in dev	nt where people may s in regular conversa to read literary mate eloping social aware in which to take con	y compet ition, pre erials, con ness and npetitive	e on b sentat mpreh positiv exams	oth a formal ions, group d end them, an ve responses	and casual iscussions, d respond to societal		
Course Outcome	U 1 2. 3	Jpon c . Ac . Impr exar 8. Deve	completi cquire kr rove voc minatior elop criti	on of t nowled abular ns. ical thi	his cours ge of the y and gra nking and	e, the students will b structure and forma mmar to increase suc I problem-solving skil	e able to t of comp ccess in c lls to ans	; oetitive ompet wer co	e examination itive mplex questio	s. ons.		

		4	. Analy:	se the	ir vocab	ulary a	nd com	nmunic	ation al	bility to	build	the kno	owledg	e of id	ioms,
		р	hrasal v	erbs a	nd com	monly ι	used ex	pressio	ns for b	etter p	roducti	ivity, jol	o perfo	rmanc	e and
		to	o develo	op self	-confide	nce.									
		5	. Learn	how to	o approa	ach and	solve o	compre	hensior	n and e	ssay qu	estions	with		
			confic	lence.											
Prereq	uisite	s:-Inte	rmedia	teLeve	el										
CO,PO	AND	PSO M	APPIN	G											
C	0	PO1	PO2	РО	РО	РО	PO6	РО	РО	PO9	PO1	PO1	РО	PS	PS
				3	4	5		7	8		0	1	12	01	02
CO	1	-	-	-	-	-	-	-	-	-	3	-			-
CO	2	-	-	-	-	-	-	-	2	2	3	-			-
CO	3	-	-	-	-	-	-	-	-	-	3	-			-
CO	4	-	-	-	-	-	-	2	-	-	3	2			-
CO	5	-	-	-	-	-	-	-	-	2	3	2			3
		1:W	eaklyre	elated,	2:Mode	ratelyr	elateda	and3:St	ronglyr	elated					
MODU	LE 1													(6P)	
Introdu	uction	to Cor	npetiti	ve Exa	ms - IEL	ΓS, TOE	FL etc.,							CO-1	
Precis	writin	g – Typ	bes of L	etter v	vriting –	Busine	ss Lette	ers – Le	tters fo	or empl	oyabilit	y		BTL-2	2
MODU	LE 2													(6P)	
Readin	g Con	nprehe	nsion-	Cloze ⁻	Fest- Pa	ssage C	omplet	ion-Pra	ictice Te	est – Lis	stening			CO-2	2
Compr	ehens	ion Ex	ercise (Lab)										BTL-	3
MODU	LE 3													(6P)	
Spottin	ig Erro	ors- Se	ntence	Impro	vement	-Practic	e Test							CO- 3	3
														BTL-	3
MODU	LE 4													(6P)	
Para Ju	mble	s- Trac	ing Odo	l Sente	ences- S	ynonym	ns and A	Antony	ms-Prac	ctice Te	st			CO-4	
														BTL-	
														3	
MODU	LE 5													(6P)	
Idioms	and	Phrase	s, One	Word	l Substit	ution,	Active	and Pa	issive V	'oice, D	irect-Ir	ndirect		CO-5	
Speech	-Prac	tice Te	sts											BTL-3	
TEXT-B	ООК														
1.	Gen	eral Er	nglish fo	or Com	petitive	Exams	, by Dr.	Rashm	ii Singh,	, 2 nd Ed	ition				
REFERE	INCEE	BOOKS													
1.	TOE	FL													
E-REFE	RENC	ES													
1	http	os://wv	vw.care	ers36	0.com/a	ll-eboo	<u>ks</u>								
2	http	os://wv	vw.dish	apubli	ication.c	om/eb	<u>ooks</u>								
3	http	s://wv	vw.visio	onias.r	et/p/fre	e-e-bo	oks-for	-all-cor	npetitiv	<u>/e.htm</u> l					
4	http	s://wv	vw.fday	/talk.co	om/ebo	oks/									
моос															
1	http	s://wv	vw.mod	oc-list.	com/tag	s/engli	<u>sh</u>								

COURSE TITLE	Fundamentals	of Finite Elen	nent Analysis	CREDITS	4
COURSE CODE	EAT51015	COURSE CATEGOR Y	PC	L-T-P-S	2-1-2-2
VERSION	1.0	APPROVA L DETAILS	36 th ACM	LEARNING LEVEL	BTL-4
ASSESSMENT	SCHEME				
		CIA			ESE

Firs Perioo Assess t (The	st dical smen eory)	P As (Seconc eriodic sessme Theory	l al ent /)	Pract Asses	ical sment:	Ob ar	oservat recor oprove Depart Examir Comm "DE	ion / la ds as d by the tment nation nittee CC"	b e Att	endanc e	Theor y	Prac	tical
15	%		15%		1	.0%		5%	6		5%	25%	25	5%
Cou Descri	rse ption	This c and f provi traini	course luid flo de kno ing on a	aims to w prot wledge analysi	o make blems w e on ma s of eng	the stu vith the athema gineerir	idents help c tical ba ng prot	expert of finite ackgrou olems u	in solvi eleme Ind in t Ising FE	ng the e nt meth he FE ar A packa	ngineer ods proo nalysis an ges.	ing structu cedure. Als nd provide	ral, ther o aims t hands-c	mal o on
Course Object	e tives	The c 1. 2. / 3. / 4. 5. /	ourses Identify Apply t Analyse Evaluat Apply t	should y the m he pro e the p te the p he Hea	enable nathem cedure rocedu procedu nt trans	the stu atical a of stat re of st ure of d fer and	udents nd phy ic struc atic str lynami fluid f	to: vsical pr ctural a ructura c analy low pro	rinciple nalysis l analys sis oblem i	s underl in 1D ap is in 2D n 1D and	lying in f oproach approac d 2D app	inite eleme h proach	ent metł	nod
Course Outcor Prereq	e mes quisites	Upon 1. 2. / 3. / 4. 5. S :: Nil	i compl Interpr Methor Apply s Analyse Derive Solve tl	letion o et the d (FEM tatic st e static and so he Hea	of this c mather) as app cructura structura lve dyn t transf	course, natical olied to al analy ural ana amic an fer and	the stu and ph solid r sis pro alysis ir nalysis fluid fl	idents nysical mechar blems n 2D ap structu ow pro	will be principl nics anc in 1D aj proach ıral pro blem ir	able to les unde l therma pproach blems n 1D and	rlying th al analys I 2D app	ie Finite Ele is roach	ement	
CO, PC	AND	PSO M	APPIN	G										
CO:	РО	РО	РО	РО	DOE	РО	DO7	РО	РО	PO1	РО	PO 12	PSO	PSO
003	1	2	3	4	FOJ	6	F07	8	9	0	11	FO 12	1	2
CO-1	3	3	1	3	3	1	1	-	-	-	1	3	3	3
CO-2	3	3	2	3	3	1	-	-	-	-	-	3	3	3
CO-3	3	3	3	3	3	2	1	-	-	-	-	3	3	3
	3 2	ঠ ০	3 2	3 2	ろ 2	1	- 1	-	-	-		3 2	3 2	3 2
0-5	5		Veaklv	Correl	ated 2	- Mod	 eratelv	Correl	ated ar	- nd 3 - Sti	rongly (orrelated	5	5
Modul	le 1 – II	NTROD		N	4104,2	11104	cratery	001101				(6L+3T+6	P)
Engine transie of FEN limitat packag solutio	eering c ent pro 1 to stru- ions of ges. Sol on - Var	lesign a blems. uctural FEM. ution a iationa	analysi Conce I analys Test for of Bour al meth	s-mear pts of I sis, hea r conve ndary v nods - N	ning and FDM, Fl t transf ergence alue pr Ainimu	d purpo EM, FVI fer and e. Eleme oblem m total	ose, ste M. Step fluid fl ent chc – Integ poten	eady sta os invo ow pro vice. Co gral forn tial ene	ate, pro lved in oblems. mmerc mulatio ergy for	ppagatio FEM. Ap Advant ial finite n for nu mulatio	n and oplicabili ages and e elemer imerical n.	ty J It	CO-1 BTL-4	
Practic	cal Exp	erimer	nts											
	1. Fo	orce ar	nd stres	s analy	/sis of t	russes								
	2. St	ress ai	nd defl	ection	analysi	s in var	ious be	eam wi	th diffe	rent loa	d types			· D)
Modul	le 2 – C	DNE DII	MENSI	ONAL	INITE	ELEMEN	NT ANA	ALYSIS				(6L+3T+6	P)

USE	e of bar and beam elements in structural analysis. Bar Element – Stiffness matrix	
for	mulation by direct and polynomial methods. Boundary condition and assemblage	
cor	ncepts. Beam element characteristics matrix. Global, local, natural coordinates.	CO-2
Pra	actical Experiments	BTL-4
	1. Stress analysis of a rectangular plate with circular hole	
	2. Stress analysis of the corner angle bracket	
Мо	odule 3 – TWO DIMENSIONAL FINITE ELEMENT ANALYSIS	(6L+3T+6P)
Lin qua axi: Pra	 ear and quadratic Triangular elements - Rectangular elements - Quadratic adrilateral elements - 2D elements applications for plane stress, plane strain and s-symmetric problems. Treatment of boundary condition. Iso Parametric elements. actical Experiments Stress analysis of an axis-symmetric component Stress and deflection analysis in various beam with different load types 	CO-3 BTL-4
Ma		(61 +3T+6P)
	Ddule 4 – STRUCTURAL AND DYNAMIC ANALYSIS	(01+31+0P)
1D vib Cas sha wo Pra	 & 2D problems in Solid mechanics. Dynamics problems representation in FE. Free ration problem formulation. Torsion of non-circular shaft - axisymmetric problem. See Studies like Structural analysis of Chassis Frame, Whirling speed of propeller aft, contact analysis of gears, modal analysis of suspension system, impact, crash orthiness etc. actical Experiments Thermal stress analysis within the rectangular plate Convective heat transfer analysis of a 2D component 	CO-4 BTL-4
1	•	
Mo	odule 5 – HEAT TRANSFER AND FLUID FLOW ANALYSIS	(6L+3T+6P)
Mo 1D cor pist Pra	bdule 5 – HEAT TRANSFER AND FLUID FLOW ANALYSIS & 2D problems in fluid mechanics and heat transfer by conduction and nvection. Transient thermal analysis. Case Studies like Heat transfer analysis of ton, fins. Actical Experiments	(6L+3T+6P) CO-5 BTL-4
Mc 1D cor pist Pra	bdule 5 – HEAT TRANSFER AND FLUID FLOW ANALYSIS & 2D problems in fluid mechanics and heat transfer by conduction and neutron. Transient thermal analysis. Case Studies like Heat transfer analysis of ton, fins. bactical Experiments 1. Modal analysis of various beam with different load types 2. Harmonic analysis of a 2D component	(6L+3T+6P) CO-5 BTL-4
Mc 1D cor pist Pra	 bodule 5 – HEAT TRANSFER AND FLUID FLOW ANALYSIS & 2D problems in fluid mechanics and heat transfer by conduction and neuction. Transient thermal analysis. Case Studies like Heat transfer analysis of ton, fins. bodule Experiments Modal analysis of various beam with different load types Harmonic analysis of a 2D component Simulation of carring mass system using MAT LAP 	(6L+3T+6P) CO-5 BTL-4
Mo 1D cor pist Pra	 Adule 5 – HEAT TRANSFER AND FLUID FLOW ANALYSIS & 2D problems in fluid mechanics and heat transfer by conduction and neuction. Transient thermal analysis. Case Studies like Heat transfer analysis of ton, fins. Actical Experiments Modal analysis of various beam with different load types Harmonic analysis of a 2D component Simulation of spring-mass system using MAT LAB 	(6L+3T+6P) CO-5 BTL-4
Mo 1D cor pist Pra	 bodule 5 – HEAT TRANSFER AND FLUID FLOW ANALYSIS & 2D problems in fluid mechanics and heat transfer by conduction and neuction. Transient thermal analysis. Case Studies like Heat transfer analysis of ton, fins. bodule Experiments Modal analysis of various beam with different load types Harmonic analysis of a 2D component Simulation of spring-mass system using MAT LAB KT BOOKS N. Reddy, "Finite Element Methods", 2nd Edition, 6th Reprint, Tata McGraw Hill. 	(6L+3T+6P) CO-5 BTL-4
Mc 1D cor pist Pra	 A Section 10 Section 2010 Section 2	(6L+3T+6P) CO-5 BTL-4 2015 012
Mc 1D cor pis' Pra TEX 1 2 REI	 A popule 5 – HEAT TRANSFER AND FLUID FLOW ANALYSIS & 2D problems in fluid mechanics and heat transfer by conduction and invection. Transient thermal analysis. Case Studies like Heat transfer analysis of ton, fins. Actical Experiments Modal analysis of various beam with different load types Harmonic analysis of a 2D component Simulation of spring-mass system using MAT LAB XT BOOKS N. Reddy, "Finite Element Methods", 2nd Edition, 6th Reprint, Tata McGraw Hill, P. Seshu, "Text Book of Finite Element Analysis" 10 Reprint PHI Learning Pvt. Ltd. 20 	(6L+3T+6P) CO-5 BTL-4 2015 012
Mc 1D cor piss Pra TE) 1 2 REI 1	 bdule 5 – HEAT TRANSFER AND FLUID FLOW ANALYSIS & 2D problems in fluid mechanics and heat transfer by conduction and nvection. Transient thermal analysis. Case Studies like Heat transfer analysis of ton, fins. bactical Experiments Modal analysis of various beam with different load types Harmonic analysis of a 2D component Simulation of spring-mass system using MAT LAB KT BOOKS N. Reddy, "Finite Element Methods", 2nd Edition, 6th Reprint, Tata McGraw Hill, P. Seshu, "Text Book of Finite Element Analysis" 10 Reprint PHI Learning Pvt. Ltd. 24 FERENCE BOOKS Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, "Concepts and a element analysis" 4th edition, John Wiley & Sons, 2017 	(6L+3T+6P) CO-5 BTL-4 2015 012 applications of finite
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Мс 1D cor pis ^s Рга ТЕЭ 1 2 REI 1 2 E B	bdule 5 – HEAT TRANSFER AND FLUID FLOW ANALYSIS & 2D problems in fluid mechanics and heat transfer by conduction and hvection. Transient thermal analysis. Case Studies like Heat transfer analysis of ton, fins. actical Experiments 1. Modal analysis of various beam with different load types 2. Harmonic analysis of a 2D component 3. Simulation of spring-mass system using MAT LAB XT BOOKS J. N. Reddy, "Finite Element Methods", 2nd Edition, 6th Reprint, Tata McGraw Hill, P. Seshu, "Text Book of Finite Element Analysis" 10 Reprint PHI Learning Pvt. Ltd. 20 FERENCE BOOKS Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, "Concepts and a element analysis", 4th edition, John Wiley & Sons, 2017 Krishnamurthy,C.S., Finite Element Analysis, Tata McGraw Hill. 2013	(6L+3T+6P) CO-5 BTL-4
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CO-2	2	2	-	-	3 2	-	-	1	2	-	-	2	1	2	
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MODU	JLE 1-	MAINTE		OF REG	CORDS	AND SC	HEDUL	ES					(6L	+6P)	
Importa mainte Mainte Practic	ance o nance nance al: Stu	ance of maintenance, preventive (scheduled) and breakdown (unscheduled) nance, requirements of maintenance, preparation of checklists. Inspection schedule, nance of records, log sheets and other forms, safety precautions in maintenance. BTL-3 al: Study the layout of automobile repair shop, tools and instruments.													
MODU	LE 2 - I	ENGINE I	MAINTE	NANCE	- REPA		OVER	AULIN	G				(6L	+6P)	
Dismar inspect methor	ntling c ions, r ds, eng	of engine ninor and gine asse	compo d major mbly, sp	nents a recond pecial to	nd clea litioning pols use	ning, cl g of vari ed for m	eaning ous cor aintena	method nponen ance ove	ls, visua its, recc erhaulir	II and di Indition Ing, engi	mensio ing ne tune	nal up.	CC BT	D-2 'L-3	

Practical: 1. Cylinder reboring.2. Valve grinding and valve lapping 3. Fault diagnosis of petrol and diesel fuel system and filters & air cleaners.							
MODULE 3 - CHASSIS MAINTENANCE - REPAIR AND OVERHAULING	(6L+6P)						
Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system. Maintenance servicing of suspension systems. Brake systems, types and servicing techniques. Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing. Practical: 1. Adjustment of pedal play in clutch, brake, hand brake and steering wheel. 2. Removal of tyre & tube.3. Wheel balancing and alignment 4. Brake bleeding and adjustment MODULE 4 - ELECTRICAL SYSTEM MAINTENANCE - SERVICING AND REPAIRS							
MODULE 4 - ELECTRICAL SYSTEM MAINTENANCE - SERVICING AND REPAIRS	(6L+6P)						
Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems. Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.	CO-4 BTL-3						
Practical: Fault diagnosis of ignition, starting and charging system.							
SYSTEMAND VECHICLE BODY	(6L+6P)						
 Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply. Cooling systems, water pump, radiator, thermostat, anti-corrosion and antifreeze additives. Lubrication maintenance, lubricating oil changing, greasing of parts. Vehicle body maintenance, Minor and major repairs. Door locks and window glass actuating system maintenance. Practical: 1. Calibration of fuel injection pump 2. Fault diagnosis of petrol and diesel fuel system and filters & air cleaners. LIST OF EQUIPMENTS: Engine Analyzer Cylinder compression pressure gauge Vacuum gauge Tachometer Wheel balancer and Wheel aligner Tyre remover Bearing puller Cylinder reboring machine Valve grinding machine Valve lapping machine Fuel injection calibration test bench with nozzle tester 	CO-5 BTL-3						
TEXT BOOKS							
 John Duke "Fleet Management", McGraw-Hill Co. USA, reprint 2012. Jigar A. Doshi, Dhruv U. Panchal and Jayesh P. Maniar, Vehicle Maintanance and Gara Prentice Hall f India, 2014. 	geE Practice ,						
REFERENCE BOOKS							
1 James D Halderman - Advanced Engine Performance Diagnosis - PHI - 2011. 2 Service Manuals from Different Vehicle Manufacturers							
E BOOKS							

1	https://books.google.co.in/books?id=WMAwBToKbvgC&pg=PA8&dq=vehicle+diagnostics&hl=en&sa=X &ved=0ahUKEwiXxd2Jst7ZAhWMo48KHQhfAAcQ6AEILDAB#v=onepage&q=vehicle%20diagnostics&f=f
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1	https://www.udemy.com/topic/car-repair/
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2	https://alison.com/topic/learn/144741/introduction-to-car-maintenance-learning-outcomes
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COURS TITLE	E	ADVANCED VEHICLE TECHNOLOGY CREDITS 3													
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CO-4	2	1	2	3	2	-	-	-	-	-	1	2	2	1	
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MODU	LE 1:	TRENDS	IN POV	VER PL	ANTS								(6L+ 6	P)	
Stratifie	ed cha	arge / lean burn engines - Hydrogen engines -LPG/ CNG Engines – Biogas CO-1													
Engines	s.												BTL-3		

Lab Experiments	
1. Performance test on LPG/ CNG Engine	
Equipment Required	
1. LPG/ CNG Engine	
MODULE 2: SUSPENSION, BRAKES AND SAFETY	(6L+ 6P)
Air suspension - Closed loop suspension - antiskid braking system, Brake Retarders,	
Regenerative braking -vehicle safety - air bags - crash resistance - passenger comfort.	
Lab Experiments	
1. Test on suspension system	
2. Test on brake	CO-2 BTL-3
Equipment Required	
1. Suspension systems	
2. Brakes	
MODULE 3: NOISE & POLLUTION	(6L+ 6P)
Noise- Reduction of noise - Internal & external pollution control through alternate	, ,
fuels / power plants - Catalytic converters and filters for particulate emission.	
Lab Experiments	
1. Measurement of pollution in Engines	CO-3
2. Testing on catalytic convertors	BTL-3
Equipment Required	-
1. Gas analyzer	
2. Smoke meter	
3. Catalytic Convertor	
MODULE 4: VEHICLE OPERATION AND CONTROL	(6L+ 6P)
MODULE 4: VEHICLE OPERATION AND CONTROL	(6L+ 6P)
MODULE 4: VEHICLE OPERATION AND CONTROL Computer control for pollution, noise and fuel economy - Transducers and actuators -	(6L+ 6P)
MODULE 4: VEHICLE OPERATION AND CONTROL Computer control for pollution, noise and fuel economy - Transducers and actuators - Information technology for receiving proper information and operation of the vehicle	(6L+ 6P)
MODULE 4: VEHICLE OPERATION AND CONTROL Computer control for pollution, noise and fuel economy - Transducers and actuators - Information technology for receiving proper information and operation of the vehicle like optimum speed and direction.	(6L+ 6P)
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MODULE 4: VEHICLE OPERATION AND CONTROL Computer control for pollution, noise and fuel economy - Transducers and actuators - Information technology for receiving proper information and operation of the vehicle like optimum speed and direction. Lab Experiments 1. Measuring noise 2. Measuring fuel economy	(6L+ 6P) CO-4 BTL-3
MODULE 4: VEHICLE OPERATION AND CONTROL Computer control for pollution, noise and fuel economy - Transducers and actuators - Information technology for receiving proper information and operation of the vehicle like optimum speed and direction. Lab Experiments 1. Measuring noise 2. Measuring fuel economy 3. Testing actuator	(6L+ 6P) CO-4 BTL-3
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MODULE 4: VEHICLE OPERATION AND CONTROL Computer control for pollution, noise and fuel economy - Transducers and actuators - Information technology for receiving proper information and operation of the vehicle like optimum speed and direction. Lab Experiments 1. Measuring noise 2. Measuring fuel economy 3. Testing actuator Equipment Required 1. Noise measuring device 2. Fuel measuring device 3. Actuator MODULE 5: VEHICLE AUTOMATED TRACKS Preparation and maintenance of proper road network - National highway network with automated roads and vehicles - Satellite control of vehicle operation for safe	(6L+ 6P) CO-4 BTL-3 (6L+ 6P)
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2	Bosch Hand Book, 3rd Edition, SAE, 2013								
E Resou	E Resources for Reference								
1.	https://books.google.co.in/books?id=aLgNET9YkS0C&pg=PA368&dq=modern+vehicle+technolo								
	gy+by+heinz&hl=en&sa=X&ved=0ahUKEwjsq9nVpZHaAhVKo48KHfXqDaAQ6AEIJjAA#v=onepage								
	&q=modern%20vehicle%20technology%20by%20heinz&f=false								
2.	https://books.google.co.in/books?id=Ek0Cxo4rfnMC&printsec=frontcover&dq=modern+vehicle								
	+technology+by+heinz&hl=en&sa=X&ved=0ahUKEwjsq9nVpZHaAhVKo48KHfXqDaAQ6AEINTAD								
	#v=onepage&q=modern%20vehicle%20technology%20by%20heinz&f=false								
MOOC									
1.	www.moditech.com/en/training/modern-vehicle-technology-special								
2.	https://www.edx.org/course/hybrid-vehicles								

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COURSE	TITLE	Research Methodology & IPR CREDITS 2												
COURSE	CODE	EGE5	51005 COURSE CATEGORY ES L-T-P-S										2-0	-0-2
Version		1	0 Approval Details 36 th ACM LEARNING LEVEL									BT	ʻL-3	
ASSESS	MENT S	CHEME	IEME											
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Fir: Perio Assess	First Second Periodical Seminar/Assign ments/Project t			sign ect	Surpri etc., a the l Exa Comm	se Test s appro Departi aminat nittee "	/ Quiz oved by nent ion DEC""	,	Attenda	ance	E	SE		
15	%	1	5%		10%			5%			5%		50	0%
Course Descript	tion	The Meth where prepa taugh V will	The students shall develop a detailed insight about various aspects of Research Methodology and IPR. Research Process and its type will be discussed in the Module I, whereas research variables were briefed in the Module II. Detailed procedure of data preparation and analysis will be discussed in the Module IV. Finally, Module taught in the Module III, report writing will be discussed in the Module IV. Finally, Module											
Course Objectiv	/e	1. 2. 1 3. 1 4. 1 5. 1	The cou The cou Durpose to solve The cou Droblen The cou	urse air rse also urse air of obj organi urse also ns urse aim	ns to id o equip ms to p ective o zationa o trains	entify a s the st olan a decisior il proble the stu	and approved udents - systema n makin ems udents t s to Prep	reciate to deve atic out g, and o analy pare res	scientif lop the look to the met ze data search r	ic inqui skill of wards thod of and f eports	ry writing busines conduc ind solu	researd ss Situa cting sci utions to	ch prop tions fo entificio o the re	osals or the nquiry search
Course Outcom	e	 Upon completion of this course, the students will be able to Identify and appreciate scientific inquiry Develop the skill of writing research proposals Plan a systematic outlook towards business Situations for the purpose of objective decision making, and the method of conducting scientificinquiry to solve organizational problems Consolidate data and write technical reports Summarize the salient features of Intellectual Property Rights 												
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CO-5	2	3	1	1	3	2	3	2	3	3	2	3	3	3
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Business	Resea	rch – De	finitio	n and S	ignifica	nce – t	he rese	arch pr	ocess –	Types	of Rese	earch –	(,	
Explorat	orv and	d causal	Resear	rch–Th	eoretica	al and e	mpirica	al Resea	arch – (Cross -	Section	nal and		
time – s	series F	Research	neseu 1 – Res	earch	questio	ns / Pr	oblems	– Rese	arch o	hiective	- Re	search		
hypothe		haracter	ristics –	- Resea	rch in a	in evoli	utionary	/ nersne	ective -	the rol	e of th	eory in	cc)-1
research. BTL-3											L-3			
Suggested Readings:														
1. Research Hypotheses														
MODULE 2: RESEARCH DESIGN AND MEASUREMENT (6L)														
Research design – Definition – types of research design –Variables in Research – Measurement														
and Scaling – Definition – types of research design –Variables in Research – Measurement and Scaling – Different scales – Construction of instrument –Validity and Reliability of														
and scaling – Different scales – Construction of Instrument –Validity and Reliability of instrument. Types of data – Primary Vs Secondary data – Methods of primary data collection –														
Instrument. Types of data – Primary Vs Secondary data – Methods of primary data collection – Survey Vs Observation – Experiments – Construction of Questionnaire and instrument – Types – CO-2														
of Validity –Sampling plan–Sample size– determinants optimal sample size – sampling														
techniqu	cechniques – Sampling methods. BTL-3													
Suggest	sted Readings:													
1. Sam	impling Techniques													
MODUL	E 3: DA	TA PREF	PARATI	ON AN	D ANAI	YSIS							(6L)	
Data Pre	paratio	on – edit	ing – C	oding -	-Data e	ntry – V	alidity	of data ·	– Quali	tative \	/s			
Quantitative data analyses – Applications of Bivariate and Multivariate statistical														
techniques, Factor analysis, Discriminant analysis, Cluster analysis, Multiple regression and CO-3)-3			
Correlation, Multidimensional scaling.										ВТ	L-3			
Suggest	ed Rea	dings:		-										
1. Cluste	er Analy		Suggested Readings:											
1. Cluster Analysis														
MODUL	E 4: RE	PORT DE	ESIGN,	WRITIN	IG AND	ETHICS	S IN BU	SINESS	RESEAF	RCH			(6L)
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3.	http://epgp.inflibnet.ac.in/ahl.php?csrno=33 (Social work education (P05-M09)
4	http://epgp.inflibnet.ac.in/ahl.php?csrno=33(Social work education(P05-M12)
моос	
1.	https://onlinecourses.nptel.ac.in/noc23 ge36/preview
2.	https://nptel.ac.in/courses/127106227

COUR TITLE	SE			P	ROJECT	PHASE	-1	CREDITS			5	3		
COUR CODE	SE		EAT518	06	COUR CATE	RSE GORY		EEC	2	L-T-P-S			0-0-6-6	
Versio	on		1.0		Appr	oval De	tails	36th A	CM	LEARNII LEVEL	NG		BTL-5	
ASSES	SMENT	SCHEN	СНЕМЕ											
FI RE\	RST VIEW		S	ECOND	REVIEV	V		THIRD REVIEW				PROJECT REPORT & VIVAVOCE		
2	0%			20)%				10	%			50%	
Course Descri	e iption	This prac prop purp integ cont anal nurt expe	This course is designed to offer a diverse range of objectives, spanning from design and practical implementation to computational work and research-based projects. Every proposed project presents a pathway to accomplish the desired learning outcomes. The core purpose of this module is to serve as a platform for students to not only develop and integrate their existing knowledge and skills but also to explore and, in certain cases, contribute to new knowledge through literature review, experimentation, or modelling and analysis, as applicable. Moreover, the module places a strong emphasis on recognizing and nurturing students' curiosity and motivation. It strives to provide a gratifying learning experience through close interaction and guidance from an academic supervisor											
Co Obje	urse ective	The	course 1. Un ba: 2. Pro fra 3. Fin pa	will ena dertake sed on t oduce p me of t ally del per pres	ble the theore the liter rogress he proje iver a se sentatic	student etical st ature re reports ect eminar a ons and	ts to: eview p on the and pre demon	comput erforme work co pare a r stratior	er sim ed. omplet report/ n of the	ulations ed and n paper to operati	and ha naintair presen onal ha	ardware n to sche t in a fo rdware	construe edule th rum inv and sof	uction e time olving tware
Co Out	urse come	Upo	 Upon completion of this course, the students will be able to 1. Categorize the topic of interest and identify the project domain based on the societal / industry requirements 2. Reproducing the existing system and feasibility of the proposed project 3. Articulate the methodology of the project based on comprehensive Literature survey and break down to point out the methods and strategies for implementation. 											
CO, PC		-30 IVIA	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PSO-	PSO-
СО	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO- 1	3	1	2	0	0	2	1	1	2	1	1	2	2	1
CO- 2	3	1	2	0	0	2	1	1	2	1	1	2	2	2

CO- 3	3	1	2	0	0	2	1	1	2	1	1	2	2	1
	1: Weakly related, 2: Moderately related and 3: Strongly related													

The Project Work shall be carried out in the field of Automobile Engineering. Students shall work in convenient groups of not more than four members in a group. Every Project Work shall have a Supervisor. During this period the supervisor shall guide the students to implement the project. The students shall give periodical presentations of the progress made in the Project Work.

Each group shall finally produce a report covering background information, literature survey, problem statement, project work details and conclusions. This final report shall be typewritten form as specified in the guidelines. Assessment Review / Exam.

Assessment								
Review / Exam	Weightage							
First Review	20%							
Second review	20%							
Third review &DEMO	10%							
Project Report &viva Voce	50%							
TOTAL	100%							

A committee shall be constituted by the HoD for the Review

Assessment Rubrics

Parameter	Weightage (%)
Title & Objectives	5.0
Review of Literature (RL)	10.0
Design / Implementation	10.0
Methodology	5.0
Planning of Project Work	5.0
Testing Environment / Test Cases	5.0
Analytical thinking [*]	5.0
Technical Knowledge [*]	5.0
Presentation [*]	10.0
Demonstration [*]	5.0
Individual Roles Distribution*	
(Individual Objectives in the project	5.0
work)	
Individual Contributions [*] (Towards	
the individual objectives in the	5.0
project work)	
Deliverables	5.0
Team- work	5.0
Report / Thesis	5.0
Publication, Patent, Funding,	5.0
Competitions	3.0
Peer Assessment [*]	5.0

* - Attributes for individual contribution

Semester VIII

COURSE	TITLE				PROJE	CT PHA	SE-2			C	REDITS	13	3	
COURSE	CODE	EAT	51807		COURS	SE CATE	GORY	EEC	2	L	-T-P-S	0-	0-26-10)
Version		1.0			Approv	val Det	ails	37	th ACM dated .01.2023	 L 3 G	EARNIN LEVEL	В	ГL-5	
ASSESS	MENT SC	HEME												
FIRST R	EVIEW	SECOND REVIEW					THIRD REVIEW				PROJECT REPORT & VIVAVOCE			
20	%	20% 10%						50%	,					
Course Descript	This course encompasses a diverse range of objectives, catering to both design and manufacturing, computational work, and research-oriented projects. Regardless of the chosen project, all participants will have ample opportunities to attain the intended learning outcomes. The primary goal of this module is to furnish students with a platform to foster and consolidate their knowledge and skills, encouraging them to explore and potentially contribute to new knowledge through various means such as literature review, experimentation, or modelling and analysis when relevant. Furthermore, the course places significant emphasis on nurturing curiosity and self-motivation, promoting a fulfilling and engaging experience for students as they engage in close collaboration with								n and of the ended tform e and eview, course ting a n with					
Course Objectiv	re	 The course will enable the students to: 1. Undertake theoretical studies, computer simulations and hardware construction based on the literature review performed. 2. Produce progress reports on the work completed and maintain to schedule the time frame of the project 3. Finally deliver a seminar and prepare a report/paper to present in a forum involving paper presentations and demonstration of the operational hardware and software 								uction le the forum dware				
Course Outcom	Course Upon completion of this course, the students will be able to 0utcome 1. Build and demonstrate the prototype based on the technical knowledge gaine in the phase 1 2. Design Engineering solutions to real time problems utilizing system approach 3. Illustrate and interpret the graphical results obtained 4. Analyze, Evaluate and compare the performance of the results. 5. Communicate with Engineers peer team members and professionals							ained ach						
CO, PO	AND PSC	MAP	PING		1						1			
со	PO-1	Р О- 2	РО- 3	РО- 4	РО- 5	РО- 6	РО- 7	РО- 8	РО- 9	РО- 10	РО- 11	PO- 12	PS O-1	PS O-2
CO-1	3	3	2	2	3	1	1	1	3	1	3	1	3	2
CO-2	3	3	2	2	3	1	1	1	3	1	3	1	2	3
CO-3	3	3	2	2	3	1	1	1	3	1	3	1	3	2
CO-4	3	3	2	2	3	1	1	1	3	1	3	1	2	3
CO-5	3	3	2	2	3	1	1	1	3	1	3	1	3	2
1: Weak	ly relate	d, 2: N	/lodera	tely rel	ated an	d 3: Str	ongly re	lated						
The Pro	oject Wo	rk sha	all be o	arried	out in	the fie	ld of A	utomo	bile Eng	gineeri	ng. Stu	dents s	shall w	ork in
convenie	convenient groups of not more than four members in a group. Every Project Work shall have a Supervisor.													

During this period the supervisor shall guide the students to implement the project. The students shall give periodical presentations of the progress made in the Project Work.

Each group shall finally produce a report covering background information, literature survey, problem statement, project work details and conclusions. This final report shall be typewritten form as specified in the guidelines. Assessment Review / Exam.

Assessment	
Review / Exam	Weightage
First Review	20%
Second review	20%
Third review &DEMO	10%
Project Report &viva Voce	50%
TOTAL	100%

A committee shall be constituted by the HoD for the Review

Assessment Rubrics

Parameter	Weightage (%)
Title & Objectives	5.0
Review of Literature (RL)	10.0
Design / Implementation	10.0
Methodology	5.0
Planning of Project Work	5.0
Testing Environment / Test Cases	5.0
Analytical thinking [*]	5.0
Technical Knowledge*	5.0
Presentation [*]	10.0
Demonstration*	5.0
Individual Roles Distribution [*] (Individual	5.0
Objectives in the project work)	5.0
Individual Contributions [*] (Towards the	5.0
individual objectives in the project work)	5.0
Deliverables	5.0
Team- work	5.0
Report / Thesis	5.0
Publication, Patent, Funding,	5.0
Competitions	5.0
Peer Assessment*	5.0

* - Attributes for individual contribution

EVALUATION PARAMETERS FOR ASSESSMENT

To be followed same as approved for Project Phase I

Department Electives (DE)

	Vertical 1	Vertical 1 Vertical 2 Vertical 3		Vertical 4		
SEM	EV Technology	Intelligent Mobility	Engine /Vehicle Technology	Design/ Manufacturing		
	Electric Drives and Control	Instrumentation for Intelligent Mobility	Alternative Fuels and Energy Systems	Production Technology		
111	OR	OR	OR	OR		
	Policy for E-Mobility	Intelligent Transportation system	Vehicle body engineering	Integrated Product Design and Development		
11/	Battery Technology	Advanced Driver Assistance System	Automotive Pollution and Control	Computer Integrated Manufacturing		
	OR	OR	OR	OR		
	Electric and Hybrid vehicles	V2V and V2X Technology	Off Road Vehicles	Process Planning and Cost Estimation		
v	Charging Technology	ECU Model Based System Design	Vehicle Design Data Characteristics	Digital Manufacturing		
	OR	OR	OR	OR		
v	Power Electronics for EV	Cyber security for Automotive Engineers	Design of Engine Exhaust system	Industrial Automation and Robotics		
	Modelling and Simulation of EV	Automotive Safety Systems	Renewable Source of Energy	Design of Experiments		
VI	OR	OR	OR	OR		
	Coding for EV	Automotive Electronic Management System	Automotive Heating Ventilation Air Conditioning (HVAC)	Industrial Engineering and Management		
	Computer Architecture and Data Analytics	Self-Driving Cars	Vibration and Noise Control	Computational Fluid Dynamics		
VII	OR	OR	OR	OR		
vii	Smart Grid for EV	Pose estimation and state estimation of self-driving cars	Fuel Cell Technology	Lean Manufacturing and Six sigma		

Syllabus for Department Electives

<u>Semester –III</u>

Vertical 1: Electric Vehicle Technology

COURSE TITLE	ELECTRIC	CREDITS	3					
COURSE CODE	EAT51500	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2			
VERSION	1.0	1.0 APPROVAL DETAILS		LEARNING LEVEL	BTL-3			
ASSESSMENT SCHEME								
	ESE							

Fir Perio Assess t (The	st dical smen eory)	Second Periodical Assessment (Theory)		Practi Asses	ctical essments Ctical essments Observation / lab records as approved by the Department Examination Committee "DEC"		n s d t n e	tendanc e	Th	eory	Practical			
15	%		15%		1	0%		5%		5%	2	5%	25	%
Course This course giving a broad overview of Electrical Drive Systems. It is assumed that have prior exposure to Electrical Machines and Power Electronics. The contro various DC and AC motors using solid state converters are discussed. Principles of Electric Motors are introduced. Some of the applications of Electrical Drive Systems. It is assumed that the basic concents of different types of electrical machines and the basic concents of different types of electrical machines and the basic concents of different types of electrical machines and the basic concents of different types of electrical machines and the basic concents of different types of electrical machines and the basic concents of different types of electrical machines and the basic concents of different types of electrical machines and the basic concents of different types of electrical machines and the basic concents of different types of electrical machines and the basic concents of different types of electrical machines and the basic concents of different types of electrical machines and the basic concents of different types of electrical machines and the basic concents of different types of electrical machines and the basic concents of different types of electrical machines and types of									at the stu of princip of select rives are	idents les of ion of e also				
Cours Object	e :ives	1. To pe 2. To 3. To	erformation study to study t	the diffe	erent m	ethods al and s	of start olid-sta	ing D.C te drive	motors	and ind	luction	motor	s.	
Upon completion of this course, the students will be able to1.Understand the basics and types of electric drives with varying loading conditions.Course2.Understand the speed torque characteristics of motor.Outcomes3.Understand modern speed control techniques to the motor.4.Understand the various methods of speed control of DC motor.5.Understand the AC motor control techniques for different applications.														
Prereq	uisites	: Nil												
СО, РО	AND F	PSO MA	PPING									1		
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO	PO	PSO	PSO
<u> </u>	2	2	2	2	2	2	2	2	2	U 2	11 2	12	1	2
CO-2	3	2	3	2	2	3	3	2	3	3	3	3	3	3
CO-3	3	2	3	2	2	3	3	2	3	3	3	3	3	3
CO-4	3	2	3	2	2	3	3	2	3	3	3	3	3	3
CO-5	3	2	3	2	2	3	3	2	3	3	3	3	3	3
		1 - W	eakly C	orrelate	ed, 2 - N	1oderat	ely Cor	related	and 3 -	Strongly	/ Corre	lated		
Modul	e 1 – Ir	ntroduct	tion to l	Electric	Drives								(6L+	6P)
Basic – heat rating Practic Speed Braking	Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors Practical: CO-1 Speed control of universal motor using controlled rectifier BTL-3 Braking methods of DC motor CO-1								-1 -3					
Modul	e 2 – D	RIVE M	OTOR C	HARAC	TERISTI	CS							(6L+	6P)
Mecha motors and the	Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound – single phase and three phase induction motors.							-2						
Practic	al:												BT	-3
Load te	est on s	single ph	hase Ind	luction	Motor									
Speed	contro	l of Indu	iction N	lotor us	sing V/f	method	d and th	iree pha	ise volt	age sou	rce			
inverte	er													
Modul	e 3 – S	TARTIN	G METH	IODS									(6L+	6P)

Type phas Prac Load Spee	CO-3 BTL-3						
Module 4 – CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES							
Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system – Using controlled rectifiers and DC choppers –applications. Practical:							
Spee	d control of DC shunt motor	BTL-3					
Load	test on DC Shunt motor						
Load	Load test on DC Series motor						
Module 5 – CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES							
Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.							
No lo	pad and blocked rotor tests on three phase induction motor						
Load	test on three-phase induction motor.						
TEXT	BOOKS						
1.	VEDAM SUBRAHMANIAM, "Electric Drives (concepts and applications)", Tata McGrawHi	ll, 2001					
2.	NAGRATH.I.J. & KOTHARI.D.P, "Electrical Machines", Tata McGraw-Hill, 1998						
REFE							
1.	PILLAI.S.K " A first course on Electric drives", Wiley Eastern Limited, 1998						
2.	M.D.SINGH, K.B.KHANCHANDANI, "Power Electronics", Tata McGraw-Hill, 1998						
E BO							
1.	1. H.Partab, "Art and Science and Utilisation of electrical energy", Dhanpat Rai and Sons, 1994						
2.	 2. https://docs.google.com/document/d/1VUiztkaSkQlgCO- IDxDtgVQCLsMD2vc4/edit?usp=share_link&ouid=100135410077428077019&rtpof=true&sd=true 						
MOC	DC						
1.	https://professional.mit.edu/course-catalog/design-electric-motors-generators-and-dri	ive-systems					
2.	https://archive.nptel.ac.in/courses/108/104/108104140/						
3.	3. https://archive.nptel.ac.in/courses/108/104/108104011/						

COURSE TITLE	P	POLICY FOR E-MOBILITY CREDITS 3												
COURSE CODE	EAT51501	COURSE CATEGORY	DE	L-T-P-S		2-0-2-2								
VERSION	1.0	APPROVAL DETAILS	36 th ACM	LEARNING LEVEL BTL		BTL-3								
ASSESSMENT SCHEME														
CIA ESE														
First Periodical Assessment (Theory)	Second Periodica Assessment (Theory)	al Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendanc e	Theory	Practical								
15%	15%	10%	5%	5%	25%	25%								
Course	The course prov	The course provides an overall insight about policies of implementing E-Mobility across												
Description	the globe. Feed	the globe. Feedback collection and stakeholder involvement with its significances will												
be educated to the learners. Finally, course also provide detailed insights abo and demand side policies as well as sustainable ecosystem development for E-												about s or E-Mo	upply bility	
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			1.	Examine	e the ne	eed of e	e-mobili	ity and	explain	the pro	ocess of	feedba	ack colle	ection
			á	and stal	keholde	er's invo	lvemer	nt.						
Cours	•		2. I	Explain	the Sup	ply Side	e Policy	Measu	res and	types of	of Subsi	dies		
Object	e tives		3. I	Explain	Deman	d side p	olicy m	leasure	s and re	egulato	ry bodie	es		
Coject			4. /	Analyze	the im	portanc	e in bu	ilding s	ustainal	ble chai	rging in	frastruc	cture.	
			5.	Investig	gate the	e challei	nges an	d oppo	rtunitie	s in dev	eloping	an eco	system	for E-
				Mobility	/									
Upon completion of this course, the students will be able to														
1. Explain the need of e-mobility and explain the process of feedback										ack coll	ection			
	and stakeholder's involvement.													
Cours	е		2. 1	zxpiain	ne sup	ipiy Siui		weasu	res and	i types o		ules		
Outco	mes		5. I	zxpiain Apolyzo	the im	u side p	olicy II	iedsure	s anu re	guiator		:S Fractruk	turo	
			4. /	Analyze	the im	portant	e in bu	nuing si	ustainai		ging in alaning		lure.	for F
			Э. I	Mobility	,	challer	iges an	u oppo	rtunntie	sinuev	eloping	aneco	system	IOI E-
Brorog	uicitor	NII		viobility	/									
CO. PC	AND P		PPING											
										PO1	РО	РО	PSO	PS
COs	PO1	POZ	PO3	P04	PO5	P06	PO7	P08	P09	0	11	12	1	02
CO-1	3	1	2	1	1	2	3	2	1	1	1	3	3	3
CO-2	3	1	2	1	1	2	3	2	1	1	1	3	3	3
CO-3	3	1	2	1	1	2	3	2	1	1	1	3	3	3
CO-4	3	1	2	1	1	2	3	2	1	1	1	3	3	3
0-5	5	1 - W/	eakly Co	rrelate	 d 2 - M	 Ioderat	elv Cori	related	and 3 -	 Strong	v Corre	s lated	5	5
Modul	o 1 – In	troduc	tion		u, 2 IV	louciut		clated		Strong		lateu	(61-	+6P)
Iviouui	E T - 11	liouuc)-1
EV– La	ayout –	Policy -	- Natio	nal – Int	ernatio	onal – O	bjectiv	es – Sta	kehold	ers – Da	ata Colle	ection	BT	L-3
Modul	e 2 – Sı	iz ylggu	ide Poli	cy Mea	sures								(6L-	+6P)
Fligibi	litv – F	lesearc	n & De	velopm	ent – I	nvestm	ent Pro	omotio	n Subsid	dv – Tu	Irnover	-based		
Subsid	ly – Tax	es – Ca	pital Su	bsidy –	Electric	ity Tax	Exempt	tion – S	tamp D	uty – Su	ibsidy o	n Cost	C	D-2
of Lan	d – Emp	oloyme	nt & In	tellectu	al Prop	erty Cre	eation I	ncentiv	e	•	•		Ы	L-3
Modul	e 3 – D	emand	Side M	easure	5								(6L-	⊦6P)
Suppo	ort Mea	sures ·	- Electi	rificatio	n of Ve	ehiculaı	Fleets	in the	e State	– Pror	noting	EVs in		
Manuf	facturin	g Facil	ities– D	emand	Aggre	gation	– Regu	latory	Measur	es & C	Concess	ions –	C	D-3
Revise	d Tran	sport F	legulati	on of I	Electric	Vehicle	es – Pr	ivate V	/ehicles	, Share	d Mob	ility &	B1	rL-3
Comm	ercial V	ehicle	Segmer	nts – Ro	ad Tax/	Registr	ation C	harges						
Modul	e 4 – C	narging	Infrast	ructure									(6L-	+6P)
Gover	nment	Interve	ntions -	- Tariff f	or EV C	harging	– Ince	ntives f	or Char	ging Sta	tions –	Public	cc) -4
Chargi	ng Stat	ions –	Private	e-Aggr	egator	Chargir	ng Stati	ons –	Incentiv	es for l	Public E	Battery	ВТ	L-3
Swapp	ong Sta	tions		lonme	. +								(61+	-6P)
Capac		ding 0	Skilling		nd Puci-	nose las	subatio	n Croat	ion of a	Circula	or Sucto	inable	(321	5.]
Econo	my Cre	ation o	f EV Pa	arks & '	Vendor	Ecosvs	tem Pr	omotin	g Starti	ups in t	the FV	Sector	CC	D-5
Invest	ment Fa	acilitati	on Safe	ty & Aw	arenes	s Sancti	ioning 8	& Imple	mentin	g Ageno	с с v Су		BT	L-3
TEXT B	OOKS			•			0							

1.	Electrical Vehicle Technology: The Future Towards Eco-Friendly Technology. Prof. Sunil R. Pawar, Notion Press; 1st edition, ISBN-10: 1685545610							
2.	EV Engineering Fundamentals: A beginner's guide to e-mobility, Ashhar Ahmed Shaikh, Notion Press; 1st edition (12 July 2022), ISBN-13: 979-8887496443							
REFE	RENCE BOOKS							
1.	Electric Cars: The Ultimate Guide, Keith Chamberlain,2019, Greentech Publishing, ISBN-13 : 978-1916141407							
2.	Bosch Automotive Handbook, 10 th Edition Robert Bosch ISBN of 978-0-7680-9567-8							
3	The Future of Electric Vehicles: A Sustainable Solution, Taiwo Ayodele, ISBN-13 : 978-1690837107,2019							
4	Hydrogen – A fuel for Automatic Engines, Prashukumar G P, ISTE							
5	Fuel Cells: Theory and Applications, Hart A B and Womack G J, Chapman and Hall							
6	Tomorrow's Energy – Hydrogen Fuel Cells and the Prospects for Cleaner Planet, Peter Hoffman, MIT							
E BOC	DKS							
1	https://investingintamilnadu.com/DIGIGOV/StaticAttachment?AttachmentFileName=/pdf/poli_not i/TN_Electric_Vehicles_Policy_2023.pdf							
2	https://powermin.gov.in/sites/default/files/uploads/EV/Tamilnadu.pdf							
3	https://www.iea.org/reports/ev-city-casebook-and-policy-guide-2021-edition							
1	https://www.niti.gov.in/sites/default/files/2021-							
-	08/HandbookforEVChargingInfrastructureImplementation081221.pdf							
MOO	c							
1.	https://onlinecourses.nptel.ac.in/noc21_ee112/preview_							
2.	https://archive.nptel.ac.in/courses/108/103/108103009/							
3	https://onlinecourses.nptel.ac.in/noc22_ee53/preview_							

Vertical 2: INTELLIGENT MOBILITY

COURSE TITLE	INSTRUME	NTATION FOR INTE	LLIGENT MOBILITY	CREDITS	3				
COURSE CODE	EAT51502	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2				
VERSION	1.0	APPROVAL DETAILS	36 th ACM	LEARNING LEVEL	B	TL-5			
ASSESSMENT SO									
	CIA								
First Periodical Assessment (Theory)	Second Period Assessment (Theory)	lical Practical t Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	Theory	Practical			
15%	15%	10%	5%	5%	25%	25%			
Course Description	This course will provide complete knowledge to the undergraduate students on Understand commonly used hardware used for self-driving cars, Identify the main components of the self-driving software stack, Program vehicle modelling and control, Analyze the safety frameworks and current industry practices for vehicle development								
Course Objectives	Course Objectives1. To impart the knowledge on Self-Driving Hardware and Software Architectures 2. To educate about condition of Object Detection in an Urban Environment 3. To impart the knowledge on Sensor Fusion & Perception 4. To instruct the knowledge on Localization and Planning 5. To educate about Control & Trajectory Tracking for Autonomous Vehicles								

Cou Outo	rse comes	 Upon completion of this course, the students will be able to understand the Self-Driving Hardware and Software Architectures understand the Object Detection in an Urban Environment understand the Sensor Fusion & Perception understand the Localization and Planning understand the Control & Trajectory Tracking for Autonomous Vehicles 												
Prere	equisites: N	Nil												
CO, PO AND PSO MAPPING														
005				ľ		1	Р	Os	1		1			PSOs
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO-1	3	3	2	2	2	1	1	-	-	-	1	-	3	3 1
CO-2	3	2	2	3	2	1	-	-	-	-	-	-	3	3 2
CO-3	2	3	3	2	1	1	1	-	-	-	-	-		
CO-4	2	2	2	2	2	1	-	-	-	-	1	-) 2
1 - W	eakly Corr	elate	d 2 -	 Mode	ratel	/ Corre	lated	and 3	- Strong	lv Correlate	d		2	- 5
Mod	ule I – Inti	ndu	rtion			,			0110118	.,				(6L+6P)
The		nts fo		onom	v- Sol	f_Drivi	ng Hai	rdwar	e and So	ftware Arch	itecture	c		(0-1
Safety Assurance for Autonomous Vehicles- Vehicle Longitudinal Control- Vehicle Lateral Control							BTL-2							
Module II – Computer Vision							(6L+6P)							
Object Detection in an Urban Environment - The Machine Learning Workflow - Sensor & Camera Calibration - From Linear Regression to Feedforward Neural Networks - Image Classification with Convolutional Neural Networks - Object Detection in Images							era ith	CO-2 BTL-2						
Module III – Sensor Fusion							(6L+6P)							
Intro poin	oduction to t clouds - k	o Sen Calma	isor Fi an Filte	usion ers - E	& Pei xtenc	^r ceptio led Kal	n - Th man F	ilters	ar Sensor - Multi-T	r- 3D Object racking Tra	t Detecti cking	ion - 3D lid	lar	CO-3 BTL-3
Mod	ule IV – Lo	ocaliz	ation	and P	lanni	ng								(6L+6P)
Intro Algo Deci Plan	oduction to rithms- Ut sion Makin ning - a de	b Loca tilizin g for cisior	alizati g Sca Auto n maki	on- M n Mai nomo ing fra	arkov tching us Ve mew	v Locali g in 3E hicles ork to	zation)- Sca - Beha plan a	n- Crea n Ma avior I n vehio	ating Sca tching Lo Planning cle's moti	n Matching ocalization - Trajectory ion in an url	- Motior Generat Dan envi	n Planning tion - Motio ronment	& on	CO-4 BTL-2
Mod	ule V – Co	ontro	l & Tr	ajecto	ory Tr	acking	for A	utono	omous Ve	ehicles				(6L+6P)
Control & Trajectory Tracking for Autonomous Vehicles – PID Control PID and MPC for trajectory tracking using the PID controller - controller with non-linear dynamics - Recognize the observation of the state of the vehicle (position, velocity), the								ry he	CO-5 BTL-3					
TEXT	BOOKS													
1. Hanky Sjafrie, Introduction to Self-Driving Vehicle Technology, 2019, CRC PRESS 2. Michael E. McGrath, Autonomous Vehicles: Opportunities, Strategies and Disruptions: Update Expanded Second Edition 2019							dated and							
REFE	RENCE BO	OKS												
1.	Andreas I With Self	Herrr -drivi	nann ng Ve	and Jo hicles	ohanr 2022	n Jungv	wirth,	Inver	iting Mol	oility for All	: Master	ring Mobili	ty-a	s-a-service
2.	אענ													
E BO	272													

1.	Shaoshan Liu, Liyun Li, Jie Tang, Shuang Wu, Creating Autonomous Vehicle Systems, Morgan & Claypool											
	Publication 2020											
۰ ۲	Sreevatsan Bhaskaran, Kai Zhou, Andrew Baab, Ronald Calhoun "Autonomous Vehicle Lidar: A											
Ζ.	Tutorial"Kindle											
3.												
MOC	DC C											
1.	https://www.coursera.org/learn/intro-self-driving-cars											
2.	https://www.udacity.com/course/self-driving-car-engineer-nanodegreend0013											

COURS	E	IN	ITELLIG	ENT TF	RANSPO	RTATIO	ON SYST	EM		CREDITS		3			
COURS	SE	EAT	51503		COURS	E RY		DE		L-T-P-S		2-0-2-2			
Versio	on	1	L.O		Approv Details	al s	36 th	ACM	L	EARNING LEVEL	G	BTL-3			
					AS	SSESSIV	IENT SC	HEME							
					CIA								ESE		
First Periodic Assessme (Theory	cal ent y)	Second Periodical Assessment (Theory)			Practical Assessme	ents	Observation / lab records as approved by the Department Examination Committee "DEC"			ttendanc	e 1	Theory P		ctical	
15%		:	15%		10%		5	5%		5%		25%	2	5%	
Cours	e	This co	urse pro	ovides	knowled	dge on	intellige	ent tran	sport s	ystem ai	nd veh	icle to v	ehicle		
Descript	ion	technol	ogy			-		<u> </u>	(170)						
Course Objectiv	es	 To discuss on intelligent transportation systems (ITS) To demonstrate telecommunications in ITS To design ITS functional areas To describe ITS user needs and services To develop Vehicle-to-Vehicle (V2V) Communications 													
Course Outcome	es	1. Dis 2. Der 3. Des 4. Des 5. Dev	cuss on monstra sign ITS scribe IT velop Ve	Intelli Intelli ate tele function S user ehicle-	gent Tra commu onal are needs a to-Vehic	nsport inicatio as and ser cle (V2)	, the stu ation Sy ons in ITS vices V) Comn	stems (S nunicat	(ITS)						
Prerequi	sites:	Nil													
CO, PO A	AND P	SO MAP	PING					-							
со	PO	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	РО	PO-	PO-	PS	PS	
	-1	2	3	4	5	6	7	8	9	-10	11	12	0-1	0-2	
CO-1	2	2	1	3	-	1	-	1	-	1	1	1	1	2	
CO-2	2	3	2	2	1	-	1	1	-	2	1	2	2	1	
CO-3	1 2	2	1	2	-	-	- 1	2	-	2	1	1 2	2	2 1	
CO-5	2	1	1	2	1	-	-	1	-	1	1	2 1	1	2	
1: Weak	lv rela		 Modera	telv re	 lated ar	nd 3: St	rongly r	related			-	-	-	2	
MODUI	F 1 · In	troducti	on to In	tellige	nt Tran	sportat	tion Sys	tems (I	TS)			(6	I+6P)		
Introduce Identifica collection Vehicle collection	MODULE 1: Introduction to Intelligent Transportation Systems (ITS)(6L+6P)Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.CO-1 BTL-2														
MODULE	2: Te	lecomm	unicatio	ons in l	15							(6	L+6P)		

Ie	elecommunications in ITS – Importance of telecommunications in the ITS system,	CO-2
Inf	formation Management, Traffic Management Centers (TMC). Vehicle – Road side	RTI-2
CO	mmunication – Vehicle Positioning System.	DIE-2
M	DDULE 3: ITS functional areas	(6L+6P)
IT	S functional areas – Advanced Traffic Management Systems (ATMS), Advanced	
Tra	aveler Information Systems (ATIS), Commercial Vehicle Operations (CVO),	CO-3
Ac	lvanced Vehicle Control Systems (AVCS), Advanced Public Transportation	BTL-3
Sy	stems (APTS), Advanced Rural Transportation Systems (ARTS).	
M	DDULE 4: ITS User Needs and Services	(6L+6P)
IT	S User Needs and Services – Travel and Traffic management, Public	
Tra	ansportation Management, Electronic Payment, Commercial Vehicle Operations,	
En	nergency Management, Advanced Vehicle safety systems, Information	CO-4
M	anagement. Automated Highway Systems - Vehicles in Platoons – Integration of	BTL-2
Αu	tomated Highway Systems. ITS Programs in the World – Overview of ITS	
im	plementations in developed countries, ITS in developing countries.	
M	DDULE 5: Vehicle-to-Vehicle (V2V) Communications	(6L+6P)
De	DDULE 5: Vehicle-to-Vehicle (V2V) Communications edicated short range communications (DSRC) –V2V vs V2I vs V2X vs V2N vs V2P -	(6L+6P)
De Im	DDULE 5: Vehicle-to-Vehicle (V2V) Communications edicated short range communications (DSRC) –V2V vs V2I vs V2X vs V2N vs V2P - portance of ongoing 5G development –GPS receivers and V2V –Laser Illuminated	(6L+6P) CO-5
De Im De	DDULE 5: Vehicle-to-Vehicle (V2V) Communications edicated short range communications (DSRC) –V2V vs V2I vs V2X vs V2N vs V2P - portance of ongoing 5G development –GPS receivers and V2V –Laser Illuminated etection and Ranging (LiDAR) –Inertial navigation systems –Characteristics of a	(6L+6P) CO-5 BTL-2
De Im De wi	DDULE 5: Vehicle-to-Vehicle (V2V) Communications edicated short range communications (DSRC) –V2V vs V2I vs V2X vs V2N vs V2P - portance of ongoing 5G development –GPS receivers and V2V –Laser Illuminated etection and Ranging (LiDAR) –Inertial navigation systems –Characteristics of a reless mesh network –V2V and Cybersecurity.	(6L+6P) CO-5 BTL-2
MC De Im De wi TE	DDULE 5: Vehicle-to-Vehicle (V2V) Communications edicated short range communications (DSRC) –V2V vs V2I vs V2X vs V2N vs V2P - portance of ongoing 5G development –GPS receivers and V2V –Laser Illuminated etection and Ranging (LiDAR) –Inertial navigation systems –Characteristics of a reless mesh network –V2V and Cybersecurity. XT BOOKS	(6L+6P) CO-5 BTL-2
MC De Im De wi TE	DDULE 5: Vehicle-to-Vehicle (V2V) Communications edicated short range communications (DSRC) –V2V vs V2I vs V2X vs V2N vs V2P - portance of ongoing 5G development –GPS receivers and V2V –Laser Illuminated etection and Ranging (LiDAR) –Inertial navigation systems –Characteristics of a reless mesh network –V2V and Cybersecurity. XT BOOKS Kan Paul Chen, John Miles, ITS Handbook: Recommendations for World Road	(6L+6P) CO-5 BTL-2
MC De Im De wi TE 1	DDULE 5: Vehicle-to-Vehicle (V2V) Communications edicated short range communications (DSRC) –V2V vs V2I vs V2X vs V2N vs V2P - portance of ongoing 5G development –GPS receivers and V2V –Laser Illuminated etection and Ranging (LiDAR) –Inertial navigation systems –Characteristics of a reless mesh network –V2V and Cybersecurity. KT BOOKS Kan Paul Chen, John Miles, ITS Handbook: Recommendations for World Road Association (PIARC)	(6L+6P) CO-5 BTL-2
MC De Im De Wi TE 1	DDULE 5: Vehicle-to-Vehicle (V2V) Communications edicated short range communications (DSRC) –V2V vs V2I vs V2X vs V2N vs V2P - portance of ongoing 5G development –GPS receivers and V2V –Laser Illuminated etection and Ranging (LiDAR) –Inertial navigation systems –Characteristics of a reless mesh network –V2V and Cybersecurity. XT BOOKS Kan Paul Chen, John Miles, ITS Handbook: Recommendations for World Road Association (PIARC) Sussman, J. M., Perspective on ITS, Artech House Publishers, 2015.	(6L+6P) CO-5 BTL-2
M(De Im De wi TE 1 2	DDULE 5: Vehicle-to-Vehicle (V2V) Communications edicated short range communications (DSRC) –V2V vs V2I vs V2X vs V2N vs V2P - portance of ongoing 5G development –GPS receivers and V2V –Laser Illuminated etection and Ranging (LiDAR) –Inertial navigation systems –Characteristics of a reless mesh network –V2V and Cybersecurity. XT BOOKS Kan Paul Chen, John Miles, ITS Handbook: Recommendations for World Road Association (PIARC) Sussman, J. M., Perspective on ITS, Artech House Publishers, 2015.	(6L+6P) CO-5 BTL-2
M(De Im De wi TE 1	DDULE 5: Vehicle-to-Vehicle (V2V) Communications edicated short range communications (DSRC) –V2V vs V2I vs V2X vs V2N vs V2P - portance of ongoing 5G development –GPS receivers and V2V –Laser Illuminated etection and Ranging (LiDAR) –Inertial navigation systems –Characteristics of a reless mesh network –V2V and Cybersecurity. XT BOOKS Kan Paul Chen, John Miles, ITS Handbook: Recommendations for World Road Association (PIARC) Sussman, J. M., Perspective on ITS, Artech House Publishers, 2015. Dimitrakopoulos, George: Current Technologies in Vehicular Communication,	(6L+6P) CO-5 BTL-2
M(De Im De wi TE 1 2 3	DDULE 5: Vehicle-to-Vehicle (V2V) Communications edicated short range communications (DSRC) –V2V vs V2I vs V2X vs V2N vs V2P - portance of ongoing 5G development –GPS receivers and V2V –Laser Illuminated etection and Ranging (LiDAR) –Inertial navigation systems –Characteristics of a reless mesh network –V2V and Cybersecurity. XT BOOKS Kan Paul Chen, John Miles, ITS Handbook: Recommendations for World Road Association (PIARC) Sussman, J. M., Perspective on ITS, Artech House Publishers, 2015. Dimitrakopoulos, George: Current Technologies in Vehicular Communication,	(6L+6P) CO-5 BTL-2 Springer, 2017.
M(De Im De wi TE 1	DDULE 5: Vehicle-to-Vehicle (V2V) Communications edicated short range communications (DSRC) –V2V vs V2I vs V2X vs V2N vs V2P - portance of ongoing 5G development –GPS receivers and V2V –Laser Illuminated etection and Ranging (LiDAR) –Inertial navigation systems –Characteristics of a reless mesh network –V2V and Cybersecurity. XT BOOKS Kan Paul Chen, John Miles, ITS Handbook: Recommendations for World Road Association (PIARC) Sussman, J. M., Perspective on ITS, Artech House Publishers, 2015. Dimitrakopoulos, George: Current Technologies in Vehicular Communication, FERENCE	(6L+6P) CO-5 BTL-2 Springer, 2017.

Vertical 3: ENGINE AND VEHICLE TECHNOLOGY

COURSE TITLE	ALTERNAT	TIVE FUELS AND	ENERGY SYSTEMS	CREDITS	3					
COURSE CODE	EAT51504	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2					
Version	1.0	Approval 36 th ACM Details		LEARNING LEVEL	BTL3					
ASSESSMENT SCHEME										
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendan ce	End Semester Examinatio n					
15%	15%	10%	5%	5%	Theory 25%					
1370	13/0	10/0	570	570	Practical 25%					
Course Description	This course is based on the developing areas of alternate fuels integrating both the theoretical and practical training for engineering students. Application of the concepts to learn the possible fuels that are available in the market for future use.									

Course Objectives	 To gain knowledge on available alternate fuels To provide a strong foundation on alcohol usage. To illustrate fuels from gases. To evaluate the performance of vegetable oils. To make the students understand the hybrid vehicles.
Course Outcomes	 Upon completion of this course, the students will be able to to familiarize on various alternate fuels. to gain knowledge on the details of methanol and ethanol usage, storage, chemical structure. to acquire knowledge of natural gas, LPG, hydrogen and biogas. to attain the performance characteristics of various vegetable oils. to familiarize with electric and hybrid vehicles.

Prerequisites: Knowledge in fundamentals of Engines

CO, PO AND PSO MAPPING

0	РО	PO	PO	РО	PO	PO	PSO	PSO						
ι	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	З	3	-	-	-	-	-	-	З	-	-	3	1	2
CO2	З	3	-	2	З	-	-	-	З	-	-	3	2	1
CO3	3	3	-	-	1	-	-	-	3	-	-	3	2	2
CO4	3	3	-	2	-	-	-	-	3	-	-	3	1	2
CO5	3	3	-	-	3	-	-	-	3	-	-	3	1	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: Introduction	(6L + 6P)
Need for alternate fuel- Evolution- Availability of alternate fuels, general use of alcohols, LPG, Hydrogen, Ammonia, CNG and LNG, Vegetable oils, water and biogas, Merits and demerits of various alternate fuels. Government norms and Subsidiary. Introduction to alternate energy sources. Like EV, Hybrid, Semi-Hybrid, Fuel cell, Nuclear Cars and Solar car. Practical component: properties of alternate fuels – Determination of properties	CO1 BTL3
MODULE 2: ALCOHOLS	(6L + 6P)
Availability –Source- Types of Alcohols- Properties as engine fuel – Octane Number- Self Ignition Temperature- Calorific Value. Fuel and Engine Modification. Blending with diesel and gasoline- Dual Fuel Operation- Energy share Calculation. Performance in SI engine- Combustion characteristics in Cl engines- Emission characteristics. Problems of using alcohols in diesel engine. DME, DEE properties- storage, Performance in SI & Cl Engines. Practical component: Alcohol fuels – Determination of blending characteristics	CO2 BTL3
MODULE 3: NATURAL GAS, LPG, HYDROGEN AND BIOGAS	(6L + 6P)
Availability of CNG, properties, Difficulties of using gaseous fuel in IC engines - Modification required using in engines, Performance and emission characteristics of CNG using LPG in SI & CI engines, Performance and emission of LPG. Hydrogen; Storage and handling, properties – flame speed- flammability. Performance emission and Combustion behavior of hydrogen in CI engine - safety aspects and design of gaseous fuel induction system. Practical component: Performance & Combustion Characteristics – To plot the graphs	CO3 BTL3
MODULE 4: VEGETABLE OILS	(6L + 6P)
Design of engine, optimum selection of operating variables for control of emissions, Crankcase	CO4

and eva reactors injection	BTL3	
Practica	component:	
Biodiese	I from Vegetable oils –characterization	
MODUL	E 5: ELECTRIC, HYBRID, FUEL CELL AND SOLAR CARS	(6L + 6P)
Need of System Station Solar po Practica Electror	f E-Vehicle. Layout of an electric vehicle, Advantage and limitations, Specifications, components, High energy and power density batteries, battery design - Charging – Cost analysis. Hybrid vehicle – type- advantages and limitations. Fuel cell vehicles, owered vehicles. I component: hic control system – Determination of the OBD Techniques.	CO5 BTL3
TEXT BC	OKS	
1	Richard. L. Bechfold - Alternative Fuels Guide Book - SAE International Warrendale - 2	2007.
2	Ganesan, V- "Internal Combustion Engines"- Tata McGraw-Hill Co 2017.	
REFERE	NCE BOOKS	
1.	Maheswar Dayal - "Energy today & tomorrow" - I & B Horishr India - 2012.	
2.	Nagpal & Sharma - "Power Plant Engineering" - Khanna Publishers - 2015.	
E BOOKS		
1.	https://link.springer.com/book/10.1007/978-1-349-04364-4	
2.	2nd Edition Handbook of Alternative Fuel Technologies, Edited By <u>Sunggyu L</u> <u>Speight, Sudarshan K. Loyalka</u>	ee, James G.
3.	https://www.intechopen.com/books/325	
MOOC		
1.	https://nptel.ac.in/courses/103101215	
2.	https://nptel.ac.in/courses/103103140	

COURSE TITLE	VEH	ICLE BODY ENGINE	CREDITS	3				
COURSE CODE	EAT51505	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2			
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3			
ASSESSMENT SCHEME								
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	End Semester Examinatio n			
15%	15%	10%	5%	5%	Theory 25% Practical 25%			

Course Description	This course is based on the understanding the vehicle body construction details integrating both the theoretical and practical training for engineering students. Application of the concepts to learn the possible construction techniques that are available in the market.
Course Objectives	 To gain knowledge on car body design. To provide a strong foundation on bus body To illustrate knowledge on vehicle aerodynamics. To remember the commercial vehicle body details. To make the students understand the load and stress available in the vehicle body.
Course Outcomes	 Upon completion of this course, the students will be able to 1. To understand the details of car body and safety design aspects 2. To introduce bus body details and types of metal sections used 3. To broaden the understanding of vehicle aerodynamics and wind tunnel technology 4. To introduce commercial vehicle body details and driver's seat design 5. To underline the importance of bus body loads and stress analysis

Prerequisites: Knowledge in fundamentals of Engineering Mechanics

CO, P	CO, PO AND PSO MAPPING													
со	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO
	1	2	3	4	5	6	/	8	9	10	11	12	1	2
CO1	3	1	-	-	-	-	-	-	1	-	-	2	1	1
CO2	2	3	-	2	3	-	-	-	3	-	-	3	1	2
CO3	3	2	-	-	1	-	-	-	2	-	-	2	2	1
CO4	3	3	-	2	-	-	-	-	3	-	-	3	1	1
CO5	1	3	-	-	3	-	-	-	2	-	-	2	2	1
	1:	: Weakl	y relate	ed, 2: M	oderate	ely rela	ted and	3: Stro	ngly rel	ated				

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: CAR BODY DETAILS	(6L + 6P)
Types car bodies – Visibility: regulations, driver's visibility, methods of improving visibility – Safety: Safety design, constructional details of roof, under floor, bonnet, boot, wings etc.	CO1 BTL3
MODULE 2: BUS BODY DETAILS	(6L + 6P)
Types of bus bodies. Floor height, engine location – Entrance and exit location, Constructional details, frame construction, Double skin construction, Types of metal sections used, regulations, Conventional and integral type construction.	CO2 BTL3
MODULE 3: VEHICLE AERODYNAMICS	(6L + 6P)
Vehicle resistances and types. Various types of forces and moments. Various body optimization techniques for minimum drag. Principle of wind tunnel technology. Flow visualization techniques. Tests with scale models.	CO3 BTL3
MODULE 4: COMMERCIAL VEHICLE BODY DETAILS	(6L + 6P)
Construction of commercial vehicle bodies. Types of bodies – Flat platform, drop side, fixed side, tipper body, tanker body. Dimensions of driver's seat in relation to controls. Drivers cab design.	CO4 BTL3
MODULE 5: BODY LOADS AND STRESS ANALYSIS	(6L + 6P)
Scaled structure – Shear panel method – Symmetric and Asymmetrical vertical loads in a car – Longitudinal loads – Different loading situations – Load distribution on vehicle structure –	CO5 BTL3

Stress analysis of bus body structure under bending and torsion – Stress analysis in integral bus body. Analysis of shock and impulse force on vehicle bodies.							
TEXT	BOOKS						
1	Powloski, J., 'Vehicle Body Engineering', Business Books Ltd., 2002						
2	Sydney F. Page, "Body Engineering", 3rd ed. Chapman & Hill Ltd., London.						
3	John Fenton, 'Vehicle Body Layout and Analysis', Mechanical Engineering Publication Ltd., London, 2013						
REFER	RENCE BOOKS						
1.	David Crolla, "Automotive Engineering: Powertrain, Chassis System and Vehicle Body" 2013						
2.	J.G. Giles, "Body Construction and Design", Vol. 6., Ilefe Books/Butterworth & Co. London						
E BOC	DKS						
1.	Wolf-Heinrich Hucho, "Aerodynamics of Road Vehicles" Published by SAE International, USA						
2.	A. Robinson, W. A. Livesey, "The Repair of Vehicle Bodies" Published by Butterworth Heinemann LTD.						
2	John Fenton, "Handbook of Automotive Body Construction and Design Analysis" Professional						
5.	Engineering Publishing.						
MOO	с						
1.	https://www.my-mooc.com/en/mooc/road-traffic-safety-in-automotive-engineering/						

Vertical 4: DESIGN AND MANUFACTURING

COURSE TITLE	PR	ODUCTION TECH	INOLOGY	CREDITS	3				
COURSE CODE	EAT51506	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2				
VERSION	1.0	APPROVAL DETAILS	36 th ACM	LEARNING LEVEL	BTL-3				
ASSESSMENT	SCHEME								
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendanc e	ESE				
15%	15%	10%	5%	5%	Theory 25%				
15/6	15/8	10/8	578	578	Practical 25%				
Course Description	Course DescriptionTo provide an understanding on the various types of production processes involved in the manufacturing of the automobile components such as casting, welding, machining, metal forming, power metallurgy etc.								
Course Objectives	 The course should enable the student to: Understand how the automobile components are manufactured. Understand the various moulding process Understand how the different machines are used for machining the components. Understand how the components are joined together by methods such as, welding, brazing and soldering. Understand the various manufacturing process such as forging, casting & machining. 								

Course Outcome	 Course Course Able to apply the casting principles for automobile components Able to perform various metal joining process Able to identify suitable bulk deformation process for automobile applications Able to perform various machining operation using lathe, milling etc Able to produce smooth metal surfaces using surface and cylindrical grinding machines 									s inding				
Prerequi	Prerequisites: Nil													
CO, PO AND PSO MAPPING														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO 11	PO	PSO 1	PS
CO-1	3	2	3	2	3	1	1	-	1	2	1	2	2	2
CO-2	2	2	2	3	2	2	2	-	2	3	2	2	1	1
CO-3	3	3	3	1	3	1	1	-	1	2	1	2	2	2
CO-4	2	2	2	3	2	2	1	-	2	3	2	2	1	1
CO-5	3	2	3	1 rolated	3	1	2	-	1	2 Strongh	2 Corrol	2	2	2
Module	I – CAS				, Z - IVIC	ouerate	ly Corre		inu 3 - 3	strongly	Correl		(6L+6	P)
Sand Ca Moulding – Princip casting – moulding Practical	Module 1 – CASTING PROCESSES Sand Casting – Sand Mould – Type of patterns - Pattern Materials – Pattern allowances – Moulding sand Properties and testing – Cores –Types and applications – Melting furnaces – Principle of special casting processes - Shell, investment – Ceramic mould – Pressure die casting – Centrifugal Casting - CO casting - Stir casting - Defects in Sand casting. Plastic moulding - injection and blow moulding. Practical Component							s – ees die tic	CO-1 BTL-3					
Module 2 – METAL JOINING PROCESSES									(6L+6P)					
Module 2 – METAL JOINING PROCESSES Fusion welding processes – Type of Gas welding – Flame characteristics – Filler and Flux materials – Arc welding, Electrodes, Coating and specifications – Principles and types of Resistance welding – Gas metal arc welding – Submerged arc welding – Electro slag welding – Gas Tungsten arc welding – Principle and application of special welding processes – Plasma arc welding – Thermit Welding – Electron beam welding – Friction welding – Diffusion welding – Weld defects – Brazing and soldering. Practical Component							ux of 	CO- BTL-	2 -3					
2.	TIG We	lding												
Module 3	8 – MA	CHININ	g proc	ESSES									(6L+6	P)
Lathe: working principle, classification, specification, accessories, work and tool holders, different operations on a lathe, turret and capstan lathes. Drilling and boring: machines - classification, specification, cutters speed & feed, jig borer - description, types and hole location procedures. Milling: classification, principle, parts – specification, milling cutters, indexing, milling processes and operations. Introduction to CNC machining. Practical Component Vertical CNC Milling 1. Linear Interpolation 2. Circular Interpolation							rs, s - ble rs,	CO- BTL-	3 -3					
3.	Facing	drilling,	g and co	ounter l	ooring									
Module 4	1 – ME1	TAL FOR	RMING	PROCES	SSES								(6L+6	P)
Hot and bending, - blankin and com	cold N hot spi g, pierc binatio	working nning, s ing, pu n dies. f	proce hearing nching, Powder	sses - g, tube trimmi Metall	rolling, and wir ng, Ber urgy – F	forgin e drawi nding - Principle	g, drav ing, sho types o es, Proc	ving ar t peeni f dies - ess, Ap	nd extro ng. She progre plicatio	usion p et meta ssive, c ns & Lir	orocesse al worki ompou mitatior	es, ng nd ns.	CO-4 BTL-	4 3

Pra	ctical Component						
She	et Metal forming						
	1. Bending						
	2. Punching						
	3. Blanking						
	4. Trimming						
Мо	dule 5 – METAL FINISHING PROCESSES	(6L+6P)					
Su dev apj hoi Pra	Inface finishing processes: grinding processes, various types of grinders, work holding vices, grinding wheels and specification, selection of grinding wheels for specific blications - selection of cutting speed and work speed. Fine Finishing Process: Lapping, hing, and super finishing process.	CO-5 BTL-3					
	1. Study on introductions to Grinding						
TEX	TEXT BOOKS						
1.	HajraChoudhary S.K., "Elements of Manufacturing Technology", Vol. I & II, 11th edition, Media						
2	Publishers, Multipal, 1997.						
Z.	ERENCE BOOKS	7-1111,2000					
NLI	Jain K.C. Agarwal, J.N. "Metal Cutting Science and Production Technology" 1st	edition Khanna					
1.	Publishers. 1986.						
2.	Chapman W.A.J., "Workshop Technology", Vol. II, Arnold Publishers.						
ΕB	DOKS						
1	MikellP.Groover https://drive.google.com/file/d/0B7JWdKw_4Q07M1F1Nm92TEUzczA	/view					
2	Kalpakjian						
2	file:///C:/Users/Admin/Downloads/Serope%20Kalpakjian%20Steve%20Schmid%20Manufacturing.pdf						
3	3 http://www.erexams.com/2017/07/mechanical-all-subjects-ebook-free-pdf.html						
MC	00						
1	1 https://www.mooc-list.com/tags/manufacturing-processes						
2	https://www.edx.org/course/fundamentals-manufacturing-processes-mitx-2-008x-0						
3	https://archive.nptel.ac.in/courses/112/103/112103244/						

COURSE TITLE	PROD	UCT DESIGN AND D	DEVELOPMENT	CREDITS	3			
COURSE CODE	EAT51507	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2			
Version	1.0	Approval 36 th ACM Details		LEARNING LEVEL	BTL-3			
ASSESSMENT SC	CHEME							
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendanc e	End Semester Examination			
1 5 %	1 5 %	1.0%	E9/	E%	Theory 25%			
15%	15%	10%	576	570	Practical 25%			
Course Description	The course aim is to provide student with the concepts and tools for the design of new products. The different approaches and methodologies for the design of new products, the stages of the design project, the design and the quality and the fundamental practices of design are review. Economic, financial and operational evaluations							

Cou Obje	urse ctives		 Know about the basics of engineering design process Understand the concepts of benchmarking for quality improvem Learn about the systematic methods of creative designing Know about the various steps involved in product design and device 									oveme	nt elopme	nt
			5. To	o instil t	he new	v produ	ct desig	gn trend	ds in en	gineeri	ng.		·	
Cou Outc	urse omes		 Upon completion of this course, the students will be able to 1. Familiarize on the basics of engineering design process 2. Acquire the concepts of benchmarking for quality improvement 3. Gain knowledge on the systematic methods of creative designing 4. Acquire about the various steps involved in product design and development. 5. Confidence to create new product based on mechanical design engineering 											
Prereq	uisites:	Knowle	edge in	fundar	nentals	of CAD	and Ai	utomot	ive Syst	:ems				
CO, PO	AND P	SO MA	PPING											
0	РО	РО	PO	PO	РО	РО	РО	РО	РО	РО	РО	РО	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	3	2	3	2	2	3	1	3	1	-	1	1
CO2 CO3	3 2	3 2	3 2	3	3 2	2	3	2	2	3 2	2	-	2 1	2 1
CO4	3	3	3	3	3	2	3	3	3	3	3	-	1	1
CO5	3	3	3	3	3	2	3	3	3	3	3	-	2	1
	1: Weakly related, 2: Moderately related and 3: Strongly related													
MODU	LE 1: EN	IGINEE	RING D	ESIGN	PROCE	SS							(6L	. + 6P)
Need for developing products – the importance of engineering design – types of design –the design process – relevance of product lifecycle issues in design –designing to codes and standards- societal considerations in engineering design –generic product development process–various phases of product development-planning for products – establishing markets- market segments- relevance of market research. Introduction to Automotive design, History of Automotive design, Car design brands & brand values and Brand history and Styling DNA and Case studies Practical component: To study the types of design and engineering design process.							n s t - o d	CO1 BTL3	3					
MODUL	E 2: BE	NCH M	ARKING	G									(6L	+ 6P)
Identifying customer Needs and Desires, Usage Habits and Attitude Study –voice of customer –customer populations- hierarchy of human needs need gathering methods, affinity diagrams –needs importance- establishing engineering characteristics-competitive benchmarking- quality function deployment- house of quality- product design specification-case studies. Practical component: Apply different techniques for Product design and put them in Drawing sheets							f - t	CO2 BTL3	2 3					
MODUL	E 3: CR	EATIVE	DESIG	N									(6L	+ 6P)
Creative thinking –creativity and problem solving- creative thinking methods- generating design concepts-systematic methods for designing –functional decomposition – physical decomposition –functional representation –morphological methods. Concept Generation, Concept selection, Concept testing. Identification of Needs - Selection of Ideas -Screening of Ideas- Methods to Select the Best Idea Practical component: Students can do practices on different issues on voice of customer						- Il If f	CO3 BTL3	3						
MODUL	E 4: PR	ODUCT	DESIG	N									(6L	+ 6P)

Decisior method process architec Practica do you t	CO4 BTL3					
MODUL	E 5: PRODUCT DEVELOPMENT	(6L + 6P)				
Industr friendly testing plannin Product approva Practica Concep basic el	CO5 BTL3					
TEXT BC	DOKS					
1	A K Chitale and R C Gupta, Product Design and Manufacturing, 6th Edition, PHI,	New Delhi, 2003.				
2	Anita Goyal, Karl T Ulrich, Steven D Eppinger, "Product Design and Development", 4 th Edition					
Z	2009, Tata McGraw-Hill Education, ISBN-10-007-14679-9					
REFERE	NCE BOOKS					
1.	Kevin Otto, Kristin Wood, "Product Design", Indian Reprint 2004, Pearsor 9788177588217	education,ISBN				
2.	YousefHaik, T. M. M. Shahin, "Engineering Design Process", 2nd Edition F Learning, 2010, ISBN 0495668141	Reprint, Cengage				
3	Clive L.Dym, Patrick Little, "Engineering Design: A Project-based Introduction", Wiley & Sons, 2009, ISBN 978-0-470-22596-7	3rd Edition, John				
E BOOK	5					
1.	https://www.mheducation.com.au/ebook-product-design-and-development-6 9781307290189-aus	e-				
2.	https://www.taylorfrancis.com/books/mono/10.1201/9780429327803/sustair design-development-anoop-desai-anil-mital	hable-product-				
3.	https://www.bokus.com/bok/9780077143961/ebook-product-design-and-dev	elopment/				
MOOC						
1.	https://onlinecourses.nptel.ac.in/noc21_me83/preview					
2.	https://onlinecourses.nptel.ac.in/noc21_de01/preview					

Semester -IV

DEPARTMENT ELECTIVE -2

Specialization 1: ELECTRIC VEHICLE TECHNOLOGY

COURSE TITLE		BATTERY TEC	CRED	ITS	3			
COURSE CODE	EAT51508	COURSE DE CATEGORY			-S	2-0-2-2		
Version	1.0	1.0 Approval 36 th ACM Details				BTL-3		
ASSESSMENT SCHEME								
	ESE							

First Pe Assess (The	Periodical essment heory) Second Periodical Assessment (Theory)				al nt A	Practic	al ents	Observ reco approv Depa Exan Commi	ation / ords as yed by t artmen hination ttee "D	lab the t n EC"	Attenda ce	пт	HEORY	PR/	ACTIC AL
15	%			15%		10%			5%		5%		25%	2	5%
Cou Descri	irse iption		In teri and	this co minolog therm	urse, s gies, Ba al mar	students attery m	s will g anager nt.	get a c ment sy	omplet stem, C	e over hargin	rview of g and dis	electr chargi	rochemis	try, B / appli	attery cation
Course O	bjectiv	e	1. 2. 3. 4. 5.	To dis To int To ide To de To dis	scuss o terpret entify t evelop scuss o	n introd the maj the recei advance n batter	uction jor bati nt deve techno ies for	to elect tery che elopmer ology automo	rochen mistrie nts in ba otive	nical en s deve atterie	nergy sto lopment s	rage and te	esting		
Course O	utcom	 Come Upon completion of this course, the students will be able to Discuss on introduction to electrochemical energy storage Interpret the major battery chemistries development and testing Identify the recent developments in batteries Develop advance technology Discuss on batteries for automotive vehicles 													
CO. PO AND PSO MAPPING															
	PO-	PC	14PPING 10- PO- PO- PO- PO- PO- PO- PO- PO- PO- PO							PO-	PSO	PSO			
со	1	2	2	3	4	5	6	7	8	9	10	11	12	-1	-2
CO-1	1	-	-	1	-	-	1	1	-	-	-	1	1	1	2
CO-2	2	-	-	2	-	-	1	1	-	-	-	2	1	2	1
CO-3	1	-	-	1	-	-	2	2	-	-	-	1	1	1	2
CO-4	1	-	-	1	-	-	1	1	-	-	-	2	2	1	1
CO-5	2	-	-	1	-	-	1	2	-	-	-	1	1	1	2
			1:	Weakl	y relat	ed, 2: M	oderat	tely rela	ted an	d 3: St	rongly re	lated			
MODULE	1 - IN	TRO	DUO	CTION T	TO ELE	CTROCH	IEMICA	AL ENER	GY STO	RAGE				(6L+	+ 6P)
Introduct electrical in cell- Cu Lab Expe Experime	tion to l energy urrent o riment ent on L	oatte / and chall s .ead	ery † d er eng Aci	technol hergy co es in Er d Batte	logies I ontent nergy s eries	Electrom of a cell torage T	otive f -Free e Techno	orce- Re energy c logies	eversibl hanges	e cells and e	- Relatior lectromc	n betw otive fo	een orce	CO- BTL	1 -3
MODULE	2 - MA	JOR	R BA	TTERY	CHEM	ISTRIES	DEVEL	OPMEN	T AND	TESTIN	IG			(6L+	6P)
INITIALITY CHEMISTRIES DEVELOPMENT AND LESTING (6L+ 6P) Battery performance evaluation- Primary battery - Service time- Voltage data- Service life – ohmic load curve- Effect of operating temperature on service life. Secondary batteries-Discharge curves Terminal voltages- Plateau voltage –Lead acid Batteries – Construction and application. CO-2 Lab Experiments Battery testing											2 -3				
MODULE	3 – RE	CEN	T D	EVELO	PMENT	ſS							· ·	(6L+	6P)
Recent development of electrode materials in lithium ion batteries- Recent development of solid electrolytes and their application to solid state Batteries-Polymer solid electrolytes for lithium ion conduction. CO-3 BTL-3															
Study on	Lithiun	n Ior	า ba	tteries											
MODULE	4 – AD	VAN	NCE	TECHN	IOLOG	Y								(6L+	6P)

Thin Capac Lab Ex Study	Film solid state Batteries: Fundamentals, Constriction and application – Super itors: Fundamental, Construction and application. speriments on Thin film soild state batteries	CO-4 BTL-3						
MOD	JLE 5 - BATTERIES FOR AUTOMOTIVE VEHICLES – FUTURE PROSPECTS	(6L+ 6P)						
Degre vehicu and lif Lab Ex Analys	es of vehicle electrification – Battery size vs. application -USABC and DOE targets for ular energy storage systems – Analysis and Simulation of batteries - Equivalent circuit Te modeling – Environmental concerns in battery production – recycling of batteries. Speriments sis and Simulation of batteries	CO-5 BTL-3						
Text B	ooks							
1.	1. T.Minami, M.Tatsumisago, M.Wakihara,C. Iwakura,S. Kohijiya, Solid state ionics for batteries, Springer Publication.							
2.	Sandeep Dhameja, Electric Vehicle Battery Systems, Newnes publication.							
REFE	RENCE BOOKS							
1	Bard, Allen J., and Larry R. Faulkner. Electrochemical Methods: Fundamentals and Aped., Wiley–VCH, Verlag, GmbH.	plications. 2nd						
2	Masataka Wakihara and Osamu Yamamoto, Lithium ion Batteries Fundamental and I Wiley–VCH, Verlag GmbH.	Performance,						
3	Robert A.Huggins, Advanced Batteries – Materials science aspects, Springer.							
E Res	ources for Reference							
1.	https://books.google.co.in/books?id=PaznCAAAQBAJ&printsec=frontcover&dq=isbn:9	<u>401168814&hl</u>						
	=en&sa=X&ved=0ahUKEwilrKC9sN7ZAhXKQY8KHTrwB1gQ6AEIJjAA#v=onepage&q&f=	<u>false</u>						
2.	https://books.google.co.in/books?id=PaznCAAAQBAJ&printsec=frontcover&dq=isbn:9	401168814&hl						
	=en&sa=X&ved=0ahUKEwilrKC9sN7ZAhXKQY8KHTrwB1gQ6AEIJjAA#v=onepage&q&f=	<u>false</u>						
MOO	C							
1.	http://nptel.ac.in/courses/108108076/							
2.	http://nptel.ac.in/courses/108108176/							

COURSE TITLE	ELECTRIC	AND HYBRID VEHI	CLES	CREDITS	3
COURSE CODE	EAT51509	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2
VERSION	1.0	APPROVAL DETAILS	36 th ACM	LEARNING LEVEL	BTL-3
ASSESSMENT	SCHEME				
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz etc., as approved by the Department Examination Committee "DEC"	Attendance	End Semester Examination
1 5 9/	1 5 9/	10%	E9/	E9/	Theory 25%
15%	12%	10%	5%	5%	Practical 25%

Cours Descript	e tion	e This course will enable the students to gain knowledge about Electric and hybrid vehicle The electric is the future vehicle doesn't produce and emissions.											es.	
Course Objectiv	es	 To recall concepts of electric vehicle & performance of electric vehicles To identify Electric Propulsion Systems & Generators. To recognize on hybrid electric drive train systems. To describe motor controllers and control systems & energy storages. To choose energy Storages on fuel Cells & Solar Cars 									cles. s.			
Course Outcome Prerequi	Course 1. Recall concepts of electric vehicle & performance of electric vehicles. 2. Identify Electric Propulsion Systems & Generators. Outcomes 3. Recognize on hybrid electric drive train systems. 4. Describe motor controllers and control systems & energy storages. 5. Choose energy Storages on fuel Cells & Solar Cars													
CO, PO AND PSO MAPPING														
COs	PO1	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 0 11 1											1	02
CO-1	2											0	1	1
CO-2	1	2 0 0 0 0 0 0 0 0 0										0	0	0
CO-3	0	0 0 0 0 1 0 0 0 0 0									0	0	0	
CO-4	0	0	0	0	1	0	0	0	0	0	0	0	1	2
CO-5	0	0 3 0 1 0 0 0 0 0 0 0								0	3	3		
1 - Weakly Correlated, 2 - Moderately Correlated and 3 - Strongly Correlated														
Module 1 – ELECTRIC VEHICLES										(6L+	6P)			
Layout of an electric vehicle, performance of electric vehicles – traction motor characteristics, tractive effort, transmission requirements, vehicle performance, energy consumption, advantage and limitations, specifications, system components, electronic control system.								otor ergy onic	CO- BTL	-1 -3				
Module	2 – ELE	ECTRIC P	ROPUL	SION SY	STEMS	& GEN	IERATO	RS					(6L+ 6P)	
DC motors, AC motors, permanent magnet motors, brushless DC and reluctance motors, characteristics, regenerative braking. DC generators, AC generators, voltage and frequency regulations									ors, ency	CO BTL	-2 -3			
Module 3	3 – HY	BRID VE	HICLES										(6L+ (6P)
Concepts of hybrid electric drive train, types, architecture of series and parallel hybrid electric drive train, merits and demerits, series and parallel hybrid electric drive train design.									brid ign.	CO BTL	-3 3			
Module 4 – MOTOR CONTROLLERS AND CONTROL SYSTEMS&ENERGY STORAGES										(6L+	6P)			
Control system principles, speed and torque control – DC motors and AC motors. Electromechanical batteries- types of batteries –lead acid batteries, nickel-based batteries, lithium-based batteries, electrochemical reactions, thermodynamic voltage, specific energy, specific power, energy efficiency, ultra-capacitors.								ors. ries, rgy,	, CO-4 , BTL-3					
Module !	5 – FU	EL CELLS	& SOL	AR CAR	S								(6L+ 6	SP)
Fuel cell, construction, working, equations, possible fuel sources, fuel reformer, design. Solar cars- photovoltaic cells, tracking, efficiency and cost comparison.									CO- BTL	-5 -4				
TEXT BO	TEXT BOOKS													

1.	Longo, Stefano, et al. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles. United States, CRC Press, 2018.
2.	James Larminie and John Loury, "Electric Vehicle Technology-Explained", John Wiley & Sons Ltd., 2013.
REFE	RENCE BOOKS
1.	Robert Bosch Automotive Handbook, 10th Edition (2018)., BOSCH 10, ISBN of 978-0-7680-9567-8.
2.	Tom Denton., "Electric and Hybrid Vehicles"2020.
E BOO	DKS
1.	https://shorturl.at/ahvAJ
2.	https://shorturl.at/arxzH
MOO	C
1.	https://elearn.nptel.ac.in/shop/iit-workshops/completed/e-mobility-and-electric-vehicle-
2.	https://nptel.ac.in/courses/108106170

Specialization 2: INTELLIGENT MOBILITY

COURSE TITLE	ADVANC	ED DRIVER ASSIST	ANCE S	SYSTEM	CREDI TS		3				
COURSE CODE	EAT51510	COURSE CATE	COURSE CATEGORY DE				2-0-2-2				
VERSION	1.0	APPROVAL DETAILS 36 th ACM			LEARN ING LEVEL		BTL-4				
ASSESSMENT S											
	ESE										
First Periodica Assessment	l Second Periodical Assessment	Seminar/ Assignments / Project	etc., the E Con	as approved by e Department xamination nmittee "DEC"	Atten dance	The ory	Practical				
15%	15%	10%	5%	25%	25%						
Course Description	This course will provide complete knowledge to the undergraduate studer Understanding the Advanced Driver Assistance Systems (ADAS) in general. role of M Learning and Deep Learning in ADAS. Role of ADAS towards Autonomous Driving, S used in ADAS and How various ADAS systems are tested in Industry										
Course Objectives	 To impart th (ADAS) To educate a To impart the To instruct th To educate a 	 To impart the knowledge on Fundamentals of Advanced Driver Assistance Systems (ADAS) To educate about Advanced Driver Assistance Systems To impart the Advanced Driver Assistance Systems To instruct the ADAS Development using Machine Learning and Deep Learning To educate about ADAS systems Testing Techniques and Standards 									
Course Outcomes	Upon completion 1. understand t 2. understand t 3. understand t 4. understand t 5. understand t	of this course, the ne Fundamentals of ne Advanced Drive ne Advanced Drive ne ADAS Developn ne ADAS systems 1	e studer of Adva er Assist er Assist nent us Festing	nts will be able to nced Driver Assis cance Systems cance Systems ing Machine Lear Techniques and S	tance Syst ning and I itandards	ems (AD Deep Lea	AS) Irning				

Prere	quisit	tes: N	il												
CO, P		D PSC	MAPP	ING											
							P	Os						PS	Os
COs		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO-1		3	3	2	2	2	1	1	-	-	-	1	-	3	1
CO-2		3	2	2	3	2	1	-	-	-	-	-	-	3	2
CO-3		2	3	3	2	1	1	1	-	-	-	-	-	2	2
CO-4		2	2	3	2	1	1	-	-	-	-	1	-	3	3
CO-5		3	3	3	3	2	1	-	-	-	-	1	-	2	3
			1 - Wea	akly Cor	related	l, 2 - M	oderate	ly Corr	elated a	and 3 -	Strongly	Correl	ated		
Modu	ıle 1 –	- Fund	damen	tals of A	Advanc	ed Driv	er Assis	tance	System	s (ADA	S)			(6L+	6P)
Introduction to ADAS - General Block Diagram – Components of ADAS – need of ADAS - Role of ADAS towards Autonomous Driving - Sensors in ADAS - Automotive Radar - Camera (Vision System) - Ultrasonic Sensor – LIDAR - GNSS, GPS, IMU.								Role /ision	CO BTI	-1 2					
Module 2 – Advanced Driver Assistance Systems									(6L+	6P)					
Adaptive Cruise Control (ACC) - Rear Cross Traffic Alert (RCTA)- Vehicle Exit Alert - Front Cross Traffic Alert - Forward Collision Warning - Blind Spot Detection - Parking Assistance System - Intelligent Head Light Control - Occupant Protection System - Pedestrian Protection System- Evasive Steering Support – Vehicle Turn assistance.								Cross tem - stem-	CC BT)-2 L-2					
Module 3– Advanced Driver Assistance Systems									(6L+6P)						
Traffic sign recognition System - Speed Limit Assist - Lane Departure Warning - 360° surrounding view system - Driver Monitoring System - Driver Drowsiness detection - Emergency Brake Assist - Anti lock braking system - Cross Wind Assist - Tire-pressure Monitoring - Head-Up Display - Navigation								360° ion - ssure	CC BT)-3 L-3					
Modu	ıle 4 –	- ADA	S Deve	lopme	nt using	g Mach	ine Lear	rning a	nd Dee	p Learn	ning			(6L+	6P)
Role Overv Algor gradie neigh	of M view - ithms ents (I ibor (I	achin - ML 8 s with HOG) KNN)	e Learı & DL in examp and pr	ning an ADAS bles - he inciple	d Deep - Senso e suppo compo	Learni rs and orts vec nent an	ing in A Sensor tor mac alysis (P	DAS D Fusion hines PCA)- h	evelopr - ML & (SVM) v e Bayes	ment - DL in with his decisio	ML & D ADAS – stograms on rule a	PL in AE Process of orie nd K ne	DAS – sors – ented arest	CO BTI	-4 2
Modu	ıle 5 –	- ADA	S syste	ems Tes	ting Te	chniqu	es and S	Standa	rds					(6L+6P)	
Testi Advar 26262	ng of nced 20 sta	ADAS Drive andar	5 - Simı r Assist ds - Saf	ulation, tance S ety Stai	SIL, HI ystems ndards	L, DIL - (ADAS – certif	Testing Calibra ication	; of AD ation- policie	AS - Or ADAS ii s and G	n Test T n funct overnn	Fracks ar ional sat nent poli	nd anal fety an icies	ysis – d ISO	CO BTI	-5 -3
TEXT	BOOK	<s< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></s<>													
1.	 Yan Li, Hualiang Shi "Advanced Driver Assistance Systems and Autonomous Vehicles" Springer; 1st ed. 2022 														
 Harald Waschl, Ilya Kolmanovsky, Frank Willems, "Control Strategies for Advanced Driver Assistance Systems and Autonomous Driving Functions" Lecture Notes in Control and Information Sciences (LNCIS, volume 476) Springer 2019 															
REFER	RENCE	E BOC	OKS												
1.	Am (AD	it Kur AS): A	mar Mo Applicat	ondal, L tions, D	entin J evelop	oseph, ment, L	"Autono egal Iss	omous ues, ar	Driving Id Testi	g and A ng" CR	dvanced C Press;	l Driver 1st edit	-Assista ion 202	ance Sy 21	stems
E BOO	OKS														
1.	Ger Janı	rardus uary 2	s Blokd 2021	yk "Adv	anced	Driver	Assistan	ce Sys	tems (A	DAS) S	tandard	Requir	ements	" 5stard	cooks,
MOO	С														
1.	1. https://www.udemy.com/course/advanced-driver-assistance-systems/														

COURSE CODE EAT51511 COURSE CATEGORY DE L-T-P-S 2-0-2-2 VERSION 1.0 APPROVAL DETAILS 36 th ACM LEARNING LEVEL BTL-4 ASSESSMENT SCHEME Second Assessment Second Assessment Seminar/ Assignment S/ Project Surprise Test / Quiz etc., as approved by the Department Examination Committee "DEC" Attendance ESE 15% Periodical Assessment Seminar/ Assessment Surprise Test / Quiz etc., as approved by the Department Examination Committee "DEC" Attendance ESE 15% 15% 10% 5% 5% Theory 25% Description This course will provide complete knowledge to the undergraduate students on Vehicle to Vehicle (V2V) and Vehicle to Everything (V2X) Communication, SG V2X Architecture, DSRC Spectrum & Architecture and Connected & Automated Car Seconse 1. To impart the knowledge on Fundamentals of Connected Car Technology 2. To educate about DSRC V2X and C + V2X Upon completion of this course, the students will be able to 1. understand the DSRC V2X and C + V2X Upon completion of this course, the students will be able to 1. understand the SG V2X Standardization and Architecture 4. understand the SG V2X Operation 2. understand the SG V2X Qoperation 2. understand the SG V2X Qoperation 2. understand the SG V2X Qoperat	COURSE	TITLE		V2V and V2X Technology CREDITS													
VERSION1.0APPROVAL DETAILS36 th ACMLEARNING LEVELBTL-4ASSESSMENT SCHEMEFirst Periodical AssessmentSecond Periodical AssessmentSeminar/ Assignment Seminar/ Assignment projectSurprise Test / Quiz etc., as approved by the Department Examination Committee "DEC"Attendance AttendanceESE15%Second Periodical AssessmentSeminar/ Assignment Seminar/ DifferenceAttendance AttendanceESETheory 25%5%Theory 25%Theory 25%Theory 25%Theory 25%ProjectDifferenceDescriptionThis course will provide complete knowledge to the undergraduate students on Vehicle to Vehicle (V2V) and Vehicle to Everything (V2X) Communication, SG V2X Architecture, DSRC Spectrum & Architecture and Connected Car Spectrum & Architecture and Connected Car Spectrum & Architecture and Connected Car Spectrum & ArchitectureObjectivesObjectivesObjectivesObjectivesObjectivesOuter about V2X Services and Use caseProfectPointObjectivesObjectivesObjectivesObjectivesObjectivesObjectivesObjectivesObjective <td< td=""><td>COU</td><td>RSE DE</td><td></td><td>EA</td><td>T5151</td><td>1</td><td>COUI</td><td>RSE CAT</td><td>EGORY</td><td></td><td>DE</td><td></td><td>L-T-F</td><td>P-S</td><td>2</td><td>2-0-2-2</td></td<>	COU	RSE DE		EA	T5151	1	COUI	RSE CAT	EGORY		DE		L-T-F	P-S	2	2-0-2-2	
ASSESSMENT SCHEME First Periodical Assessment Second Periodical Assessment Second Segment s/ Project Surprise Test / Quiz etc., as approved by the Department Examination Attendance ESE 15% 15% 10% 5% 1 Theory 25% 25% 15% 10% 5% 5% Theory 25% 25% 0 This course will provide complete knowledge to the undergraduate students on Vehicle to Vehicle (V2V) and Vehicle to Everything (V2X) Communication, 5G V2X Architecture and Connected & Automated Car Spectrum & Architecture and Connected & Automated Car Tenory 25% 25% 0 1. To impart the knowledge on Fundamentals of Connected Car Technology 2 To educate about DSR V2X and C · V2X 3. To impart the 5 G V2X Standardization and Architecture 4. To instruct the 5G V2X Operation 5. To educate about V2X Services and Use case Upon completion of this course, the students will be able to 1. understand the 5G V2X and C · V2X 3. 1. understand the 5G V2X and C · V2X 3. 1. understand the 5G V2X and C · V2X 3. 1. understand the 5G V2X and C · V2X 3. 1. understand the 5G V2X and C · V2X 3. 1.	VERS	ION			1.0		APPR	ROVAL	DETAILS		36 th ACI	И	LEARN LEV	ling El		BTL-4	
First Periodical Assessment Second Periodical Assessment Second Assignment Second Assignment Sumprise Test / Quiz etc., as approved by the Department Examination Committee "DEC" Attendance ESE 15% 15% 10% 5% 5% 10% 25% Practical 25% Practical 25% 0 15% 15% 10% 5% 5% 10% 25% Practical 25% 25% Practical 25% 25% Practical 25% 25% Practical 25% 25% Practical 25% 25% 10% 5% 10% 5% 10% 5% 10% 25% Practical 25% 25% Practical 25% 25% Practical 25% 25% 10% <td>ASSESS</td> <td>MENT SC</td> <td>CHEN</td> <td>ME</td> <td></td>	ASSESS	MENT SC	CHEN	ME													
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Assessment s/ Project Examination Committee "DEC" Image: Technology 15% 15% 10% 5% 5% Theory 25% 15% 10% 5% 5% Practical 25% Course Description This course will provide complete knowledge to the undergraduate students on Vehicle to Vehicle (V2V) and Vehicle to Everything (V2X) Communication, 5G V2X Architecture, DSRC Spectrum & Architecture and Connected & Automated Cars Course Objectives 1. To impart the knowledge on Fundamentals of Connected Car Technology 2. To educate about DSRC V2X and C- V2X 3. To impart the 5 G V2X Standardization and Architecture 3. To impart the 5 G V2X Standardization and Architecture 4. To instruct the 5G V2X Operation 5. To educate about DSRC V2X and C- V2X 3. To impart the 5G V2X Standardization and Architecture 4. understand the Fundamentals of Connected Car Technology 2. understand the SG V2X Operation 5. understand the SG V2X Operation 5. understand the SG V2X Operation 5. understand the 5G V2X Operation 5. understand the SG V2X Operation 5. understand the SG V2X Operation 1. 1 1 60/02 1 2 3 700 1 2 3 2 1	First Pe	eriodica		Ρ	eriodi	cal	Assigr	nment	th	e Depa	artment	:	Attend	ance		ESE	
15% 10% 5% Theory 25% 15% 10% 5% 5% Theory 25% Practical 25% 25% Practical 25% 25% Description This course will provide complete knowledge to the undergraduate students on Vehicle to Vehicle (V2V) and Vehicle to Everything (V2X) Communication, 5G V2X Architecture, DSRC Spectrum & Architecture and Connected & Automated Cars 5% To inpart the knowledge on Fundamentals of Connected Car Technology Course Objectives 1. To impart the knowledge on Fundamentals of Connected Car Technology 5 To educate about DSRC V2X and C- V2X 3. To impart the 5 G V2X Operation 5. To educate about DSRC V2X and C- V2X 5 1 5. To educate about DSRC V2X and C- V2X 5 1 1 1 6. Upon completion of this course, the students will be able to 1. understand the Fundamentals of Connected Car Technology 1 1 2 0utcomes 3. understand the 5G V2X Operation 5 1 2 1 2 0 1. understand the 5G V2X Operation 5 1 2 2 2 0 1 2 3 2 1 1 1 </td <td>Asses</td> <td>sment</td> <td></td> <td>As</td> <td>ssessm</td> <td>ent</td> <td>s/ Pr</td> <td>oject</td> <td></td> <td>Examir</td> <td>nation</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Asses	sment		As	ssessm	ent	s/ Pr	oject		Examir	nation						
15% + 15% + 10% + 5% + 5% + 5% + 10% + 5% + 10% + 10% + 5% + 10			_						Co	nmitte	e "DEC					hoory	
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Course Objectives Venicle (v2v) and venicle to Everything (v2x) Communication, 33 v2x Architecture, Disc Spectrum & Architecture and Connected & Automated Cars Course Objectives 1. To impart the knowledge on Fundamentals of Connected Car Technology 2. To educate about DSRC V2X and C- V2X 3. To impart the 5 G V2X Operation 5. To educate about V2X Services and Use case Course Objectives Upon completion of this course, the students will be able to 1. understand the Fundamentals of Connected Car Technology 2. understand the DSRC V2X and C- V2X 3. understand the 5 G V2X Standardization and Architecture 4. understand the 5G V2X Operation 5. understand the 5G V2X Operation 5. understand the 5G V2X Operation 5. understand the V2X Services and Use case Prerequisites: Nil Cos 1 2 3 2 2 3 3 2 Cos 1 1 2 3 2 2 3 2 2 2 3 2 3 3 2 2 3 3 2 2 3 3 2 3 3 4 5	Course Vehicle (V2V) and Vehicle to Everything (V2X) Communication, 5G V2X Architecture,													ehicle to			
Course Objectives I. To impart the knowledge on Fundamentals of Connected Car Technology 2. To educate about DSRC V2X and C- V2X 3. To impart the 5 G V2X Standardization and Architecture 4. To instruct the 5G V2X Operation 5. To educate about V2X Services and Use case Course Outcomes Upon completion of this course, the students will be able to 1. understand the DSRC V2X and C- V2X 3. understand the DSRC V2X and C- V2X 3. understand the DSRC V2X and C- V2X 3. understand the 5G V2X Standardization and Architecture 4. understand the 5G V2X Qperation 5. understand the 5G V2X Operation 5. understand the V2X Services and Use case Prerequisites: Nil Vertice to the V2X Services and Use case PSOs Co.y O AND PSO MAPPING PSOs PSOs Co.3 Q Q Q Q Q Q Q Q Co.3 Q Q Q Q Q Q Q Q Q Co.3 Q	Description Spectrum & Architecture and Connected & Automated Cars													Ie, DSRC			
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Vehicle to the network (V2N) - Vehicle to everything (V2X) – V2X terminology – Vehicle to Cloud CO-1	Vehicle t		e (V	21/)-	– Vehi	cle to r	oadway	/ infrast	ructure	(\/21) -	Vehicle	to Pe	destriar	s (\/2P)		<u> </u>	
	Vehicle t	o the ne	etwo	۷) rk (۱	V2N) -	Vehicl	e to eve	erything	g (V2X) -	- V2X t	ermino	logy –	Vehicle	to Clou	id	CO-1	
(V2C)- V2X Communication Standards – Dedicated Short-Range Communication (DSRC) V2X – BIL-2	(V2C)- V2X Communication Standards – Dedicated Short-Range Communication (DSRC) V2X – B												BTL-2				
Cellular C-V2X.																	
Module 2– DSRC V2X and C- V2X (6L+6P)	Module	2– DSRC	: V2)	K an	d C- V	2X										(6L+6P)	
DSRC V2X - DSRC Spectrum - DSRC Architecture – DSRC 802.11p – WLAN-based V2X - Wi-Fi -	DSRC V2	X - DSR	C Sp	pect	rum -	DSRC	Archited	cture –	DSRC 8	02.11p) – WLA	N-bas	ed V2X	- Wi-Fi	-	60 0	
Orthogonal Frequency Division Multiplexing (OFDM) – Carrier Sense Multiple Access (CSMA) - C-	Orthogo	nal Freq	uen	CY D	vivisior	n Multi	plexing	(OFDM) – Carri	er Sen:	se Mult	iple A	cess (CS	5MA) - (C-	CO-2 BTL-2	
	technolo	io base()gy- Sing	le-c	arrie	er Frec	Long I	Division	n Multir	le Acce	ынк — з ss (SC-	FDM) -	C-ITS	i cenulal	model		U1 L-2	
technology- Single-carrier Frequency Division Multiple Access (SC- FDM) - C-ITS	Module	3–56V	2X 9	Stan	dardiz	ation	and Arc	hitectu	re		,	2110				(6L+6P)	
v2x kei.10 based on kk (3G) – Long Term Evolution (ETE) upink – 3GFF based on Central modern	technolo	ogy- Sing	le-ca	arrie	er Frec	luency	Divisior	n Multip	le Acce	ss (SC-	FDM) -	C-ITS					
technology- Single-carrier Frequency Division Multiple Access (SC- FDM) - C-ITS	Module	3– 5 G V	2X S	Stan	dardiz	ation a	and Arc	hitectu	re							(6L+6P)	

Vehi and F 5G no	cle to everything (V2X) - Intelligent Transportation System Architecture – Sensors – LIDAR AADAR – ITS Stations – ITS layers – 3GPP NR – V2X Architecture- V2X Application layers - Key odes for V2X – 5G V2X RSU (Road Side Units) –Multicast broadcast service architecture	CO-3 BTL-3							
Modu	Ile 4– 5G V2X Operation	(6L+6P)							
PC5 - PC5 - 5G V2	Configuration – Direct Communication Modes – 5G V2X Bands – Communication Over NR- - NR-PC5 Protocols – Broadcast – Group Cast - Unicast - NR V2X QoS and Network Slicing – 2X Synchronization - 5G V2X Mobility and Roaming – MEC Traffic Routing and Operation	CO-4 BTL-2							
Modu	Ile 5– V2X Services and Use case	(6L+6P)							
V2X Coop Auto Coop Drivir	telematics – Autonomous Vehicle – 3GPP– 5AA – Safety and Vehicle Management – erative Traffic – Interactive VRU Crossing - Vehicle Management Software – convenience – mated Valet parking – obstructed view Assistance – Automated Intersection Crossing – erative lane Merge – Infrastructure Assisted Environment Perception – Tele operated ng – Vehicle Platooning – Patient Transport Monitoring.	CO-5 BTL-3							
TEXT BOOKS									
1.	1. Wishart Jeffrey "Fundamentals of Connected and Automated Vehicles" SAE International,2021								
2.	Fei Hu "Vehicle-to-Vehicle and Vehicle-to-Infrastructure Communications" CRC Press 2020								
REFER	RENCE BOOKS								
1.	Xiang Cheng, Rongqing Zhang, Liuqing Yang "5G-Enabled Vehicular Communications and Ne Springer 2019	tworking"							
2.									
E BOC	DKS								
Radovan Miucic "Connected Vehicles Intelligent Transportation Systems" Springer 2019									
MOO	C								
1.	https://www.udemy.com/course/c-v2x-cellular-vehicle-to-everything-5g/								
2.	https://www.udemy.com/course/fundamentals-of-connected-car-technology/								

Specialization 3: ENGINE AND VEHICLE TECHNOLOGY

COURSE TITLE	AUTOM	OTIVE POLLUTIO	N AND CONTROL	CREDITS	3						
COURSE CODE	EAT51512	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2						
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3						
ASSESSMENT SCHEME											
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	End Semester Examinati on						
15%	15%	10%	5%	5%	Theory 25% Practical 25%						

C Des	ourse cription	Thi me	This course is based on the exposing the students on various automobile emissions and methods to control the automobile pollutants.											
Course1. To Understand the effect of various types of emissions.Objective2. To Know about the formation of various types of pollutants from SI and CI engines.Objective3. To Understand the significance of emission control techniques.4. To Understand the construction and working of emission measuring instruments.5. To Learn the various emission standards and test procedures.											2S.			
C Ou	CourseUpon completion of this course, the students will be able toCourse1. Familiarize the effect of various automotive emissions.Outcome2. Gain Knowledge about the formation of various types of pollutants from SI and CI engines.Outcome3. Acquire the significance of emission control techniques.4. Familiarize the construction and working of emission measuring instruments.5. 5. Gain information on various emission standards and test procedures.													
Prer	Prerequisites: Knowledge in fundamentals of Engines													
со, і	CO, PO AND PSO MAPPING													
CO PO										PSO	PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	-	-	-	-	-	-	3	-	-	3	1	2
CO2	3	3	-	-	3 1	-	-	-	3 3	-	-	3 2	2	2
CO4	3	3	-	2	-	-	-	-	3	-	-	3	1	3
COT J J Z I I I J CO5 3 3 - - 3 - - 3											2	1		
1: W	1: Weakly related, 2: Moderately related and 3: Strongly related													
MOL	DULE 1:	INTRO	DUCTIO	N									(61	. + 6P)
Vehicle population assessment in metropolitan cities and contribution to pollution, effects on human health and environment, global warming, types of emission, transient operational effects on pollution. Practical component: Emission Measuring Device - Catalogue									CC BT	D1 L3				
MOD	ULE 2: F	POLLUT	ANT FO	RMATI	ON IN S	I ENGIN	ES						(6L +	- 6P)
Pollutant formation in SI Engines, mechanism of HC and CO formation in four stroke and two stroke SI engines, NO _x formation in SI engines, effects of design and operating variables on emission formation, control of evaporative emission. Two stroke engine pollution. Practical component: Measurement of emissions in SI engines									CO2 BTL3					
MODULE 3: POLLUTANT FORMATION IN CI ENGINES									(6L	+ 6P)				
 Pollutant formation in CI engines, smoke and particulate emissions in CI engines, effects of design and operating variables on CI engine emissions. No_x formation and control. Noise pollution from automobiles, measurement and standards. Practical component: Measurement of emissions in CI engines 									C(B1	03 ГL3				
MOD					BILLER	IEC ENAL	CLICNIC							
MODULE 4: CONTROL OF SI AND CLENGINES EMISSIONS									talutic	(61	+ 0P)			
conve	Design of engine, EGR, Thermal reactors, secondary air injection, DPF, Lean NOX, SCR, catalytic converters, catalysts, fuel modifications, fuel cells, Two stroke engine pollution control.									larytic	BT	74 "L3		

Pract	Practical component:									
optim	um selection of operating variables for control of emissions – Plotting Graph									
MOD	ULE 5: MEASUREMENT TECHNIQUES EMISSION STANDARDS AND TEST PROCEDURE	(6L + 6P)								
NDIR, FID, Chemi-luminescent analyzers, Gas Chromatograph, emission standards, driving cycles - USA, Japan, Euro and India. Test procedures - ECE, FTP Tests. SHED Test - chassis dynamometers, dilution tunnels. C Practical component: B										
s	moke meters – Determination of the emission									
TEXT	BOOKS									
1	Ganesan, V- "Internal Combustion Engines"- Tata McGraw-Hill Co 2017.									
2	2 Paul Degobert - Automobiles and Pollution - SAE International ISBN-1-56091-563-3.									
REFER	RENCE BOOKS									
1.	1. SAE Transactions- "Vehicle Emission"(3 volumes)									
2.	Obert.E.F "Internal Combustion Engines"									
3.	3. Marco Nute- " Emissions from two stroke engines, SAE Publication - 1998									
E BOC	воокѕ									
1.	Catalysis and Automotive Pollution Control IV (ISSN Book 116) 1st Edition, Kindle Edition									
2. <u>http://www.faadooengineers.com/threads/9929-Automotive-pollution-and-control-full-notes-</u> <u>ebook-free-download-pdf?s=bec82efb82e4eac385bd1baeef6a5aec</u>										
3. <u>https://www.scribd.com/book/282540186/Catalysis-and-Automotive-Pollution-Control</u>										
моос										
1.	https://nptel.ac.in/courses/103107215									

COURSE TITLE		OFF ROAD VEHICLE	S	CREDITS	3
COURSE CODE	EAT51513	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2
Version	1.0	Approval Details	36 [™] ACM	LEARNING LEVEL	BTL-3
ASSESSMENT S	CHEME				
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz etc., as approved by the Department Examination Committee "DEC"	Attendance	End Semester Examination
					Theory 25%
15%	15%	10%	5%	5%	Practical
					25%
Course Description	This course gives	s knowledge on off ro	ad vehicles and its ap	oplications	
Course Objectives	 To familiariz To acquire equipment 	e with the construction the knowledge on c	on and working of va onstruction and wo	rious Earth movir rking of various	ng equipment constructional

	 To familiarize with the working of Industrial equipment To develop the knowledge on working of Military equipment 														
			5.	Upon c	ompleti	on of t	his cour	se, the	studen	ts will b	e able	to			
			1.	Familia	rize wit	h the c	onstruc	tion an	d worki	ng of va	arious E	arth mo	oving e	quipm	ent
Со	urse		2. /	Acquire	the k	nowled	lge on	constr	uction	and w	orking	of vai	ious co	onstruc	tional
Out	tcome	es	3. (Gain kn	owledg	e on th	e consti	ruction	and wo	orking o	f Farm	equipm	ent		
			4. 1	Familiar	ize with	n the w	orking o	of Indus	trial eq	uipmer	t				
_			5. I	Develop	the kn	owledg	e on wo	orking c	of Milita	ary equi	pment				
Pre				DING											
0	CO PO PO- PO- PO- PO- PO- PO- PO- PO- PO- PS PS CO 1 2 2 4 5 6 7 8 6 10 11 12 64 6														
C	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$														
CO	-1	3	1	3	-	-	1	3	-	-	-	2	3	3	1
CO	-2	2	1	2	-	-	3	3	-	-	-	1	2	2	2
CO	-3	3	2	1	-	-	2	2	-	-	-	2	3	3	2
CO	-4	2	1	2	-	-	3	3	-	-	-	1	2	2	1
CO	-5	3	1	3	-	-	3	3	-	-	-	1	3	2	3
		- 4 -	1	: Weak	ly relat	ed, 2: N	Aodera	tely rela	ated an	d 3: Str	ongly r	elated		101	(2)
		E 1 - E/				VIINING			tions of	foorth		liko du	mnore	(6L+	6P)
frou	nt-en		rs hull	ig equi dozers	hackho	capaci o loada	iy anu	applica Rock dr	illing m		and Ev	iike uu vcavato	nipers,	C	D-1
Pra	actice	: Demo	nstrati	on of o	peration	$r of CA^{-1}$	T backh	oe load	er	actimes		Cavato	13.	ВТ	L-2
MO	DULE	2 - CO	NSTRU	CTION	AL AND	ROAD	EQUIPN							(6L+	6P)
Lay	out (of Con	structio	onal an	d Road	l equip	ment:	Tower	cranes	, hoist,	motor	grade	rs, Soil	1	
Cor	npact	ors, Ro	ad pav	ing mac	hines, c	concret	e ready	mixers	for con	structic	on of bri	idges ar	nd their	C	0-2
wo	rking	princip	les.											B	TL-2
Pra	octice	: Demo	nstrati	on of o	peration	n of cor	ncrete r	eady m	ixers.						
MO	DULE	3 - FA	RM AN	d fore	STRY E	QUIPM	ENT							(6L+6I	P)
Cla	ssifica	ation c	of tract	ors –	Main c	ompon	ents of	tracto	r. Wor	king of	tracto	ors – A	uxiliary		
equ	ipme	nt – T	railers	and bo	ody tipp	ping me	echanis	m - plo	owing -	paddy	planta	ition m	achine,	C	0-3
har	vestir	ig maci	nines, I	ree cut	ting ma	ichine.	-	ر ا مر ممر : ام						В	TL-3
MO						n of trac	ctors an	ia impie	ements					(61 + 61	D۱
	nstru	tional	feature	AL EQU	acity an	I d stahi	lity of	Overhe	ad crar	nes Mo	hile cr	anes ii	h		-)
cra	nes. F	orklifts	. Towir	ng vehic	les.		inty of	overne				unes, ji	0	C	D-4
Pra	actice	: Demo	nstrati	on of o	peration	n of mo	bile cra	nes.						BT	L-2
МО	DULE	5 - MI	LITARY	VEHIC	.ES									(6L+	6P)
Sp	ecial	feature	s and c	onstruc	tional d	details o	of tanke	rs, Mai	n Battle	Tank(N	/IBT), gi	un carri	ers and		
Mil	itary 1	ranspo	ort vehi	cles.										BT	J-5 []_2
Pra	octice	: Demo	nstrati	on of o	peration	n of Mil	itary tra	ansport	vehicle	es.					
TEX	T BO	DKS		-											
1.	Won	g.J.T., '	' Theor	y of Gro	ound ve	hicles "	', John \	Wiley &	Sons, N	Vew Yo	rk.			0	
2. Construction planning, Equipment and Methods - Robert L. Peurifoy, William B. Ledbrtter, Clifford J.															
RFF	REFERENCE BOOKS														
1. Construction Equipment Management by John Schaufelberger															
2.	Abro	simov	K. Brai	n berg.4	A. andKa	ataver.	(., " Roz	ad maki	ng Mac	hinerv	", MIR I	Publishe	ers, Mos	cow	
E BC	OOKS			0.						,			, ,		

1.	https://www.studynama.com//construction-techniques-equipment-practices-ebook-n
2.	https://www.kopykitab.com/Construction-Equipment-and-Job-Planning-eBook
MOO	C
1.	https://www.iti.com/heavy-equipment-training
2.	www.news.mit.edu/2015/mitx-mooc-helps-farmer-develop-autonomous-tractor-app

Specialization 4: DESIGN AND MANUFACTURING

COUR TITLE	SE		CON	IPUTER			/IANUF	ACTUR	NG		CREDI	rs		:	3	
COUR CODE	SE	E	AT5151	.4	COURS CATEG	E ORY		C	E		L-T-P-S 2-0-2-2					
Versic	on		1.0		Approv Details	/al		36 th	АСМ		LEARNING BTL-3					
ASSES	SMENT	SCHEN	1E													
					CI	4							E	SE		
Fi Perio Asses (The	rst odical ssment eory)	P As (Second eriodica sessme Theory	al :nt)	Pra Asses	ctical sments	Ot lal aı the Ex	oservati o recorc oprovec Depart xaminat Commit "DEC"	on / ls as l by ment tion tee	Atte	ndanc e	Theo	ry	Pra	actical	
1!	5%		15%		1	0%		5%		!	5%	25%	6	2	25%	
Cou Descr Cours Objec	urse ription e tive	This c Desig 1. T 5 7 5	course c gn, Prop To discu systems To sumi To diffe To inter vehicle To discu	deals w er plan uss on marize rentiati pret th (AGV) s uss on r	ith the a ning, M basic co the proo e the dif e conce system obots us	oncepts duction ferent c pts of fle	on of c uring co of CA plannir oding s exible n dustria	ompute ost, Lay D, CAM ng and c systems nanufac al applic	ors in va out & N and c ontrol used in turing s ations	arious Aateri compu and co n grou systen	aspects al Hand iter inte pmpute p techn n (FMS)	of Mar ling syst egrated rized pr ology and au	ma coma	nufac ss plar	g viz., turing nning guided	
Cours Outco	e ome O AND P	Upon 1. [2. S 3. [4. V 5. [SO MA	 To discuss on robots used in industrial applications Upon completion of this course, the students will be able to Discuss on basic concepts of CAD, CAM and computer integrated manufacturing systems Summarize the production planning and control and computerized process planning Differentiate the different coding systems used in group technology Interpret the concepts of flexible manufacturing system (FMS) and automated guided vehicle (AGV) system Discuss on robots used in industrial applications 													
со	PO- 1	PO- 2	PO- 3	РО- 4	PO- 5	PO- 6	РО- 7	PO- 8	РО- 9	PO- 10	• PO- 11	PO- 12		PSO -1	PSO -2	

CO- 1	1	2	1	1	3	1	-	-	2	1	2	1	1	2
CO- 2	2	2	2	2	2	2	-	-	3	1	3	2	2	1
CO- 3	1	1	1	1	3	-	-	-	2	2	2	1	1	1
CO- 4	1	1	2	1	2	-	-	-	3	1	3	2	1	2
CO- 5	2	2	1	1	3	-	-	-	2	2	2	1	2	1
	I	I	1: Wea	akly rela	ated, 2:	Moder	ately re	lated a	nd 3: St	rongly	related	I		L
MOD	10DULE 1: INTRODUCTION (6L+ 6P)												+ 6P)	
Brief i Introd eleme Mathe Contro Auton Lab E xper	ntroduc luction ents of C ematica ol – Sin nation – cperime iment o	ction to to CAD, CIM syst I model nple Pro - Lean P ents n CNC r	CAD and /CAM – eem – Ty s of Pro oblems Producti machine	d CAM - - Concu /pes of duction – Basic on and	- Manuf rrent Ei product Perforr Eleme Just-In-	acturin ngineer ion - M nance - nts of a Time Pr	g Planni ing-CIM anufact - Simple an Auto roductic	ing, Mai concer uring m proble omated on.	nufactu ots – Co odels a ms – Ma system	ring cor ompute nd Met anufact – Leve	ntrol- rized rics – uring els of		CO-1 BTL-3	
MOD	ULE 2: P	RODUC	CTION P	LANNI	NG AND	CONTR	ROL ANI	D COMP	PUTERIS	ED PRC	DCESS P	LANNIN	IG (6L+	- 6P)
Comp Produ Syster Planni Lab Ex Practi	uter Aid ction So ms-Shop ing-II (N operime ce on Lo	ded Pro chedule o Floor 1RP-II) & ents ogical st	cess Pla – Mate Contro & Enterp ceps in (anning - erial Re I-Invent prise Re Comput	- Aggre quiremo ory Con source er Aideo	gate Pre ent plar ntrol – Plannin d Proces	oductio nning – Brief o g (ERP) ss Planr	n Plann Capacit n Manu - Simple ning	ing and ty Plann Ifacturii e Proble	l the M ling- Co ng Resc ems	aster ntrol ource		CO-2 BTL-3	
MOD	ULE 3: (CELLULA	AR MAN	NUFACT	UFACTI	JRING							(6L	.+ 6P)
Group Proble Manu Quant Arran Lab E Practi	Techn ems in facturin titative ging Ma cperime ce on G	ology(G Opitz ag – Co analysis achines ents roup Te	GT), Par Part C Omposit s in Cel in a GT echnolog	rt Fami oding ce part lular M cell – H gy	lies – F system concer anufact ollier M	Parts Cl – Proo ot – M ouring – ethod –	assifica duction achine - Rank (- Simple	tion an flow cell de Order C Proble	d codir Analysis esign ar Clusterir ms	ng – Si 5 – Ce nd Iayo ng Meth	mple Ilular out – nod -		CO-3 BTL-3	
MOD (AGVS	ULE 4: 1 6)	FLEXIBL	E MAN	UFACTL	JRING S	YSTEM	(FMS) /	AND AU	TOMA	red GU	IDED VE	EHICLE S	SYSTEM	
													(6L+	6P)
Types Plann Guide Vehicl Lab Ex Practi	of Flex ing and d Vehic le Mana xperime ce on Q	ibility - Contro le Syste gemen ents uantita	FMS – I – Qua em (AG\ t & Safe tive ana	FMS C ntitativ VS) – Ad ety. alysis in	ompone e analys GVS App FMS	ents – F sis in FN plicatior	MS Ap MS – Sir ח – Veh	plication nple Pro icle Gui	n & Ber oblems. dance t	nefits – Autom echnolo	FMS hated ogy –		CO-4 BTL-3	
MOD	ULE 5:	INDUS	TRIAL R	OBOTI	CS						I		(6L	+ 6P)
Robot syster	: Anato ns – Fn	my and d Effect	Relate	ed Attri ensors	butes – in Robo	Classif	fication	of Rob	ots- Ro and Re	bot Co	ntrol ility -		CO-5 BTL-3	

Industrial F	Robot Applications – Robot Part Programming – Robot Accuracy and
Repeatabili	ty – Simple Problems.
Lab Experin	nents
Practice on	Robot Part Programming
TEXT BOOK	<u>s</u>
1	Mikell P. Groover "Automation, Production Systems and Computer Integrated Manufacturing"
1.	Prentice Hall of India 2018
2.	Radhakrishnan P, Subramanyan S.and Raju V., "CAD/CAM/CIM", 2nd Edition, New Age
	International (P) Ltd, New Delhi, 2015.
REFERENCE	BOOKS
1	Gideon Halevi and Roland Weill, "Principles of Process Planning – A Logical Approach"
	Chapman & Hall, London.
2	Kant Vajpayee S, "Principles of Computer Integrated Manufacturing", Prentice Hall India.
3	Rao. P, N Tewari & T.K. Kundra, "Computer Aided Manufacturing", Tata McGraw Hill Publishing
	Company.
E Resource	s for Reference
1.	https://www.amazon.in/Computer-Integrated-Manufacturing-Venkateshwaran-Alavudeen-
	ebook/dp/B00K7YFX3S
2.	https://www.amazon.in/COMPUTER-INTEGRATED-MANUFACTURING-22658-VILAS-
	ebook/dp/B08B1R2XR3
3.	https://www.google.co.in/books/edition/COMPUTER_INTEGRATED_MANUFACTURING/GILOT
	O6n320C?hl=en
моос	
1.	https://onlinecourses.nptel.ac.in/noc22_me10/preview
2.	https://www.classcentral.com/course/swayam-computer-integrated-manufacturing-17550

COURSE TITLE	PROCESS	PLANNING AND	COST ESTIMATION	CREDITS	3
COURSE CODE	EAT51515	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2
VERSION	1.0	APPROVAL DETAILS	36 [™] ACM	LEARNING LEVEL	BTL-3
ASSESSMENT S	CHEME		·		
First Periodical Assessment (Theory)	Second Periodica Assessment (Theory)	Practical Assessme nts	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	ESE
15%	15%	10%	5%	5%	Theory 25%
15%	15%	10%	5%	5%	Theory 25% Practical 25%
15% Course Description	15% To know and unde estimation for vario	10% erstand about th ous products use	5% he process planning of ed in automobiles afte	5% concepts as we er process planr	Theory 25% Practical 25% ell as to make cost ning

Course Outcor	CourseUpon completion of this course, the students will be able to1. Define a Process Plan for a Product.2. Derive the Cost for a product based on Cost elements for a Product.3. Assign Overhead cost of the product based on different departments in manufacturing4. Estimate cost for Casting and Forging products.5. Estimate the costs for machining a product													
Prerequ	uisites: N	lil												
CO, PO AND PSO MAPPING														
COs	PO1	Р О 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO 11	PO 12	PSO 1	PSO 2
CO-1	3	2	2	2	1	1	1	-	2	-	2	1	1	1
CO-2	2	3	1	2	2	1	2	-	1	-	1	2	1	2
CO-3	3	2	2	1	1	2	1	-	1	-	2	1	2	1
CO-4	3	3	2	1	2	1	2	-	2	-	1	2	1	2
	-	1 - W	eakly C	orrelate	ed, 2 - N	/loderat	tely Cor	related	and 3 -	Strong	ly Corre	lated		
Module	e 1 – Pro	cess l	Plannin	g									(6L+	-6P)
of Process of Proce Operati Instrum Practic 1.Case S 2. Desig	ess Parar on Sequ eents –Co al Comp Study in gn of Jigs	neter uenci ompu ompu onen Proce and	rs– Facting; Equ iter Aide iter Aide it: ess Plan Fixtures mation	ors to b uipment ed Proc ning.	e consid t & To ess Plar	dered ir ol Sele nning –	vorks	ing: Pro Tool H	cesses; olding	Process	s Sequer ; Meas	ncing; suring	CC BT	0-1 L-3
Costing Departr Practica 1.Calcu Module	- Cost ment, co al Compo lation of a 3 – Allo	Esti sting onen cost	mation versus t: for diffe	– Eler Estimat erent au	ments ing, Typ utomob	of Cos bes, Imp ile com	t. Estin portanc ponent	nating e, Proce s	- Func edure o	tions o f Estima	f Estim tion	nating	CC BT (6L+	D-2 'L-3 -6P)
Overhe to Calcu	ads, Typ Ilate it, I	es - A ntere	Allocatio est on Ca	on or Di apital, I	stributi dleness	on of O Costs,	verhea Repair a	d Cost , and Ma	Depreo intenan	ciation a ice Cost	and Me	thods	CC BT	D-3 'L-3
Module	e 4 – Cos	t Esti	mation	for Cas	ting, W	elding	and Foi	rging pr	ocess				(6L+	-6P)
Module 4 – Cost Estimation for Casting, Welding and Forging process Estimation of cost for Casting processes, Welding processes and Forging processes Practical Component: 1.Estimate the cost of casting an Aluminium Engine block. 2. Create a welding joint (Butt, Jan and Tioint) and estimate the cost involved in the process											ocess.	CC BT)-4 L-3	
Module	e 5 – Cos	t Esti	mation	for Ma	chining	proces	s						(6L+	6P)
Estimation of Machining Time and Cost – Lathe operations, Drilling, Milling, Shaping Planing, and Grinding operations. Practical Component: 1.Estimate the cost of turning, facing and threading cutting operations in a lathe												CC BT)-5 L-3	
2.Estim	ate the c DOKS	ost f	or mach	nining tl	ne prod	uct (dia	igram w	vill be p	rovided)				

1.	Process Planning And Cost Estimation, Panneerselvam, R., Sivasankaran, P.(2016) ISBN: 9788120351721. PHI Learning Pvt. Ltd.
2	Mechanical Estimating and Costing, T.R. Banga and S.C. Sharma
Ζ.	ISBN: 978-81-7409-266-3, Khanna Publishers (2017)
REFER	RENCE BOOKS
1.	Narang G.B.S. & Kumar.V, "Production and Costing", Khanna Publishers, 2000.
2	Process Planning and Cost Estimation 2Nd Edition 2015 by Dr M Adithan, New Age International (P)
۷.	Ltd Publishers
E BOO	DKS
1	https://www.phindia.com/Books/BookDetail/9788120351721/process-planning-and-cost-
1.	estimation-panneerselvam-sivasankaran
2.	https://khannapublishers.in/index.php?route=product/product&path=63&product_id=267
моо	C
1.	https://in.coursera.org/learn/product-cost-and-investment-cash-flow-analysis
2.	https://nptel.ac.in/courses/112107143

Semester-V

DEPARTMENT ELECTIVE -III

Specialization 1: ELECTRIC VEHICLE TECHNOLOGY

COURS	E TITLE			CHA	ARGING	TECHN	OLOGY			C	REDITS		3	
COL CO	JRSE DE	I	EAT515	16	COL CATE	JRSE GORY		DE		I	T-P-S		2-0-2	2-2
VERS	SION		1.0		APPF L DE	ROVA FAILS		36 th AC	М	LE	ARNING LEVEL	6	BTL	-4
ASSESS	MENT	SCHEM	E											
Fii Perio Assess (The	rst odical sment ory)	Pe As: ("	Second eriodica sessme Theory)	al nt	Practica Assessm	l ients	Obse r app De Ex Com	ervation ecords roved b epartme aminat mittee	i / lab as by the ent ion "DEC"	Att	endanc	e	ESE	E
15	5%		15%		10%	6		5%			5%		Theory Practica	25% 25%
Cou Descri	urse iption	The unde and	course erstand battery	will for variou swapp	cus on t is under bing.	he func pinning	damenta g techno	als of C blogies	harging for chai	techno		or EV ve conduc	ehicles a ctive, wi	and to reless
Course Objecti	ves	2.	To und environ	lerstan Imenta	id the o il, and so	develop pcietal p	oment perspec	of elec tives.	tric vel	hicle c	harger	from 1	echnolo	ogical,
Course Outcon Prerequ	nes uisites: l	 To discuss the basic mechanisms charging of batteries. To interpret the components, processes and characterization tools in battery discharging process. To impart knowledge on fast charging. To deliver knowledge on electric vehicle charging station. To divulge about future and environment aspects. 											attery	
CO, PO	AND PS	O MAF	PPING											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	РО	PO	PSO	PS
							-			0	11	12	1	02

		1		1		1			1			1		
CO-1	3	3	2	3	2	1	1	1	1	3	3	3	3	3
CO-2	3	3	1	2	1	2	2	1	2	2	2	2	3	3
CO-3	2	2	3	3	3	1	3	2	1	1	1	2	3	3
CO-4	1	2	1	3	2	3	1	2	2	2	1	1	3	3
CO-5	2	1 1/0		3	3	3 adarati	2		2	2 Strongli	2	1	3	3
		1 - we		rrelated	J, Z - IVI	oueral	ely Corr	elated	anu 3 -	Strong	y corre	lateu	10	
Module	e 1- BAT	TERY C	HARGIN	NG									(61	.+6P)
Chargir Battery Chargir LAB- O chargin	ng NiMH Packs, ng Techr bserve g/load o	I Batter Enviror hology, the ch current	ries, Rat nmenta Battery arging µ , SOC, te	te of Cl I Influe Pack Co process empera	narge E nces or orrectiv , and ture, D	ffect of Charg ve Actio plot gra OC, and	n Charg ing, Ch ns. aph of I termir	ge Acce arging chargin nal volta	ptance Methoo g/load age.	Efficier ds for N current	icy of T IiMH Bi t-plot g	raction atteries graph o	f C B	0-1 TL-3
Module	e 2 –BA [.]	TTERY [DISCHA	RGING									(61	.+6P)
Definiti Li-ion B Vehicle LAB- Ob chargin	on of N Battery, Battery Serve tl g/load o	iMH Ba Dischai / Discha he disch	attery Ca rge of a arge harging , SOC, te	apacity, n Elect process empera	Discharic Veh s, and p ture, D	irge Cap icle Bat olot gra OC, and	pacity B tery Pa ph of di termir	ehavior ck, Colo ischargi nal volta	r, Disch d-Weat ng/load age.	arge Ch her Imp d currer	aracter bact on ht-plot (ristics of Electric graph o	f C f	:0-2 TL-3
Module	e 3 – BA	TTERY	FAST CH	IARGIN	IG								(6L	.+6P)
On-boa Charge Recharg Speedo LAB- Ex	ord & of r Confi ging Ea ometer (operime	f-board guratio sier, Ra Calibrat nt study	l chargin on, Usir ange Te ion. Wir y on fas	ng, The ng Equ esting c reless C t chargi	Fast C Ializing, of Elect harging	harging /Levelin ric Veh s nology	Proces g Cha iicles U on Li-io	s, Fast rgers, sing Fa	Chargii Inducti Ist Cha acid b	ng Strat ve Cha rging, E atteries	egies, ⁻ arging– Electric	The Fast -Making Vehicle	c B	:O-3 TL-3
Module	e 4 – Ele	ectric Ve	ehicles (chargin	g statio	n							(61	.+6P)
Type o station Vehicle LAB- Ba	f Charg . Charge to Grid attery lo	ing stat er infras , EV Per ad mar	tion, Se structur netratio nageme	lection e: Char on, Syne nt studi	and Si ging sta rgistic es usin	zing of ation ar control g MATL	chargin nd netw of EV a .AB & Si	ng stati vork, pa nd plan imulink	on, Co ntogra ning.	mponer ph, loac	nts of a I mana	charging gement	C B	0-4 TL-3
Module	e 5 – Fu	ture pro	ospects										(6L	+6P)
Charge standar Battery wireles LAB-Ca	r standa rd incluo r swapp s charge se Studi	ards: W ding CH ing, Hy er, Coil ies	'ireless s AdeMO ydrogen design,	standar , SAE ar and s Couplir	ds incli nd IEC, olid fu ng, Elec	uding Q Connec el. Con tromag	i, PMA, ction an cept of netic in	, A4WP, d plug. f wirele terferer	, Magn Other ess pov nce.	et, conc Chargin ver trai	ductive g techn nsfer, [chargei ologies Dynamio	C B	0-5 TL-4
TEXT B	OOKS													
1.	Energy S	Storage	by Rob	ert A. H	luggins	Spring	er Publi	ication						
2.	Sandeep	o Dham	eja, Eleo	ctric Ve	hicle Ba	attery S	ystems,	, Newne	es publ	ication,	2001.			
REFERE	NCE BC	OKS												
1.	Energy s	storage	(A new	approa	ich) by	Ralph Z	ito Wile	ey Publi	cation					
2. James Larminie and John Lowry, "Electric Vehicle Technology Explained," John Wiley, 2003.												03.		
E BOOK	S	obro "	Datter	Tocha	locult	ndh	L " NA		kor ND	C 2002				
1. 2	FI. A. KI	Manac	omont '		nogy Ha		k, ivlar Turnar		rmont	C, 2003	c Eth	Edition	Goorgi	2
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COURSE CODE EAT51517 COURSE CATEGORY DE LT-P-3 2-0-2-2 Version Jac LEARNING LEARNING LEVEL APProval Jac LEARNING LEVEL ASSESSMENT SCHEME Second Periodical Assessment (Theory) Second Segment Learning Committee Colspan="4">Second Committee Colspan="4">Second Periodical Assessment Learning Committee Colspan="4">Second Colspan="4">Second Periodical Assessment Learning Committee Colspan="4">Second Colspan="4">Second Periodical Assessment Learning Committee Colspan="4">Second Colspan="4">Second Periodical Assessment Learning Colspan="4">Second Colspan="4">Second Periodical Assessment Learning Colspan="4">Second Colspan="4">Second Colspan="4">Second Colspan="4">Second Periodical Assessment Learning Colspan="4">Second Colspan="4">Colspan="4">Second Colspan="4">Second Colspan="4" Course Seco	COUR	SE TIT	LE	l	POWEF		ECTRO	NICS F	OR EV	1	CRE	DITS			3					
Version 1.0 Approval Details 36 TM ACM LEARNING LEVEL BTL-4 ASSESSMENT SCHEME	COUR	SE CO	DE	EAT5	1517	CO CA	URSE FEGOR	Y	D	E	L-T-	P-S			2-0-2	-2				
SESSMENT SCHEME EVA ESE First Periodical Assessment (Theory) Second Periodical Assessment (Theory) Second Periodical Assessment (Theory) Second Periodical Assessment (Theory) Practical Baperoved by the Department Examination Attendance To fortroduce the application of electronic devices for conversion, control and conditioning of electric power. To introduce the application of electronic devices for conversion, control and conditioning of electric power. Second To introduce the application of electronic devices for conversion, control and passive components, their practical applications in power electronics. Course 1. To introduce students to the basic theory of power semiconductor devices and passive components, their practical applications. Objective Objective <td>Versio</td> <td>on</td> <td></td> <td>1.</td> <td>.0</td> <td>Ap Det</td> <td>proval tails</td> <td></td> <td>36[™] /</td> <td>ACM</td> <td>LEA LEV</td> <td>RNING /EL</td> <td>i</td> <td colspan="7">BTL-4</td>	Versio	on		1.	.0	Ap Det	proval tails		36 [™] /	ACM	LEA LEV	RNING /EL	i	BTL-4						
CIA ESE First Periodical Assessment (Theory) Second Periodical Assessment (Theory) Practical Assessment (Theory) Practical Assessment ts Observation / lab records as approved by ts Examination Committee Attendance Periodical Assessment (Theory) Practical Periodical Assessment (Theory) Practical Periodical Assessment (ASSES	SMEN	IT SC	HEME																
First Periodical Assessment (Theory) Second Practical Assessment (Theory) Practical Assessment ts Attendance Department Examination Committee "DEC" Attendance Theory Practical 15% 15% 10% 5% 5% 25% 25% Course Description To introduce the application of electronic devices for conversion, control and conditioning of electric power. To introduce students to the basic theory of power semiconductor devices and passive components, their practical applications in power electronics. Course Dijective 1. To introduce students to the basic theory of power semiconductor devices and passive components, their practical applications in power electronic. 2. To familiarize students to the principle of operation, switching techniques and basic topologies power conversion circuits and their applications. 3. To provide strong foundation for further study of power electronic circuits and systems Upon completion of this course, the students will be able to 1. Describe modern power semiconductor devices, their control and protection 2. Design an AC/DC certifier circuit. 3. Design a DC//DC converter circuit 4. Analyse and design a DC//C (neveter circuit Pre requisites : NIL Context and their applications in power semiconductor devices, their control and protection 2. Design an AC/DC certifier circuit. 3. Design a DC//DC converters in a Power System such as HVDC Transmission and FACTS Pre requisites : NIL						(CIA								ESE					
15% 15% 10% 5% 5% 25% 25% 25% Course Description To introduce the application of electronic devices for conversion, control and conditioning of electric power. Image: Course optimized for the application of electronic devices for conversion, control and passive components, their practical applications in power electronics. Course Objective 1. To introduce students to the principle of operation, switching techniques and basic topologies power conversion circuits and their applications. 3. To provide strong foundation for further study of power electronic circuits and systems Upon completion of this course, the students will be able to 1. Describe modern power semiconductor devices, their control and protection Course Outcome Design an AC/DC rectifier circuit. 3. Design an DC/DC converter circuit 3. Apply Power Converters in a Power System such as HVDC Transmission and FACTS Pre requisites : NIL Course PO P	F Per Asse (Th	irst iodica ssmer ieory)	l 1t	Seco Perio Assess (The	ond dical sment ory)	Pi Ass	ractica sessme ts	l i en	Observa ab reco approv th Depart Examir Comm "DE	ation / ords as red by e cment nation nittee C	Att	endan	ce -	ſheory		Practical				
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 To introduce students to the basic theory of power semiconductor devices and passive components, their practical applications in power electronics.	Co Deso	ourse criptio	n	To intro conditi	oduce t oning c	he ap of elec	plicatio tric po	on of e wer.	lectro	nic dev	ices fo	or conv	ersior	ı, contr	ol and					
Upon completion of this course, the students will be able to1. Describe modern power semiconductor devices, their control and protection2. Design an AC/DC rectifier circuit.3. Design an DC/DC converter circuit4. Analyse and design a DC/AC inverter circuit5. Apply Power Converters in a Power System such as HVDC Transmission and FACTSPre requisites : NILCOPO <td>Cc Obj</td> <td>ourse jective</td> <td>2</td> <td>1. To pa 2. To to 3. To sy</td> <td>o introc issive c familia pologie o provi stems</td> <td>duce s ompor arize s es pow de str</td> <td>tudent nents, tudent ver con rong fc</td> <td>ts to t their p ts to th versio oundat</td> <td>he bas practica ne prine n circu tion fo</td> <td>sic the al appli ciple of iits and r furth</td> <td>ory of catior opera their er stu</td> <td>^F powe as in po ation, s applica ady of</td> <td>r sem ower e witch ations powe</td> <td>iicondu lectror ing tec r electi</td> <td>ictor d nics. hnique ronic c</td> <td>evices and es and basic fircuits and</td>	Cc Obj	ourse jective	2	1. To pa 2. To to 3. To sy	o introc issive c familia pologie o provi stems	duce s ompor arize s es pow de str	tudent nents, tudent ver con rong fc	ts to t their p ts to th versio oundat	he bas practica ne prine n circu tion fo	sic the al appli ciple of iits and r furth	ory of catior opera their er stu	^F powe as in po ation, s applica ady of	r sem ower e witch ations powe	iicondu lectror ing tec r electi	ictor d nics. hnique ronic c	evices and es and basic fircuits and				
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CO, PO AND PSO MAPPING CO PO PO PO PO PO PO PO PO PS PS CO -1 -2 -3 -4 -5 -6 -7 -8 -9 -10 -11 -12 O-1 O-2 CO- 3 3 2 3 3 - 1 3 2 - CO- 3 3 2 2 - - -	Pre re	equisit	es : I	NIL																
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-1 -2 -3 -4 -3 -6 -7 -6 -5 -10 -11 -12 0-1 0-2 CO- 3 3 2 3 3 - - - - 1 - -2 CO- 3 3 2 3 3 - - - - 1 3 2 2 - - - - - - 1 3 2 20 3 3 2 3 - - - - 1 3 2 20 3 3 2 2 - - - - 1 3 2 3 3 2 3 3 2 - - - - 1 3 2 4 - 3 3 2 2 - - - - 1 3 2 - 5 1 3 3 2 - - -	со	PO 1	204	204	PO	PO	PO	70	PO 0	04	PO	PO	10	PS	PS					
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CO- 3 3 2 2 3 - - - - - 1 3 2 3 3 2 3 - - - - - 1 3 2 3 3 2 3 3 2 2 - - - 1 3 2 4 - - - - - 1 3 2 - 4 - - - - - 1 3 2 - 4 - - - - - - 1 3 2 - 60- 3 3 2 2 - - - - - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - - - - - - - - - - - - -	1 CO- 2	3	3	2	3	3	-	-	-	-	-	-	1	3	2					
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CO-5 3 3 2 2 - - - - - 2 - 2 1: Weakly related, 2: Moderately related and 3: Strongly related MODULE 1: POWER SEMI-CONDUCTOR DEVICES (6L+6P) Structure, operation and characteristics of SCR, TRIAC, power transistor, MOSFET and IGBT-Turn-on and turn-off characteristics and switching losses. BTL-3 Introduction on driver and snubber circuits. Suggested Readings: Advanced semiconductors devices Image: Colspan="5">Lab Experiments:	CO- 4	3	3	2	3	3	2	2	-	-	-	-	1	3	2					
1: Weakly related, 2: Moderately related and 3: Strongly relatedMODULE 1:POWER SEMI-CONDUCTOR DEVICES(6L+6P)Structure, operation and characteristics of SCR, TRIAC, power transistor, MOSFET and IGBT-Turn-on and turn-off characteristics and switching losses.BTL-3Introduction on driver and snubber circuits. Suggested Readings: Advanced semiconductors devices Lab Experiments:BTL-3	CO- 5	3	3	2	2	-	-	-	-	-	-	-	2	-	2					
MODULE 1:POWER SEMI-CONDUCTOR DEVICES(6L+6P)Structure, operation and characteristics of SCR, TRIAC, power transistor, MOSFET and IGBT-Turn-on and turn-off characteristics and switching losses.CO-1Introduction on driver and snubber circuits.BTL-3Suggested Readings: Advanced semiconductors devices Lab Experiments:Lab Experiments:				1: W	/eakly	related	d, 2: M	odera	tely re	lated a	and 3:	Strong	gly rela	ated	•					
Structure, operation and characteristics of SCR, TRIAC, power transistor,CO-1MOSFET and IGBT-Turn-on and turn-off characteristics and switching losses.BTL-3Introduction on driver and snubber circuits.Suggested Readings: Advanced semiconductors devicesLab Experiments:Co-1	MOD	ULE 1:	F	OWER	SEMI-C	ONDU	JCTOR	DEVIC	ES						(6L+6F)				
Lab Experiments:	Struct MOSF Introc Sugge	ET and ET and luctior	pera d IGB n on Read i	tion and T-Turn- driver ai i ngs : Ad	l chara on and nd snul vanced	cterist turn-o ober ci l semio	ics of S off cha ircuits. conduc	SCR, TH racter	RIAC, p istics a evices	ower t nd swi	ransist tching	tor, losses			CO- BTL-	1 3				
1. Triggering circuits for SCR	Lab Ex	kperin gering	nents circu	:: uits for ^c	SCR															

2. Obtain the	characteristics of MOSFET								
3. Obtain the									
Software/Equ									
MATLab Simu	ılink								
MODULE 2: P	HASE-CONTROLLED CONVERTERS	(6L+ 6P)							
2-pulse, 3-pul	se and 6-pulse converters - Inverter operation of fully	CO-2							
controlled co	nverter - Effect of source inductance - Distortion and	BTL-3							
displacement	factor - Ripple factor - Single phase AC voltage controllers.								
Suggested Re									
Lab Experime	nts:								
1.Analyse the	operation of single phase full wave controlled rectified with R-L								
load									
2 Analyse the	operation of three phase full wave controlled rectified with R-L								
load									
Software/Equ	lipment Required								
MAILab Simu	llink and High voltage power electronics work bench								
MODULE 3: D	C TO DC CONVERTERS	(6L+ 6P)							
Step-down an	d step-up choppers - Time ratio control and current limit	BIL-4							
control - Swit	ching mode regulators: Buck, boost, buck-boost and Cuk								
converter									
Suggested Re	ading: Simulation of various choppers using MATLAB								
Lab Experime	nts:								
1.Design a Bu	ck-boost regulator and plot the characteristics for different duty								
cvcle									
2 Design a cu	k converter and plot the characteristics for different duty cycle								
Software/Fou									
MATI ah Simi	link and High voltage nower electronics work bench								
		(61 ± 6D)							
Single phase a	and three phase (both 120 degree mode and 180 mode)								
inverters - PM	/M techniques: Sinusoidal DWM, modified sinusoidal DWM and	CO-4 BTI -4							
multiple DIA/A	A Series resepant inverter Current source inverters	DILA							
	- Series resonant inverter - Current source inverters.								
Lab Experime	nts:								
1.IGBT based	single-phase bridge inverter								
2. MOSFET OF	IGBT based single-phase series-resonant inverter.								
Software/Equ	ipment Required								
MATLab Simu	link, and High voltage power electronics work bench								
MODULE 5: A	APPLICATIONS	(6L+ 6P)							
Uninterrupted	d power supply topologies - Flexible AC transmission systems -	CO-5							
Shunt and ser	ies static VAR compensator - Unified power flow controller-	BTL-4							
HVDC Transm	ission.								
Suggested Readings: Application of UPS, UPFC									
BUUKS	Muhammad II. Dashid "Dawar Flastranian Circuita Daviasa and	Analisational Decrean							
1.	iviunarimad H. Kashid, "Power Electronics: Circuits, Devices and	Applications", Pearson							
Education, Inira edition, 2017.									
2. P.S.Bimbra, , " <i>Power Electronics</i> ", <i>Khanna Publications, fifth edition</i> ", 2022.									
REFERENCE BC	REFERENCE BOOKS								
1	Mohan, N., T. M. Undeland. and W. P. Robbins. "Power Flectron	ics book: Converters."							
_	2019.								

2	Rashid, Muhammad H., ed. "Power electronics handbook", Butterworth-heinemann, 2017.
E Resources f	or Reference
1.	www.powerelectronics.com/learning-resources/ebooks
2.	https://www.scribd.com/document/356197939/Power-Electronics-Book
MOOC	
1.	https://www.coursera.org/learn/power-electronics

Specialization 2: INTELLIGENT MOBILITY

COURS	E TITLE		E	си ма	DDEL BA	SED SY	STEM D	ESIGN		CRE	CREDITS 3				
COURS	E CODE	E	AT515	18	COUR	RSE ORY	DE			L-T-P-S		2-0-2-2			
Version 1.0				Appro Deta	oval ils	36 th ACM			LE	ARNIN LEVEL	G	BTL	3		
ASSESS	ASSESSMENT SCHEME														
First Pe Assess (The	riodical sment ory)	l P As	Second Periodical Assessment (Theory)		Practica Assessm	l Ient	Observation / lab records as approved by the Department Examination Committee "DEC"		At	Attendance		ESE			
												_	Theory 25%		
15	o %		15%		10%		5%				5%		Pract 259	tical %	
Cou Descri	urse iption	Th sol	This course provides concepts of ECU design for automotive applications, knowledge on software modules and hardware modules for ECU design.												
Cou Objec	urse ctives	1. 2. 3. 4. 5.	 To familiarize on concepts of ECU design for automotive applications. To gain knowledge on software modules and hardware modules for ECU design To acquire knowledge to solve complex problems in Model based system design & hardware in-the-loop simulation To attain the knowledge on the process of Verification and To develop Validation of HIL test results with real world result Hardware in-the-Loop 												
Course Upon completion of this course, the students will be able to 1. Familiarize on concepts of ECU design for automotive applications. 2. Gain knowledge on software modules and hardware modules for ECU desig 3. Acquire knowledge to solve complex problems in Model based system d hardware in-the-loop simulation 4. 4. Attain the knowledge on the process of Verification and 5. Develop Validation of HIL test results with real world result Hardware in-t testing. Testing.								J design stem des re in-the	sign & e-Loop						
Prerequisites: NIL															
CO, PO AND PSO MAPPING															
0	РО	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	РО	PO-	PO-	PS	PS	
	-1	2	3	4	5	6	7	8	9	-10	11	12	0-1	0-2	

CO-1	3	1	3	-	-	1	3	0	-	-	0	3	2	1
CO-2	2	1	2	-	-	3	3	0	-	-	1	2	2	3
CO-3	3	2	1	-	-	2	2	0	-	-	2	3	1	2
CO-4	2	1	2	-	-	3	3	0	-	-	1	2	2	1
CO-5	3	1	3	-	-	3	3	0	-	-	1	3	2	3
1: Weak	ly relat	ed, 2: N	Лodera	tely rel	ated ar	nd 3: St	rongly	related						
MODULE 1 – ECU DESIGN CONCEPT										(6L	+6P)			
The cond	cepts of	f ECU d	esign fo	or auto	motive	applica	tions- N	leed fo	r ECUs-	advand	ces in E	CUs for		
automot	ive- de	sign co	mplexit	ties of I	ECUs-V-	Model	for Au	tomotiv	/e ECU	's Arch	itectur	e of an		• •
advanced	d micro	control	ler use	d in the	design	of auto	mobile	ECUs -	analog	and dig	ital Inte	erfaces-	C	J-1
Controlle	ers for	ECUs: l	Underst	tanding	differe	nt ECU	ls in an	autom	obile-c	halleng	es and	design	BI	L-2
requirem	nents of	f ECU de	esign - :	selectio	n of sei	nsors ai	nd inter	faces fo	or ECU	design.				
MODULE	2 – M/	ATHEM	ATICAL	MODE	LING AI		IDATIO	N					(6L+6	P)
Ton leve	hlock	s diagra	am dev	elonme	ent for	FCUs- (design	of softy	vare m	odules	and ha	rdware	1	
modules	for Fi	CII dog	ign_ m	athom	atical r	nodelir	or of a		tivo Ar	ouules	anu na	igning_		
modellin	با 101 م م م م	co ues	of cofty					nmont	oftoct (sotup fo		tosting		0.2
System	g anu p	ting Ex	un sulti	vare int	tun for	ECIL va	lidation		n loval	ontimiz	n LCO	or cost	р. С	0-2 TI 2
roliability	, chock	and or	duran					ority of	hock or				D	16-2
intograti	/ Check				KOLEC	.us- sig	nai inte	egnity ci	песк аг		EIVIC d	narysis-		
										D)				
MODULE 3- MODEL BASED SYSTEM DESIGN									(0L+0	P)				
Introduc	tion to	Model	based :	system	design	-hardw	are in-t	he-loop	o simula	ation- c	ontinuo	ous and		
discrete	simulat	tion ba	sics-mo	odeling	basics.	Conne	ction b	etweer	h Hardy	ware ar	nd Simi	ulation-	с	0-3
Coupling	conce	pts-sim	ulator	couplin	g and	co-simu	ulation,	synchr	onizatio	on of c	o-simu	lations,	B	TL-3
basic cou	ipling p	orinciple	es- Ever	nt Discr	ete Sim	ulation	-Real Ti	me Wo	rkshop	-Introd	uction	to basic		
Simulink	blocks,	xPC tai	rget, Re	eal Time	Works	hop-St	ate flow	v and Re	eal Tim	e Embe	dded c	oder.		
MODULE	– 4 MC	ODEL BI	UILDIN	g with	SIMUL	INK							(6L+6F	')
Model B	uilding	with Sir	mulink:	Contro	ller pro	gramm	ing usir	ng mode	el basec	l systen	n desigi	n for an		
automot	ive app	lication	using	Simulin	k-Plant	Model	ling- Pla	ant moo	delling (using Si	mulink	for the		
automot	ive app	lication	n-PID co	ontrolle	r desig	n, analo	og outp	out, targ	geting a	proce	ssor fo	r plant-	C	D-4
Hardware Implementation-Design of ECU for automotive applications, interfacing of sensors									BT	∫ L-2				
and Actu	ators-S	ystem r	nodelli	ng and	validati	on usin	g test se	etup- In	terfacir	ng of so	ftware	models		
with hardware design.														
MODULE- 5 HARDWARE IN LOOP SIMULATION								(6L+6	P)					
System programming and development of experimental setup for hardware in loop simulation.														
Hardware in-the-Loop-Testing of plant separately, testing of controller separately and testing of														
plant and controller in the loop-System Verification and Validation-Comparing the HIL test										C	D-5			
results w	vith rea	al world	l result	Hardw	are in-	the-Loo	op testi	ng- Exp	perimer	ntal set	up for	HIL-HIL	B	L-2
testing u	sing dS	PACE m	nicro au	utobox,	introdu	uction t	o carm	aker, b	uilding	scenari	os and	vehicle		
analysis (using ca	armakei	r- inter	facing d	SPACE	with ca	rmaker	and ca	se stud	ies on r	nicro au	ıtobox		
TEXT BOOKS														

	Frank Vahid and Tony Givargis, (2002) Embedded System Design: A Unified Hardware/Software
1.	Introduction, John Wiley & Sons Ronald K. Jurgen, (1999), Automotive Electronics Handbook,
	McGraw-Hill .
2	Heywood, John B. (2018) Internal Combustion Engine Fundamentals, McGraw-Hill, New York.
Ζ.	
2	Hall, Douglas V, (2015) Microprocessors and Interfacing: Programming and Hardware, 2nd
3.	edition, Tata McGraw Hill
REFERENCI	BOOKS
1.	David E. Simon, (2015), An Embedded Software Primer, Pearson Education
2.	Ferguson, Colin R. (2010) Kirkpatrick, Allan T., Internal Combustion Engine - Applied
E BOOKS	
1.	http://estc.dsr-company.com/images/b/b5/Automotive-embedded-systems.pdf
MOOC	
1.	https://nptel.ac.in/courses/108103009/download/M10.pdf

COURSE TITLE	CYBER SECUR	TY FOR AUTOMO	TIVE ENGINEERS	CREDITS		3					
COURSE CODE	EAT51519	COURSE CATEGORY	DE	L-T-P-S	2-0	2-0-2-2					
VERSION	1.0	APPROVAL DETAILS	36 th ACM	LEARNING LEVEL	BT	BTL-3					
ASSESSMENT SCHEME											
First Periodical	t Second Seminar/ t Periodical Assignments/			Attendance	End Semester Examination						
Assessment	Assessment	Project	Examination Committee "DEC"		Theory	Practical					
15%	15%	10%	5%	5%	25%	25%					
Course Description	CourseThis course will enable the students to explore the various cyber-attacks, practice the security tools and employ penetration testing.										
Course Objectives	 To outline the key components and principles of security. To explore the various attacks and management roles To apply the security policies and procedures for organizations To practice the security tools and hardening techniques To employ the penetration testing. 										

Upon completion of this course, the students will be able to															
Cour Outco	 Outline The Key Components and Principles of Security Explore The Security Attacks and Management Roles. Apply the cyber security policies and procedures for organizations. Practice The Security Tools and Hardening Techniques Employ the Penetration Testing and explore the Next Generation Security. 														
Prerequi	Prerequisites: Nil														
CO, PO AND PSO MAPPING															
COs	PO1	PO2	PO	PO	PO	PO	PO	РО	РО	PO	PO	PO	PSC	PSO2	
<u> </u>	2	2	3	4	5	6	7	8	9 2	10	11	12	1	1	
CO-2	י א	3	2	2	2	2	_	2	2	2	2	2	2	1	
CO-3	3	3	2	2	2	2	_	2	2	2	2	2	3	3	
CO-4	3	3	2	2	2	2	-	2	2	2	2	2	2	2	
CO-5	3	3	2	2	2	2	-	2	2	2	2	2	3	3	
		1 - Wea	kly Co	rrelate	ed, 2 -	Moder	ately (Correla	ated ar	nd 3 - 9	Strong	ly Cori	related	1	
MODULE 1: INTRODUCTION TO CYBERSECURITY										(6L+ 6P)					
 and Cyber-attack. Fundamental security principles –threats, attacks and vulnerability. Key Security triad–Confidentiality, Integrity and Availability. Key components of cyber security network architecture. Introduction to basic Security Management and Policies-Authentication, Authorization, Access control, Identification and Accounting. Lab Experiment Detection of various cyber-attacks using Wireshark. Software Tool :Wireshark. 										Key urity	CO-1 BTL-3	ł			
MODULI	E 2: SEC		TTACI	KS, PR	INCIPL	ES AN	D MAN	NAGEN	/IENT					(6L+ 6P)	
Introduction to different classes of security attacks - active and passive. Impact of attacks on organization and individuals. Principles of Cybersecurity - Apply cybersecurity architecture principles. Cyber security models (the CIA triad, the star model, the Parkerian hexad). Techniques used by Hackers - The Reconnaissance Phase: Active and Passive Scanning Techniques. Risk Management–Principles, Types Strategies-The Risk Management Framework(RMF). Cyber security Management concepts – Security Governance and Management roles, models and functions. Lab Experiment Packet sniffing using Wireshark.										acks	CO-2 BTL-3	ł			
Software	e Tool :\	Niresha	rk.												
MODUL	E 3: SEC		LANS,	POLIC	IES AN	ID PRO	CEDU	RES						(6L+ 6F	')

Defin in the									
and a									
proce	dures -Compare the organization's cyber security policy to actual practices.	CO-3							
Lab E	BTL-3								
Mana	ging Securing Policies Using Tcp dump, dump cap using Wireshark.								
Softw	vare Tool :Wireshark.								
MOD	ULE 4: OVERVIEW OF SECURITY COUNTER MEASURE TOOLS	(6L+ 6P)							
Intro Ident									
Secur – Leg	ity Countermeasure tools and techniques - Encryption standards - Modern Methods itimate versus Fraudulent Encryption Methods.								
Secur	ity threats–Threat and Risk exposure -Determine the organization's exposure to	CO-4							
interr	nal threats – Evaluate the risk of external security threats.	BTL-3							
Lab E	xperiment								
Secur	ity analysis and reporting using Wireshark.								
Softw	vare Tool :Wireshark.								
MOD SECU	(6L+ 6P)								
Cyber Intrus Ethica	rsecuritytesting–Penetrationtesting.SystemLevelSolutions- sionDetectionSystem(IDS)andIntrusionProtectionSystem(IPS). Basic Concept of al Hacking.								
Prote Introd Proce Infect	CO-5 BTL-3								
Lab E	xperiment								
Pen T	est (Penetration Testing) using Wireshark.								
Softw	vare Tool :Wireshark.								
TEXT	BOOKS								
1.	Lawrence C. Miller, "Cyber security for Dummies"-PaloAl to Networks, by John Wiley Edition, 2016.	& Sons, Inc., 2 nd							
 William Stallings, "Effective Cyber security: A Guide to Using Best Practices and Standards", Addison- Wesley Professional Publishers, 1st Edition, 2018. 									
REFERENCE BOOKS									
1.	Raef Meeu wisse, "Cyber security for Beginners", Cyber Simplicity Publications, 2 nd E	dition, 2017.							
2	Mehdi Khosrow-Pour, DBA, Information Resources Management Association, USA, "	Cyber							
۷.	2. security and threats: concepts, methodologies, tools, and applications", IGI Global, Vol. 1, 2018.								
E BO	DKS								
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1.	http://www.uou.ac.in/sites/default/files/slm/Introduction-cyber-security.pdf								
MOO	C								
1.	https://www.edx.org/course/cybersecurity-fundamentals								
2.	https://www.coursera.org/specializations/cyber-security								
3.	https://www.udemy.com/topic/cyber-security/								

Specialization 2: ENGINE AND VEHICLE TECHNOLOGY

COUR TITLE	SE		VEHI	CLE DES	IGN DA	ТА СНА	RACTE	RISTICS		CRED	ITS			3				
COUR CODE	SE	E	AT5152	0	COURS	E CATE	GORY		DE	L-T-P	-S			2-0-2	2-2			
Versic	on		1.0		Approval Details			36 [™]	5 TH ACM LEARNING LEVEL			36 TH ACM			LEARNING LEVEL		BTL	-3
ASSES	SMENT	SCHEN	1E	-						· · · · · · · · · · · · · · · · · · ·								
					CIA	N								ESE				
Fi Peric Asses (The	rst odical sment eory)	P As (Second eriodica sessme Theory	al nt)	Pra Asses	ctical sments	Ob: re app Dej Exa Co	servation / lab cords as proved l the partmen mination mmitte "DEC"	on s oy A nt on e	ttendar	ice	THEO	RY	PRA	CTICA L			
1	5%		15%		1	10% 5% 5% 25%						2	5%					
Cou Descr	urse ription	This o the v	course i ehicle c	nvolved ompon	l in the ents	vehicle	design a	and app	ly the d	lata for	the o	ptimur	n de	esignin	g of			
Cou Obje	urse ective	To ma the sa	ake the ame for	studen ⁻ the op	ts unde timum (rstand t designir	he basions of the	c princip e vehicle	oles inv e comp	olved in onents.	the v	vehicle	desi	ign and	l apply			
Cor Outo	urse come	Upon 1 2 3 4 5	2. Disc 2. Inte 3. Det 4. Des 5. Det	etion of cuss on erpret o erminat ign of E erminat	this co vehicle n perfo tion of r ngine tion of g	urse, th specific rmance resistano gear rati	e stude ations curves ce to ve ios	nts will hicle m	be able	e to								
CO, PO	O AND F	SO MA	PPING															
со	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	РО- 10	PO- 11	- PO 12	-	PSO- 1	PSO- 2			
CO-1	3	2	2	2	-	-	-	-	-	2	1	2		2	3			

CO-2	2	3	3	2	-	-	-	-	-	1	2	3	3	3
CO-3	3	2	2	3	-	-	-	-	-	2	1	2	2	3
CO-4	2	2	3	2	-	-	-	-	-	2	1	3	2	3
CO-5	3	3	2	3	-	-	-	-	-	2	1	2	3	3
1: We	akly rel	ated, 2	: Mode	rately r	elated a	nd 3: S	trongly	related					•	
MOD	ULE 1: II	NTROD	UCTION										(6L	+ 6P)
Study arrang variab Lab Ex 1	Study and selection of vehicle specifications - Choice of Cycle, fuel, speed, cylinder arrangement, number of cylinders, method of cooling, material, design variables and operating variables affecting performance and emission. Lab Experiments 1. Practice on selection of vehicle specifications and study MODULE 2: PERFORMANCE CLIBVES													20-1 TL-3
MOD	ULE 2: P	ERFOR	MANCE	CURVE	S								(6L	+ 6P)
Resist grades Lab Ex 1	ance, P ability i cperime . Calci	ower an n differe ents ulation	nd torqu ent gear of Resis	ie curve rs for a tances,	e, drivin typical o power	g force car or tr and tor	against [.] uck plo que	vehicle tted fro	speed - m spec	– Accele	eration as.	and	G	:0-2 TL-3
MODULE 3: RESISTANCE TO VEHICLE MOTION												(6L	+ 6P)	
Calcul power Lab Ex 1	ation an r, speed xperime . Calco	nd plott I, rear a ents ulation o	ing the xle ration of drivir	curves b, Torqu ng force	of air, re le and r e, engine	olling ai nechan e powei	nd gradi ical effic	ient resi ciency a	istance: t differ	s, drivin ent vehi	g force icle spe	– Engin eds.	e G B	:0-3 TL-3
MOD	ULE 4:	ENGIN	E DESIG	iN									(6L	+ 6P)
Pressu of bor variou Lab Ex	ure volu re and s is crank cperime . Prac	me diag troke le angles ents tice to o	gram, fr ngth, ve – Side t c alculat	ictional elocity a hrust o e gas fo	mean e and acco n cylind orce, ine	effective eleratio er walls ertia and	e pressu n, gas fo s. d resulta	ire, eng orce, ind ant forc	ine cap ertia an e at var	acity, ca d result ious cra	alculatic ant fore	on ce at les	G	20-4 TL-3
MOD	JLE 5:	GEA	R RATIC)S									(6L	+ 6P)
Determination of Gear Ratios, Acceleration and gradeability - typical problems. Lab Experiments 1. Calculation of gear ratios										G	:O-5 TL-3			
TEXT	BOOKS													
1. Giri.N.K. "Automobile Mechanics" Khanna Publishers – New Delhi .														
2	2.	Heldt	P.M "H	ligh Spe	ed Com	bustior	n Engine	e" Oxfor	d & IB⊦	l Publisł	ning Co.	, Calcut	ta.	
REFER	ENCE B	OOKS												
1	L	Lichty	"IC Eng	ines", K	ogakusl	na Co.,	Ltd. Tok	yo						
E Resources for Reference														
1	L.	https:	//sist.sa	athvaba	ma.ac.i	n/sist d	coursem	naterial	/upload	s/SAU1	404.pdf	:		

COURSE T	ITLE		DES	SIGN O	F ENGI	NE EXH	AUST S	YSTEM		CR	EDITS		3		
COURSE	CODE	E	AT5152	21	CO CATE	URSE GORY		DE	:		L-T-P-S		2-0-2	2-2	
Versio	'n	1.0 Approval Details 36 th ACM LEARNING LEVEL BTL-3													
ASSESSMI	ENT SC	HEME													
First Peric Assessm (Theor	odical ent y)	P As	Second Observation / lab Periodical Practical Assessment Assessment (Theory) Examination												
		Theory 25%													
15%			15% 10% 5% 5% Practical												
Cours Descript	e ion	This of emiss develo	This course gives knowledge in the global environmental air pollution control bureaus, emission control systems and noise control devices and advanced technology development on exhaust system for SI and CI engines.												
Course Objectives	5	2. T 3. T 4. T 5. T	o famil o desig opplicati o gain l i and C	iarize v gn and ions. knowle I engine iarize v	vith em valida dge on es vith aut	ission c te full the adv	ontrol : exhaus vanced e desig	systems st syste techno n and c	s and no em for ology de	oise co on-roa velopn ational	ntrol de id, off-i nent on simulat	evices road a exhau	ind non ist syste vironme	-road m for ents	
Course Outcomes		L 1. (2. F 3. [4. (3. 2 4. (5. F	Jpon co Gain kn Gamiliar Design Ipplicat Gain kno Gain kno Gamiliar	ompleti owledg ize with and va ions. owledg ngines ize with	on of th ge in the n emissi alidate e on th n autom	his cour e global ion con full ex e advar nobile d	se, the enviro trol sys khaust nced te lesign a	studen nmenta tems ar system chnolog nd com	ts will b al air po nd noise n for o gy deve nputatio	e able ollution e contr on-road lopme onal sir	to contro ol devic d, off-r nt on ex nulatior	l burea ces oad a khaust n envire	nus nd non system onment	-road for SI s	
Prerequisi	tes:														
CO, PO AN	ND PSO	MAPP	ING												
со	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	PS	PS	
	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	0-1	0-2	
CO-1	2	1		2	1	-	-	-	-	-	-	1	1	1	
CO-2	1														
CO-3	2		1	1	2	1	-	-	-	-	-	1	0	2	
CO-4	2	0	0	0	1	-	-	-	-	-	-	1	1	2	

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CO-5

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3

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1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE 1 - INTRODUCTION TO ENGINE EXHAUST	(6L+6P)
Introduction of exhaust system – Engine Exhaust Technology Evolution – India automotive emission regulation – Noise limits for vehicles at manufacturing stage – Basics of Exhaust System from Engine head face to tail pipe – Components of exhaust system – Exhaust catalytic converter – Silencer (Muffler) – System integration. Suggested Reading: IC engine exhaust, Layout of IC engine systems.	CO-1 BTL-2
MODULE 2 - EMISSION CONTROL SYSTEMS	(6L+6P)
Understanding of Gasoline and diesel engine out pollutants – Emission Norms – Air to Air – Converter Hot end components – TWC – Manifold – Cone Profiles – Substrate – Types of Substrate – Wash coat – Mat – Types of Mats – Shell – Canning – Types of Canning – Controlled canning – GBD (Gab Bulk Density) – Temperature Sensor – Oxygen Sensor – Thermal Management – Insulators – Heat Shields – (Gasoline / Diesel) – Advancement in substrates – Technology for gasoline engine – Three way converter (TWC) – Gasoline particulate filter (GPF) – Lean NOX Trap (LNT) – Technology for diesel engine – Exhaust gas recirculation (EGR) – Diesel oxidation catalyst (DOC) – Partial flow filter (PFF) – Diesel particulate filter (DPF) – Selective catalytic reduction (SCR) – Selective catalytic reduction filter (SCRF) – Global regulations and testing protocols – System integration. Carbon di oxide (CO ₂) control systems. Suggested Reading : carbon di oxide emissions	CO-2 BTL-3
MODULE 3 - NOISE CONTROL SYSTEMS	(6L+6P)
Basics of Acoustics – Fundamentals of sound – Terminologies – Noise cancellation – Destructive & Constructive interferences – Engine exhaust noise introduction – Gasoline & Diesel engine operation & exhaust noise characteristics – Vehicle Pass by Noise – Exhaust noise measurement standards – Types of exhaust noises – Pulsation noises – Flow noises – Booming noises – Shell radiation noises – Passive noise reduction techniques – Types of mufflers – Reflective – Absorptive Hybrid mufflers – Muffler design constrains – Muffler internal design – Tri flow muffler – Straight though muffler – Helmholtz resonator – Internal resonators – Baffle plates – Perforations – shells – End Plates – Pipe diameters – Absorptive materials – Development methodologies – Muffler performance parameters – Sound transmission loss – Insertion loss – Noise reduction – Tail pipe noise level – back pressure – Vehicle interior noise levels – Advanced muffler technologies – Cat con integrated muffler – variable flow muffler – Twin mufflers – Active noise cancellation – Sporty sound mufflers – Sound engineering, Off Road – On Road – Non Road muffler applications Examples – Manufacturing Types & Process – Roll & Spot welding – Lock seaming – Double seaming – Web forming – Clinching – Cold metal transfer – Hydro forming – Piercing – Stamping – Muffler examples. Suggested Reading : Muffler design	CO-3 BTL-3
MODULE 4 - COMPUTATIONAL ANALYSIS (CFD, FEA)	(6L+6P)

CFD for v Uniformit Conjugat Future Ff Techniqu Static Ana – RLDA & and Targe Suggeste	rehicle exhaust system – Governing equation of fluid flow and heat transfer – Flow ty – Pressure loss through exhaust system – Flow Eccentricity – HEGO Index – e Heat Transfer Analysis – Introduction to finite element analysis.Present, Past, EA – Introduction to Pre-processing ID, 2D, 3D Elements – Meshing, Processing es – Statics of strength of materials – Types of Analysis – Modal Analysis – Linear alysis – Introduction to Non-linear Analysis – Dynamic Analysis – Thermal Analysis Fatigue Analysis – Post processing techniques of different Analysis – Process Flows ets – Case Study 1-2-3.	CO-4 BTL-3
MODULE	5 - TESTING AND VALIDATION	(6L+6P)
Vehicle n – Air leak – Hot enc deformat Condensa measurer radiation Suggeste TEXT BOC 1. 2.	 Noise measurement – Operational vibration analysis – Experimental modal analysis test Thermal Shock Tests – Thermal fatigue test – Back pressure measurement test I system: Hot Vibration Test – Cold vibration test – Flow noise measurement – Shell ion test – Cold end: Biaxial fatigue test – Uni-axial fatigue test – Salt spray test – ate Water Noise Test – Transmission loss measurement – Shell stiffness ment – Glass wool endurance test – Resonance frequency measurement – Shell noise measurement – Tail pipe noise measurement – Water drainage ability test. Engine Emissions: Pollutant Formation and Advances in Control Technology, publisher,2015 Noise and Bivration Control Engineering (Principles and applications) Istvan L. Ver and State State	CO-5 BTL-3 Alpha science and Leo L, 2016.
REFEREN	CE BOOKS	
1.	Beranek, - 2nd Edition 2006, John Wiley & Sons Inc	
2.	Acoustics of Ducts and Mufflers with Applications to Exhaust and Ventilation Syste Munial – 2ndEdition. Wiley – Inter Science.	em Design, M.L.
моос		
1.	https://www.youtube.com/watch?v=W6dIsC_eGBI	

Specialization: Design and Manufacturing

COURSE TITLE	D	IGITAL MANUF	ACTURING	CREDITS	3
COURSE CODE	EAT51522	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3
ASSESSMENT SC	HEME				
First Periodical Assessment (Theory) Second Periodical Assessment (Theory)		Practical Assessment S	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	ESE
15%	15%	10%	5%	5%	Theory 25%
					Practical

													25	%
Cour Descrip	se tion	This engir	course leering	provide & pow	es know der bas	vledge o ed addi	on prote tive ma	otyping Inufacti	and 3[uring sy) printii /stems.	ng, CAD	and re	verse	
Cour Objecti	se ives	1. 1 2. 1 3. 1 4. 1 5. 1	Γο discu Γο acqu Γο deve Γο famil Γο acqu	iss on r ire kno lop skil liarize c ire kno	ieed foi wledge I on CA on liquid wledge	r digital on pro D and r d based on pov	manuf totypin everse and so vder ba	acturing g and 3 enginee lid base sed ado	g D print ering ed addi ditive n	ing tive ma nanufac	nufactu	uring systems	stems	
Cour Outcor	se nes	1. [2. / 3. [4. F 5. /	Upon co Discuss Acquire Develop Familiar Acquire	omplet on nee knowle skill o ize on knowle	ion of t d for di edge or n CAD a liquid b edge or	his cour gital ma n protot and reve ased ar n powde	rse, the anufact cyping a erse en nd solid er based	studen uring nd 3D p gineerir based a d additi	nts will printing ng additive ve mar	be able 5 e manu 1ufactu	to facturii ring sys	ng syste tems	ms	
Prerequis	ites:													
CO, PO A	ND PSO	MAPP	ING											
со	PO -1	PO -2	PO -3	РО -4	РО -5	РО -6	РО -7	РО -8	РО -9	РО -10	PO -11	РО -12	PS O-1	PS O-2
CO-1	3	1	2	2	3	-	-	-	-	-	-	3	3	1
CO-2	2	2	1	1	3	-	-	-	-	-	-	2	2	2
CO-3	3	2	2	2	1	-	-	-	-	-	-	3	3	2
CO-4	2	1	1	1	3	-	-	-	-	-	-	2	2	1
CO-5	3	1	1	1	2	-	-	-	-	-	-	3	2	3
		1:	Weakly	relate	d, 2: M	oderate	ely rela	ted and	3: Stro	ongly re	elated			
MODULE	1 - NE	ED FOF		AL MAI	NUFAC	ruring	i						(6L+	·6P)
Introduct DM, 10 di Suggeste	ion to F sruptive d Readi	uture N e princi ng: Mo	Aanufa ples of dern m	cturing DM pro anufac	: three ocess, S turing p	– legge M Vs D process	d stool IM es.	concep	t, Defin	ition of	f DM, N	eed for	C(B1	0-1 ГL-2
MODULE	2 – PRO	ΤΟΤΥΡ	ING										(6L+6	iP)
Introduct Technolog	ion to gy.	3D prir	nter, Ro	ole of 3	BD in p	roduct	develo	pment,	Classif	ication	of 3D	Printer	c	:0-2

Technology.

Suggested Reading: Advantages of 3D printing.

MODULE 3 - CAD & REVERSE ENGINEERING	(6L+6P)
Basic Concept – Digitization techniques – Model Reconstruction – Data Processing for Additive	
Manufacturing Technology: CAD model preparation – Part Orientation and support generation	CO-3
– Model Slicing – Tool path Generation – Basic Software for Additive Manufacturing Technology:	BTL-3
MIMICS, MAGICS.	

BTL-2

Suggeste	ed Reading: CAM and its merits	
MODULE	4 - LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING	
SYSTEMS		(6L+6P)
Classifica advantag process, Suggest e	ation – Liquid based system – Stereo lithography Apparatus (SLA)- Principle, process, ges and applications – Solid based system –Fused Deposition Modeling – Principle, advantages and applications, Laminated Object Manufacturing ed Reading: Additives and its applications.	CO-4 BTL-2
MODULE	5 - POWDER BASED ADDITIVE MANUFACTURING SYSTEMS	(6L+6P)
Selective	e Laser Sintering – Principles of SLS process – Process, advantages and applications,	
Three-Di	mensional Printing – Principle, process, advantages and applications- Laser Engineered	CO-5
Net Shap	ing (LENS), Electron Beam Melting.	BTL-2
Suggeste	ed Reading: Powder based additives.	
TEXT BO	DKS	
1.	Chua C.K., Leong K.F., and Lim C.S., "Rapid prototyping: Principles and applications", Th World Scientific Publishers, 2010.	nird Edition,
2.	Gebhardt A., "Rapid prototyping", Hanser Gardener Publications, 2012.	
REFEREN	CE BOOKS	
1	Liou L.W. and Liou F.W., "Rapid Prototyping and Engineering applications: A tool box fo	r prototype
1.	development", CRC Press, 2010.	
2.	Kamrani A.K. and Nasr E.A., "Rapid Prototyping: Theory and practice", Springer, 2016.	
E BOOKS		
1.	www.springer.com/gp/book/9780857295637	
2.	https://pro.sculpteo.com/en/ebooks/	
MOOC		
1.	https://www.coursera.org/specializations/digital-manufacturing-design-technology	/
2.	https://www.coursera.org/learn/digital-manufacturing-design	

COURSE TITLE	INDUSTRIA		AND ROBOTICS	CREDITS	3
COURSE CODE	EAT51523	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2
VERSION	1.0	APPROVAL DETAILS	36 [™] ACM	LEARNING LEVEL	BTL-3
ASSESSMENT	SCHEME				
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz etc., as approved by the Department Examination Committee "DEC"	Attendance	End Semester Examination
15%	15%	10%	۲%	5%	Theory 25%
15%	15%	10%	5%	5%	Theory 25% Practical 25%

		Robo consi	Robotics for the required industry to decrease the work load and the activity time consumption of the industries.												
		1. T 2. T v	 To develop the student's knowledge in various robot structures and their workspace. To develop student's skills in performing spatial transformations associated with rigid body motions androbot systems. To provide the student with knowledge of the singularity issues associated 												
Cours Object	e :ives	3. Т ∨ ⊿ т	o prov vith the	ide the operation	studer tion of r	nt with obotics	knowle ystems	dge of	the sir	ngularity	issues	associ	ated		
		5. T	vith tra	jectory lop the	plannin e analy	ig andro tical ab	bot co ility fo	ntrol. r the r	obotics	for the	neces	sity of	the		
	Upon completion of this course, the students will be able to 1. Demonstrate knowledge of the relationship between mechanical structures of														
	 Demonstrate knowledge of the relationship between mechanical structures of industrial robots and their operational workspace characteristics. 														
Course	 Course 2. Apply spatial transformation to obtain forward kinematicsequation of robot manipulators. 														
Outco	Outcomes manipulators. 3. Analyze for solving inverse kinematics of simple robot manipulators.														
	 Analyze for solving inverse kinematics of simple robot manipulators. Develop an ability to obtain the Jacobean matrix and use it to identify singularities Create the design model and apply the concents through robotics to the pacessary. 														
	5. Create the design, model and apply the concepts through robotics to the necessary application in the industries														
Prerequisites: Nil															
СО, РО	CO, PO AND PSO MAPPING														
COs	P01	PO2	PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO PO PS01 PS02												
CO-1	3	3	3 3 2 2 2 1 1 1 3 3 3 3 2 2 2 1 1 1 3 3												
CO-3	3	3	3	3	2	2	2	2	1	1	1	1	3	3	
CO-4	3	3	3	3	2	2	2	2	1	1	1	1	3	3	
CO-5	3	3	3	3	2	2 Madara	2	2	1	1 Strong	1		3	3	
Modul	e 1 – In	troduc	tion	Jurrela	.eu, z -	Nouera		related		- Strong	IV COT	elateu	(61+	-6P)	
Conce	pt and	scope o	of autor	nation:	Socio e	conomi	c impa	cts of au	utomat	ion, Type	es		CO)-1	
Modul	e 2 – Fl	uid Poy	Lost Au	tomati	on.								(6L+	L-3 -6P)	
Fluid	power	contro	ol eler	nents.	Standa	rd gra	phical	svmbo	ls. Flu	id pow	er			Ur j	
genera	itors, I	Hydrau	lic and	pneu	matic (Cylinder	s - co	nstruct	ion, d	esign ar	nd		СС)-2	
mount	ing; Hy I	draulio	c and	pneum	atic Val	ves for	pressu	ıre, flo	w and	directio	on		BT	L-3	
Modul	e 3 – Ba	asic hyd	draulic	and pn	eumati	c circuit	S						(6L+	-6P)	
Direct	and In	direct (Control	of Sing	gle/Dou	ble Acti	ng Cyli	nders, o	designi	ng of log	gic				
circuits	s for a	given	time	displac	ement	diagrar	n & si	equenc	e of o	peration	is,		~	` 2	
Мето	ry Circi	uit & S	peed C	ontrol	of a Cyl	inder, T	rouble	shootin	ig and	"Causes	e, &		BT	J-3 L-3	
Effects	ofMal	functio	ns" Ba	sics of	Control	Chain,	Circuit	Layout	s, Desi	gnation	of				
Specifi	c Eleme e 4 – Fl	uidics	a Circui Flectric	t. Cal and	Flectro	nic Cont	rols an	d Tran	sfer De	vices an	d feede	ors	(61 +	-6P)	
Boolea	an alge	bra, Tr	uth Tak	oles, La	gic Gat	es, Coa	nda eff	ect. Ba	sics of	Program	mable	logic		5.]	
control	llers (Pl	C), Arc	hitectu	re& Co	mpone	nts of P	LC, Lad	der Lo	gic Diag	grams. C	lassifica	ation,	со	-4	
Constru Recipro	uctiona	l deta	ils and Centrifu	Appli Igal hor	cations	of Tra ders	nsfer	devices	, Vibra	atory bo	wl fee	eders,	BT	L-3	
Modul	e 5 – Ro	obotics		0~110									(6L+	-6P)	

Intro Speci pend	duction, Classification based on geometry, control and path movement, Robot fications, Robot Performance Parameters, Robot Programming, Machine Vision, Teach ants, Industrial Applications of Robots.	CO-5 BTL-4							
TEXT	BOOKS								
1.	Esposito, Anthony. Fluid power with applications. Upper Saddle River, New Jersey: Prer	ntice Hall, 2000.							
n	Vacca, Andrea, and Germano Franzoni. Hydraulic fluid power: fundamentals, applications, and circuit								
Ζ.	design. John Wiley & Sons, 2021.								
REFE	RENCE BOOKS								
1.	Yeaple, Frank. Fluid power design handbook. CRC Press, 1995.								
2.	Zhang, Qin. Basics of hydraulic systems. CRC Press, 2019.								
E BOO	DKS								
1.	Fluid Power eBook, Edition 1								
2.	El-Din, Mahmoud Galal, and Mohamed Rabi. Fluid power engineering. McGraw-Hill Ed	lucation, 2009.							
2	Watton, John. Modelling, monitoring and diagnostic techniques for fluid power systems. Springer								
3.	Science & Business Media, 2007.								
MOO	C								
1.	https://archive.nptel.ac.in/courses/112/106/112106175/								
2.	https://archive.nptel.ac.in/courses/112/106/112106300/								
3.	https://archive.nptel.ac.in/courses/112/105/112105047/								

Semester –VI

Department Elective-4

Specialization 1: Electric Vehicle Technology

COURSE TITLE	MODE	LLING AND SIM	CREDITS		3			
COURSE CODE	EAT51524	COURSE CATEGORY	DE	L-T-P-S	2-(2-0-2-2		
Version	1.0	Approval Details	36 [™] ACM	LEARNING LEVEL	BTL-4			
ASSESSMENT SCHE	ME							
		CIA			E	SE		
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessment	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	Theory	Practical		
15%	15%	10%	5%	5%	25%	25%		
Course Description	This course int hybrid electric,	roduces the arcl and plug-in hyb	nitectures and technol prid vehicles including	logies associate their constitue	ed with ele nt compo	ectric, nents		
Course Objective	 To understand the basic components and various types of electric vehicles To familiarize the different types of motors used in electric vehicles To discuss about the battery technology for electric vehicles To familiarize the different charging system technologies for electric vehicles 							
5. To discuss about the future trends in electric vehicles. Upon completion of this course, the students will be able to 1. Explain the architecture design of electric vehicle and types of electric vehicle 2. Select appropriate electric machine for electric vehicle application.								

- 4. Describe the different types and design considerations of electric vehicle charging.
 - 5. Illustrate the recent trends and developments in electric vehicle market

Prerequisites: NIL															
со	РО- 1	РО- 2	РО- 3	РО- 4	РО- 5	РО- 6	РО- 7	РО- 8	РО- 9	РО- 10	РО- 11	РО- 12	PS 0-1	РS 0-2	
CO-1	3	3	3	3	3	-	-	-	-	-	-	-	1	-	
CO-2	3	3	3	3	3	-	-	-	-	-	-	-	1	1	
CO-3	3	3	3	3	3	-	-	-	-	-	-	-	1	1	
CO-4	3	3	3	3	3	-	1	-	-	-	-	-	1	1	
CO-5	3	3	3	3	3	-	1	-	-	-	-	-	1	1	
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODUL	MODULE 1: INTRODUCTION TO TECHNOLOGY OF EVs										(6L+6P)				
Basic EV Components and Architecture - Types of electric vehicles - Basics of EV charging - Case study Suggested Reading: Economies of Electric Vehicles compared to gasoline vehicles									rging						
1.Study	of vari	ous cor	npone	nts of e	electric	car.								CO-1 BTL-4	
2. Electr	2. Electric Vehicle Architecture Design.														
Software Required: MATLAB															
MODUL	E 2: EL	ECTRIC	мотс	ORS FO	R EVs								(6L-	+ 6P)	
Electric Applicat Manage Suggest Lab Exp	Motor ion of ment c ed Rea erimen	Requir Inducti of EV M ding: D its:	ements on & S lotors - DC Mac	s for EV witched Sensir hine Di	('s - Ap d Reluc ng Requ rives ar	plicatic tance I iiremen nd Cont	n of PN Motor ⁻ nts for trol of F	ASM & Fechno EV Mot EV Usin	BLDC I logy fo tors ig DC N	Motor : r EV's - 1achine	for EV's Therm	s - nal		CO-2 BTL-4	
2. Simul	ation o	of EV pc	wered	by bru	shless	DC mo	tor usir	ь. ng MAT	LAB.						
Softwar	e Requ	ired: N	/IATLAI	В											
MODUL	E 3: BA	TTERY	TECHN	IOLOG	Y FOR I	EVs							(6L	+ 6P)	
Battery EV appl System Suggest	Select ication - Energ ed Rea	ion Me - Basi gy Stora ding: I	thodol cs of Th age sys Battery	ogy for nermal tems fo Manag	EVs an Manag or Elect gemen	d HEVs ement ric and t Syster	i – Batto Systen Hybric m Desig	ery sizii n Desig I Vehic gn usin	ng and n – Bat le Appl g MAT	consid tery M ication LAB	eration anager s	is for nent			
Lab Exp	erimen	its:												CO-3	
1. Estim	ation o	of Batte	ry Stat	e-of-Cł	narge u	sing M	ATLAB/	/Simuli	nk					512-3	
2. Estim	ation o	of Batte	ry Stat	e-of-He	ealth us	sing M/	ATLAB/	Simulir	nk						
Softwar	Software Required: MATLAB														
MODUL	E 4: CH	IARGIN	G SYST		CHNOI	.OGY F	OR EV	APPLIC	ATION	S			(6L+ 6P)		

Charging syst its limitations Case Study Suggested Rea Lab Experiment 1. Modelling a Software Req	CO-4 BTL-4							
MODULE 5: FU	JTURE TRENDS IN ELECTRIC VEHICLES	(6L+ 6P)						
Wireless and o Charging EVs f Suggested Rea	CO-5							
Lab Experime	nts:	PTI 4						
1.Modeling an	d Simulation of plug-in hybrid electric vehicle using MATLAB	DIL-4						
Software Req	uired: MATLAB							
TEXT BOOKS								
1.	Liu, Wei, "Hybrid electric vehicle system modeling and control", John Wile	ey & Sons, 2017.						
2.	Donateo, T., "Hybrid electric vehicles", BoD–Books on Demand, 2017.							
REFERENCE B	OOKS							
1.	Ehsani, M., Gao, Y., Longo, S., & Ebrahimi, K., "Modern electric, hybrid ele vehicles", CRC press, 2018.	ectric, and fuel cell						
2.	Erjavec, J., "Hybrid, electric, and fuel-cell vehicles", Cengage Learning, 202	16.						
E RESOURCES	FOR REFERENCE							
1.	https://onlinelibrary.wiley.com/doi/book/10.1002/9781119278924							
2.	https://www.sciencedirect.com/book/9780444535658/electric-and-hy	ybrid-vehicles						
MOOC								
1.	https://onlinecourses.nptel.ac.in/noc22_ee53/preview							
2.	2. https://www.udemy.com/course/electric-vehicles/							

COURSE TITLE		CODING FOR EV CREDITS 3										
COURSE CODE	EAT51525 COURSE CATEGORY		DE	L-T-P-S	2-0-2-2							
VERSION	1.0	APPROVAL DETAILS	36 th ACM	LEARNING LEVEL	BTL-3							
ASSESSMENT SC	HEME											
First Periodical Assessment	First Periodical Assessment Assessment		Observation / lab records as approved by the Department	Attendance	End Ser Examir	mester nation						

							E) C	xamina Commit "DEC	tion tee "			т	'heo ry	Prac	tical
1	.5%		159	%	1	.0%		5%			5%	2	25%	25	5%
Co Desc	ourse ription	F	Program	ming in nting we	R and orkflov	use of a ı, data ı	associa manag	ited Op ement,	en Sou and sc	rce toc ientific	ls. Add compu	ressing ting.	g pract	ical issu	es in
Course Objectives1. To learn the concepts of R LanguageCourse Objectives2. To learn the Data Analysis3. To import a variety of data formats into R using RStudio4. Prepare or tidy data's for in preparation for analysis5. Analyse a data set in R and present findings using the appropriate packages.															
Course Outcomes Upon completion of this course, the students will be able to 1. Describe the fundamental syntax of R through readings, practice exercised demonstrations, and writing R code. 2. Apply critical programming language concepts such as data types, iteration, c structures, functions, and Boolean operators by writing R programs and th examples 3. Demonstrate an understanding of Data Import and parsing 4. Recognize the principles of the Relations of Data. 5. Generate the Pattern and Popular Expression						rcises, ontrol rough									
Prereg	uisites:	Prog	rammin	Know	ledge			<u></u>		-					
CO, PO	AND P	SO M	APPING	J J											
Cos	РО	РО	PO	РО	РО	РО	РО	РО	РО	РО	РО	РО	PSO	PS	
	1	2	3	4	5	6	7	8	9	10	11	12	1	02	
CO-1	3	3	2	2	2	Ţ	T	-	2	Z	Z	-	3	3	
CO-2	3	3	2	2	2	1	1	-	2	2	2	-	3	3	
CO-3	3	3	2	2	2	1	1	-	2	2	2	-	3	3	
CO-4	3	3	2	2	2	1	1	-	2	2	2	-	3	3	
CO-5	3	3	2	2	2	1	1	-	2	2	2	-	3	3	
		1-	Weakly	Correla	ted, 2	- Moder	rately (Correla	ted and	3 - Str	ongly C	orrela	ted		
History	LE 1: IN	Vervie	PW of R -	l Getting	Starte	d with F	R - Gett	ting sta	rted wit	th the I	Rinterfa	ace	(6	L+6P)	
- R Nu Textua	ts and I and I	Bolts- Binary	· Getting / Forma	g Data I ts for	n and Storing	Out of g Data-	R - Us Inter	faces t	e reade	r Packa Outside	age- Us e World	ing d -			
Lab Ex	perime	nt:	is - vecio	Jiised (perau	ons-Da	tes and	1 mes		.es				CO-1	
1.	Instal	latior	n of RStu	dio and	l config	guration	n							BTL-3	
2.	Progr	amm	ing Exer	cise bas	ed on	Vectors									
3.	Progr	amm	ing exer	cise bas	ed on	Matrice	es								
MODU	LE 2: CO	ONTR	OL STRU	CTURE	S								(6	L+6P)	
Matric	es- Arı	rays-	Factors-	Data	Frame	s -Mar	naging	Data	Frames	with	the dp	lyr		CO-2	
packag	e-Cont	rol St	ructures	-Functi	ons-Sco	oping Ri	ules of	R Codi	ng Stan	dards	for R-Lo	ор	BTL-3		

Functions-List -Debugging-Profiling R Code-Simulation- Data Analysis Case Study: Changes in Fine Particle Air Pollution in the in Chennai.	
Lab Experiment:	
1. Programming Exercise based on Simple functions	
2. Practise the Programming based on Data Frame	
3. Practise R program using List and Array	
Software: Rstudio	
MODULE 3: PACKAGES & FILES	(6L+6P)
 Packages- Data Reshaping- CCV Files- Excel File- Binary Files XML Files- JSON File- Web Data- Databases- PIE Charts- BAR Charts- Boxplots- Histograms- Line Graphs-Scatterplots- Mean, Median & Mode- Linear Regression- Multiple Regression- Logistic Regression- Normal Distribution- Binomial Distribution- Poisson Regression- Analysis of Covariance Time Series Analysis- Nonlinear Least Square- Decision Tree- Random Forest- Survival Analysis- Chi Square Test. Lab Experiment Practise the Program using Array Write a Program to handle the CCV, Excel, Binay, XML, JSON Files Apply the R tool for Time Series Analysis of any real time data set, Practise the PIE Charts, BAR Charts, Boxplots in R studio 	CO-3 BTL-3
MODULE 4: DATA VISUALIZATION	(6L+6P)
Data Visualization with ggplot2: Introduction -First Steps - Aesthetic Mappings - Common Problems – Facets - Geometric Objects - Statistical Transformations - Position Adjustments - Coordinate Systems - The Layered Grammar of Graphics – Workflow Basic - Data Transformation with dplyr – Workflow Scripts. PIE Charts- BAR Charts- Boxplots- Histograms- Line Graphs- Scatterplots.	
Lab Experiment:	CO-4 BTL-3
1. working on mpg data frame, gg plot	
2. Apply aesthetic is a visual property of the objects in your plot.	
3. Implement with sample Data Transformation with dplyr	
Software: Rstudio	
MODULE 5: EXPLORATORY DATA ANALYSIS	(6L+6P)

Intro Mode Does	Introduction - Questions - Variation - Missing Values - Covariation - Patterns and Models - ggplot2Calls - Learning More - Workflow: Projects - What Is Real? - Where Does Your Analysis Live? – Paths and Directories - RStudio Projects.									
Lab E 1. Im 2. Exp a diar with s 3. Buil the In	Lab Experiment: 1. Implement the Visualizing Distributions with sample data with relevant variables 2. Explore the distribution of each of the x, y, and z variables in diamonds. Think about a diamond and how you might decide which dimension is the length, width, and depth with sample data. 3. Build the Sentiment Analysis Model in R and Perform the Sentiment Analysis with the Inner Join. CO-5 BTL-3									
Softw	vare: Rstudio									
TEXT	BOOKS									
1.	Roger D. Peng, "R Programming for Data Science" Leanpub,2015.									
2.	Hadley Wickham and Garrett Grolemund - "R for Data Science" O'Reilly Media,	Inc.,2017.								
REFER	ENCE BOOKS									
1.	Ross Ihaka and Robert Gentleman, "R Programming" Tutorials Point (I) Pvt. Ltd,	2016.								
2.	Garrett Grolemund ,"Hands-On Programming with R" , O'Reilly Media, Inc 2014.									
E BOO	KS									
1.	https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf/									
MOOC										
MOO	OOC									

Specialization 2: Intelligent Mobility

COURSE TITLE	AUTOM	OTIVE SAFETY	SYSTEMS	CREDITS	3				
COURSE CODE	EAT51526	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2				
VERSION	1.0	APPROVAL DETAILS	36 [™] ACM	LEARNING LEVEL	BTL-4				
ASSESSMENT SCHEME									
First Periodical Assessment (Theory)	rst odical sment eory) Second Periodical Assessment (Theory)		Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	ESE				
15%	15%	10%	5%	5%	Theory 25%				
20/0	20/0	20/0	5/0	270	Practical 25%				
Course Description	This course impart technology.	ts understandir	ng of role of safety	systems in autor	mobiles through				
Course Objectives	 To design and validate the vehicle structure with respect to crash worthiness To know the various types of safety aspects such as active and passive safety, the active safety components and the working passive safety components such as air bags, seatbelts To know about various object detection system and working of various comfort, convenience system and environment information system. 								

5. To analyze pedestrian safety by use of light measurement and testing														
		1.	Design	and va	lidate t	he vehi	cle stru	cture w	ith resp	ect to o	crash w	orthine	SS	
6		2.	Demon	istrate	the vari	ous typ	es of sa	ifety as	pects					
Outcon	e nos	3.	DISCUSS	ionco s	arious	object	detect	nt infor	stem a	na wa	orking (or vario	ous coi	mfort,
Outcom	1163	4	Analyz	e and si	mulate	vehicle	in bar	ier imn	acts	systen	1.			
		5.	Analyz	e pedes	strian sa	afetv bv	use of	light me	easurer	nent ar	nd testir	Ig		
Prereguisites: Nil														
CO, PO	AND PS	SO MAF	PING											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO 11	PO 12	PSO 1	PS O2
CO-1	3	3	2	3	2	1	1	1	1	3	3	3	3	3
CO-2	3	3	1	2	1	2	2	1	2	2	2	2	3	3
CO-3	2	2	3	3	3	1	3	2	1	1	1	2	3	3
CO-4	1	2	1	3	2	3	1	2	2	2	1	1	3	3
CO-5	2	1	2	3	3	3	2	2	2	2	2	1	3	3
1 - Wea	kly Cori	related,	, 2 - Mo	derate	y Corre	lated a	nd 3 - S	trongly	Correla	ted				
Module TESTIN	e 1- INTF G	RODUC	TION TO	O VEHIC	CLE SAF	ETY, STI	RUCTUI	RAL CRA	SHWO	RTHINE	ESS AND	CRASH	I (6L	.+6P)
Automo	tivo Co	fot A	ativo o	ad Dag	ciuco Co	fatur	rivor A	coicton	an Curt	ome in	Autor	mahilaa		
Definition	ons and	itety-Ad I Tormi	nology	10 Pas Design	sive sa	body f	or safet	ssistan		ems ir	nging l	nobiles	,	
deceler	ation of	f vehicle	e inside	passer	i or the	npartm	ient, de	celerati	ion on i	mpact	with sta	ationary	, ,	
and mo	vable o	bstacle	, conce	pusser pt of cr	umble z	zone, sa	ifety sa	ndwich	constru	uction.	Optimiz	ation o	f c	0-1
Vehicle	Structu	res for	Crash V	Vorthin	ess, Ty	bes of Ir	npacts,	and Im	pact W	ith Reb	ound, N	Aovable	B	TL-3
Barrier	Tests,	Roll Ov	er Cras	h Test	s, Beha	vior of	Specifi	c Body	Struct	ures in	Crash	Testing	,	
Photog	raphic A	nalysis	of Impa	act Test	:S.									
LAB- Modeling and Simulation Studies														
Module	e 2 – VE	HICLE S	AFETY	SYSTEN	15								(61	.+6P)
The cor	ncept of	f vehicle	e safety	; Need	of safe	ty, Acti	ve safe	ty: driv	ing safe	ety, cor	ditiona	l safety	,	
percept	ibility s	safety,	operati	ng safe	ety-cras	sh safet	ty pass	ive safe	ety: ext	terior s	afety,	interior	,	
safety,	deform	ation	behavio	our of	vehicle	body,	speed	and ad	ccelerat	ion ch	aracteri	stics of	f	
passeng	ger com	partme	ent on i	mpact.	Safety	equipn	nent: S	eat belt	t, regula	ations,	automa	tic seat		0-2
belt tigh	ntened s	system,	Anti-lo	cking b	rakings	system ((ABS), S	peed lir	niting c	levice (SLD), au	tomatio	B	TL-3
venicie	stability	contro	n, Collaj	osible s	teering	system	, tilt abi	e steeri	ng syste	em, air i	oags, ei icators	ectronic		-
latches	winers	horns	ali uags etc	, սսու	lers des	SIGIT TOT	salety.	vvariii	ig uevi	les, mu	icators,	minges	,	
LAB- Fir	e detec	tion ar	nd supp	ression	system	n (FDSS)), autor	natic tr	action	control				
Module	e 3 – VE	HICLE I	NTEGR	ATION /	AND NA	VIGATI	ION SYS	STEM					(61	.+6P)
Looking	out ser	nsors ar	nd Looki	ng in se	ensors, l	ntellige	ent visio	n systei	m, Vehi	cle Inte	gration	system	.	
Global	Positio	ning Sy	/stem.	Vehicle	Navig	ation S	ystem.	Road	Netwo	rk.V2V,	SAE le	evels of	f c	0-3
automa	tion												В	TL-3
LAB- Se	nsors													
Module	e 4 – ER	GONON		ND HUN	/IAN RE	SPONS	Ε ΤΟ ΙΝ	IPACT					(61	.+6P)
Importa	ance of	Ergono	mics in	Autom	otive Sa	fety, Lo	cations	of Con	trols. A	nthrop	ometrv.	Humar	ı	
Impact	Tolerar	nce Det	ermina	tion of	Injury	Thresh	olds, Se	everity	Index,	Study o	of Com	parative	2	
Toleran	ce, App	lication	ofTrau	ıma for	Analysi	s of Cra	sh Injur	ies. Inju	iry Crite	eria's ar	d Relat	ion with		0-4
Crash a	nd Mod	leling a	nd Simu	lation	Studies	in Dum	my						B	IL-3
LAB- Ar	nalysis a	nd Sim	ulation	of Veh	icle in l	Barrier	Impact	s						
Module	e 5 -	LIGH	IT ME	ASURE	MENTS	, TEST	'ING I	QUIPN	1ENT,	CALIB	RATION	AND	(6L	+6P)
РНОТО	METRIC	PRACT	ICE										,	

Basics of Standards and Detectors, Spectral Measurements and Colorimetry, Illuminant Meters and Luminance Meters, Colorimeters. Fundamentals of Equipment Used for Light Measurement in Automotive Field - Gonio- Photometer, Reflecto-Meter, Colorimeter, Integrating Sphere, Types, Application, Coordinates System, Types of Sensors and Working Principle, Construction, Characteristics Etc. Used in Different Equipment. National and International Regulations, Test Requirements and Testing Procedure							
TEXT	BOOKS						
,	Johnson W and Mamalis A.G., "Crashworthiness of Vehicles", Mechanical Engineering Pu	ublications,					
1.	¹ . 2002.						
2 Ljubo Vlacic, Michel Parent, Fumio Harashima – "Intelligent Vehicle Technologies Theory a							
Ζ.	2. Applications" -Butterworth-Heinemann, 2001						
REFE	REFERENCE BOOKS						
1	J. Marek, HP. Trah, Y. Suzuki, I. Yokomori - "Sensors for Automotive Applications" - WILEY	VCH Verlag					
	GmbH & Co. 2003						
2.	ARAI Safety standards						
E BO	DKS						
1.	Matthew Huang, "Vehicle Crash Mechanics", CRC Press, 2002						
n	J. Marek, HP. Trah, Y. Suzuki, I. Yokomori - "Sensors for Automotive Applications" - WILEY	VCH Verlag					
Ζ.	GmbH & Co. 2003						
3.	Ronald.K.Jurgen - "Automotive Electronics Handbook" - Second edition- McGraw-Hill Inc.	, - 1999					
MOC	C						
1.	1. https://onlinecourses.nptel.ac.in/noc20_de06/preview						
2.	https://www.edx.org/course/road-traffic-safety-in-automotive-engineering						

COURSE TITLE	AUTOMOTIVE	ELECTRONIC ENG	INE MANAGEMENT	CREDITS	3						
COURSE CODE	EAT51527	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2						
Version	1.0	Approval Details	36th ACM	LEARNING LEVEL	BTL-3						
ASSESSMENT SCH	ASSESSMENT SCHEME										
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	ESE						
4 50/	450/	100/	59/	50/	Theory 25%						
15%	15%	10%	5%	5%	Practical 25%						
Course	This course will	enable the student	s to gain knowledge al	bout fundamen	tals of						
Description	automotive elec	tronics and electro	onic engine manageme	nt systems.							
	1. To study th	e concepts on auto	omotive electronics.								
Course	2. To identify	the engine parame	eter by using different	types of sensor	S.						
Objectives	3. To describe	engine managem	ent systems of S.I engi	ne.							
Objectives	4. To describe	engine managem	ent systems of C.I engi	ne.							
	5. To Illustrate										
Course	Upon comp	letion of this cours	se, the students will be	2							
Outcomes	1. State the co	oncepts on automo	otive electronics.								

		2. Identify the engine parameter by using different types of sensors.												
		3.	Develo	o engin	e mana	gemen	t syster	ns of S.	l engin	e.				
		4.	Design	engine	manag	ement	system	s of C.I	engine					
		5.	Illustrat	e elect	ronic ig	nition s	ystem	and en	gine ma	apping				
Prerequisi	tes: EEI	B4101-	Introdu	uction t	o Digita	al Syste	ms							
CO, PO AN	D PSO	MAPPI	NG											
~	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PSO	PSO
co	1	2	3	4	5	6	7	8	9	10	11	12	-1	-2
CO-1	2	0	0	0	1	0	0	0	0	0	0	1	1	1
CO-2	1	2	0	0	0	0	0	0	0	0	0	2	2	0
CO-3	0	0	0	0	0	1	0	0	0	0	0	1	0	2
CO-4	0	0	0	0	1	0	0	0	0	0	0	1	1	2
CO-5	0	0	3	0	1	0	0	0	0	0	0	2	3	3
		1: \	Weakly	related	d, 2: Mo	oderate	ly relat	ted and	l 3: Stro	ongly re	elated			
MODULE 1	.: - FUN	IDAME	NTALS	OF AU1	омот	IVE ELE	CTRON	ICS					(6L-	⊦6P)
Microproc	essor a	rchitec	ture, op	pen and	l closed	loop c	ontrols	trategi	es, PID	contro	l, Look			
up tables, i	introdu	iction to	o mode	rn cont	rol stra	itegies l	ike Fuz	zy logic	and ac	laptive	contro		CO -1	L
A/D and D,	/A cont	rollers.											BTL-	1
Suggested	Readir	ng: Adv	ancem	ents in	closed	loop co	ntrol, F	rogram	nme in	look up	table			
MODULE 2	2: - SEN	SORS											(6L+	6P)
Types – Ma	ass Air	flow, N	lanifold	Absolu	ite Pres	ssure, T	empera	ature, S	peed, E	GO, Kr	iock,			
and Cranks	shaft Po	osition-	Hall Eff	ect-Prii	nciple o	of opera	tion, co	onstruc	tion, m	aterial	and		CO-2	2
characteris	stics.	-			~		D		<i>c</i>				BTL-	2
Suggested		ng: Type		CENTER	sors, Ca	imsnatt	POSITIC	on sense	or, Spe	ed sens	or		(61)	CD)
Mono noin	• • • • • • • •				ntion s	vetome	Drinc	inlos ar	d Foat		acch			
injection s	ustems		anic an	ест пје 4 I H — И	atronic.	, Lavout	- FILL	orking	Onen l	000 CO	ntrol		<u> </u>	2
and Lambo	la loon	contro	l in inie	ction		Layou		orking,	openi	000 00	nuor		BTI-	, 7
Suggested	Readir	ng: K-Je	tronic.	KE-Jetr	onic. M	otronic	Systen	ns					2.2	-
MODULE 4	: - C.I E	INGINE	MANA	GEME	NT		- 1						(6L+	6P)
Fuel injecti	ion syst	tem pai	ramete	rs affec	ting co	mbustic	on, nois	e and e	emissio	ns in Cl			1-	
engines. Ir	, nline in	, jection	pump,	Rotary	pumpa	and inje	ector - (Constru	ction a	nd prin	ciple of	:		
operation,	electro	- onically	contro	lled Un	it Inject	tion sys	tem. La	yout of	f the co	mmon	rail fue	1	CO-4	Ļ
injection sy	ystem.				-	-		-					BTL-	2
Suggested	Readir	ng: Noz	zle spra	y chara	octeristi	ics, Typ	es of N	ozzles,	Types o	of comb	oustion			
Chambers														
MODULE 5	5: IGNIT	FION SY	STEMS	AND E	NGINE	MAPPI	NG					•	(6L+	6P)
Ignition fu	ndame	ntals, T	ypes of	solid st	tate ign	ition sy	stems,	High er	nergy ig	gnition				
distributor	s, Elect	ronic s	park tin	ning an	d contr	ol. Com	ibined i	gnition	and fu	el man	agemer	nt		
systems. D	igital c	ontrol t	echniq	ues - D	well ang	gle, Igni	tion tir	ning an	d Injec	tion du	ration		CO-5	5
calculation													BTL-	3
Suggested	Readir	ng: Elec	tronic l	gnition	system	n, Optin	nizatior	techni	ques in	ignitio	n and			
injection ti	ming													
TEXT BOO	KS													
1.	۱	Nilliam Eighth E	B. Ribb dition.	ens., "I 2017	Underst	tanding	Autom	otive E	lectron	ics an I	Enginee	ring Pe	rspecti	ve"
2.	1	Fom De	nton., '	'Autom	obile E	lectrica	l and El	ectroni	c Syste	ms" 3 ^{rc}	^l editior	n 2014.		
REFERENC	E BOOI	< <u>s</u>	,						,	-				

1	Robert Bosch Automotive Handbook, 10th Edition (2018)., BOSCH 10, ISBN of 978-0-7680-
1.	9567-8.
2.	Robert Bosch, "Gasoline Engine Management- system and component. 2014.
3.	Robert Bosch "Diesel Engine Management" -4 th edition 2006.

Specialization 3: Engine and Vehicle Technology

COUI TITI	RSE LE		REN	IEWAE	BLE SO	URCE	OF EN		CR	EDITS		3				
COU COI	RSE DE		EAT515	28	CO CATE	URSE EGORY		DE		L-	T-P-S		2-0-2-	2		
VERS	ION		1.0		APPI DE1	ROVAL FAILS		36 ^{тн} А(CM	LEA	RNING EVEL		BTL-3	8		
ASSES	SMENT	SCHE	ME													
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15	%		15% 10% 5% 5% Theory 25% Practical 25%													
15	/0		13/0		10	/0		J/0			J /0	Ρ	ractical	25%		
Cou Descri	rse ption	This vario reade addit	his course enhances the reader the availability, feasibility, methods of utilization of the arious renewable sources of energy with respect to the application. This also enables the eader the advantages, limitations and the methods to overcome the limitations by the dditional equipment to obtain the required outcome													
Course Objecti	e ives	2. [3. [4. [5. [convent earn th Design Dumpin Underst energy Design t	ional fu e funda wind tu g and el and the from oc he utiliz	el reser imental irbine t ectricity workir cean, ki zation n	ves will concep blades a y genera ng of OT now ab nethod	I last ots about and kno ation FEC systemout Bio from th	ut solar ow abo tem and omass e ie energ	energy ut app d differe energy. gy of Hy	system lications ent poss	s and do s of with sible wa	evices nd ene ays of e ermal s	rgy for xtractin	water		
Course Outcor	e nes	Upo 1. 2. 3. 4. 5.	Discus Gain ki Develo Interpi Discus hydro,	oletion s on ren nowledg p the a ret capa s the a geothe	of the c ewable ge abou pplicatio bility to pplicatio rmal en	ourse the and no at worki on of w o do bas ons of aergy et	he stud on-rene ng prin ind ene ic desig differen c.	ents are wable s ciple of rgy and n of bio nt rene	e able to sources various I wind e gas pla wable	of ener solar e nergy c ant energy	gy nergy s onversi sources	ystems on syste ilike o	em cean th	ermal,		
			PPING													
COs	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO 11	PO 12	PSO 1	PSO 2		
CO-1	1	1	1	1	2	2	2	2	2	2	1	1	1	1		
CO-2	1	1	1	1	2	2	2	2	2	2	1	1	1	1		
CO-3	1	1	1 1 1 2 2 2 2 2 2 1 1 1 1													
CO-4	1	1	1	1	2	2	2	2	2	2	1	1	1	1		
CO-5	1	1	1 1 1 2 2 2 2 2 2 1 1 1 1													
		1 - W	eakly C	orrelate	ed, 2 - N	/loderat	ely Cor	related	and 3 -	Strong	y Corre	lated				
Module	e 1 – IN	NTROD	UCTION	I TO EN	ERGY S	TUDIES							(6L+	6P)		

Introduction, Energy science and Technology, Forms of Energy, Importance of Energy Consumption as Measure of Prosperity, Per Capita Energy Consumption, Roles and responsibility of Ministry of New and Renewable Energy Sources, Needs of renewable energy, Classification of Energy Resources, Conventional Energy Resources, Non- Conventional Energy Resources, World Energy Scenario, Indian Energy Scenario.	CO-1 BTL-3
Module 2 – SOLAR ENERGY	(6L+6P)
Introduction, Solar Radiation, Sun path diagram, Basic Sun-Earth Angles, Solar Radiation Geometry and its relation, Measurement of Solar Radiation on horizontal and tilted surfaces, Principle of Conversion of Solar Radiation into Heat, Collectors, Collector efficiency, Selective surfaces, Solar Water Heating system, Solar Cookers, Solar driers, Solar Still, Solar Furnaces, Solar Greenhouse. Solar Photovoltaic, Solar Cell fundamentals, Characteristics, Classification, Construction of module, panel and array. Solar PV Systems (stand-alone and grid connected), Solar PV Applications. Government schemes and policies.	CO-2 BTL-3
Module 3 – WIND ENERGY	(6L+6P)
Introduction, History of Wind Energy, Wind Energy Scenario of World and India. Basic principles of Wind Energy Conversion Systems (WECS), Types and Classification of WECS, Parts of WECS, Power, torque and speed characteristics, Electrical Power Output and Capacity Factor of WECS, Stand alone, grid connected and hybrid applications of WECS, Economics of wind energy utilization, Site selection criteria, Wind farm, Wind rose diagram.	CO-3 BTL-3
Module 4 – BIOMASS ENERGY	(6L+6P)
Introduction, Biomass energy, Photosynthesis process, Biomass fuels, Biomass energy conversion technologies and applications, Urban waste to Energy Conversion, Biomass Gasification, Types and application of gasifier, Biomass to Ethanol Production, Biogas production from waste biomass, Types of biogas plants, Factors affecting biogas generation, Energy plantation, Environmental impacts and benefits, Future role of biomass, Biomass programs in India.	CO-4 BTL-3
Module 5 – HYDRO POWER AND OTHER RENEWABLE ENERGY SOURCES	(6L+6P)
Hydropower: Introduction, Capacity and Potential, Small hydro, Environmental and social impacts. Tidal Energy: Introduction, Capacity and Potential, Principle of Tidal Power, Components of Tidal Power Plant, Classification of Tidal Power Plants. Ocean Thermal Energy: Introduction, Ocean Thermal Energy Conversion (OTEC), Principle of OTEC system, Methods of OTEC power generation. Geothermal Energy: Introduction, Capacity and Potential, Resources of geothermal energy.	CO-5 BTL-4
TEXT BOOKS	
1. Twidell, J.W. & Weir, A. Renewable Energy Sources, EFN Spon Ltd., UK, 2006 2. B. H. Khan, Non-Conventional Energy Resources, The McGraw Hill	
2.	
REFERENCE BOOKS	
Godfrey Boyle, "Renewable Energy, Power for a Sustainable Euture". OxfordUniversi	tv Press. U.K
2. 1996	
E BOOKS	
1. https://www.uobabylon.edu.iq/eprints/publication_4_10679_78.pdf	
2. https://drive.google.com/drive/folders/1hfCGgh8eMJfNHbfHu10Ja2GSTzmuRro0?usp=	-sharing
1. nttps://arcnive.nptei.ac.in/courses/121/106/121106014/ 2. https://arcnive.nptei.ac.in/courses/121/106/121106014/	
I Z. I NTLDS://NDTEI.aC.IN/COURSES/108105058	

	RSE .E	AUT	AUTOMOTIVE HEATING VENTILATION AIR-CONDITIONING (HVAC) CREDITS													
COU	RSE DE	E	AT5152	:9	COL CATE	JRSE GORY		[DE		L-T-I	P-S	2-0-	2-2		
VERS	ION		1.0		APPI L DE	ROVA TAILS		36 [™]	ACM		LEAR G LE	NIN VEL	BT	L-3		
ASSESS	MENT	SCHEM	E													
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159	9/		15%		100	/		E%			= 9/		Theory 2	25%		
15	/0		To enable the students gain knowledge on Automative air conditioning.													
Cou	rse	To ena	g, Eleo	ctronic c	limate											
Descri	otion	contro	ol and A	ir cono	litioning	service	2.									
Course Objecti	ves	1. 2. 3. 4. 5.	 e course should enable the students to: 1. To know about the automotive air conditioning fundamentals. 2. To understand the concepts and components of automotive cooling and heating systems 3. To learn about the refrigerants and handling of refrigerants. 4. To Know the working of automotive sensors used for climate and temperature control. 5. To Know about the servicing of automotive air conditioning system. 													
Course Outcon	nes	1. 2. 3. 4. 5.	Fami Gain heat Acqu Attai temp Fami	iliarize know ing sys uire the oeratu	on fund ledge o tems. knowle knowl re contro on servi	lamenta on the edge on edge o ol. icing of	als of au concep refrige on wor automo	itomoti ts and rants ar king o ptive air	ve air co compo nd its ha f autor <u>r conditi</u>	onditior nents c andling. motive	ning sys of auto sensor ystem.	tems. motiv s for	e coolin climate	g and		
Prerequ	lisites:	Nil														
CO, PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO 11	PO 12	PSO 1	PS O2		
CO-1	3	3	2	3	1	2	0	2		5	1	1	1	1		
CO-2	3	1	2	1	1	1	-	1			1	1	1	1		
CO-3	3	1	2	1	1	1		1			1	1	1	1		
CO-4	3	1	2	1	1	1		1			1	1	1	1		
CO-5	3	1	2	1	1	1		1			1	1	1	1		
		1 - We	akly Co	rrelate	ed, 2 - M	oderat	ely Corr	elated a	and 3 - 9	Strongly	/ Correl	ated				
Module	e 1 – Ba	sics of A	Air Con	ditioni	ng								(6L+	·6P)		
Introduction to HVAC- Environmental Concerns- Ozone layer depletion. Location of air conditioning components in a car – Schematic layout of a vehicle refrigeration system. Psychometric – Basic terminology and Psychrometric mixtures- Psychrometric Chart- Related simple basic problems Practical Component: Study and sketching of the schematic layout of air-conditioning system in an automobile)-1 L-3				
Module	e 2 – Aiı	⁻ Condit	ioning	Systen	ns								(6L+	·6P)		
Vehicle	Refrige	eration	System	and and	related	probler	ns- Fixe	ed ther	mostati m- Veh	c and icle air o	Orifice	tube ming	СС	CO-2 BTL-3		

opera Comp temp	ition Types of compressor- Compressor Clutches- Compressor Clutch electrical circuit- pressor lubrication- Condensers- Evaporators- Expansion devices- Evaporator erature and pressure controls- receiver-drier- Accumulators- refrigerant hoses,	
Dract	ical Component:	
Pract		
Ident	frication of Air conditioning system components	
Remo	val and Assembly of air filters	
Modu	ıle 3 – Climate Control	(6L+6P)
Differ air co clima	ent types of sensors and actuators used in automatic temperature control- Automotive onditioning manual control system, auto temperature control system, Automotive te control system.	CO-3 BTI-3
Pract	ical Components	512 5
Study	and testing of sensors uses in Automotive Air conditioning	
Modu	ule 4 – Maintenance of Automobile Air Conditioning	(6L+6P)
Temp Retro Pract Refrig	erature measurements – Refrigerant recovery, recycle and charging-system flushing, fitting – Replacement and adjustment of compressor components Handling ical Component; gerant Charging in an Automobile.	CO-4 BTL-3
Modu	ıle 5 – Refrigerants	(6L+6P)
Refrig tappi ambio Pract Detec	gerants – Discharging, Charging & Leak detection Containers handling refrigerants, ng into the refrigerant container refrigeration system diagnosis, diagnostic procedure, ent conditions affecting system pressures ical Component: ction of Refrigerant leakage in an automobile	CO-5 BTL-3
TEXT	BOOKS	
1.	Steven Daly- "Automotive Air –Conditioning Climate Control Systems" - Butterworth – Elsevier Publications -2011.	Heinemann –
2.	William H. Crouse and Donald I. Anglin - "Automotive Air conditioning" - McGraw Hill I	nc 1990.
REFE	RENCE BOOKS	
1.	Boyce H. Dwiggins - "Automotive Air Conditioning" - Delmar – 2002. Mitchell information - "Mitchell Automatic Heating and Air Conditioning Systems" - Prentice Hall Ind. – 1989	n Services, Inc
2.	Paul Weiser - "Automotive Air Conditioning" - Reston Publishing Co., Inc., - 1990	
E BOO	DKS	
1.	https://www.elsevier.com/books/automotive-air-conditioning-and-climate-control- systems/daly/978-0-7506-6955-9	
2.	https://link.springer.com/book/10.1007/978-3-319-33590-2	
MOO	c	
1.	https://nptel.ac.in/courses/112107208	
2.	https://www.edx.org/course/distribution-and-control-of-heat-cold-and-air-flows-in-bu	uildings

Specialization 4: Design and Manufacturing

COURSE TITLE		DESIGN OF EXPERIME	CREDITS	3							
COURSE CODE	EAT51530	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2						
VERSION	1.0	APPROVAL DETAILS	36 [™] ACM	LEARNING LEVEL	BTL-3						
ASSESSMENT	ASSESSMENT SCHEME										

F Peri Asse (Th	First iodical ssment ieory)	P	Second Periodica ssessme (Theory	l al ent /)	Practica Assessn nts	il ne	Obse records the Ex Com	rvation as appr Departn amination nittee "	/ lab oved by nent on DEC"	Atte	endance		ESE		
1	L5%		15%		10%			5%			5%	1	Theory 2	.5%	
												P	ractical	25%	
Desc	ourse	Thi	s course lysis to e	e gives obtaint	knowle the onti	edge mized	on how results i	to design econo	gn the o mical wa	experin av with	iental v less nun	vorks and	and stat	istical nents	
5050		This	course	aims to	give kr	owle	dge on ti	ne follov	ving top	ics	icoo nun		слрени	ierres.	
		1.	To und	erstan	d princip	oles ar	nd guide	ines of I	Design o	f Exper	iments				
Cours	se	2.	To Ran	domize	e block o	lesign									
Objec	tives	3.	To do f	actoria	l design										
		4.	To follo	ow Tag	uchi me	thod a	and Regr	ession A	nalysis						
		5.	10 Use	Respon	of this c		tho stu	ogy in D		o to					
1. Familiarize on the principles and guidelines of Design of Experiments															
Cours	Course2.Analyze the randomized block design														
Outco	omes	3.	Analyz	e the fa	ctorial	desigr	1								
		4.	Solve p	roblen	ns by Ta	guchi	method	and Reg	ression	Analysi	S				
	5. Analyze the importance of Response Surface Methodology in DOE														
Prere	quisites	s: Nil													
СО, Р	O AND	PSO M	APPING							DO1	PO	PO	DSO .	DC	
COs	PO1	PO2	PO3	PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO1 PO PO PSO PSO PO3 PO4 PO5 PO6 PO7 PO8 PO9 0 11 12 1 O											
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CO-4	2	1	-	-	-	-	-	-	-	-	-	1	1	1	
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		1 - V	Veakly C	Correlat	:ed, 2 - I	Mode	rately Co	rrelated	and 3 -	Strong	ly Corre	lated		_ \	
MOD	ULE 1 – I	Experin	nents w	rith a Si	ngle Fa	ctor							(6L+6	P)	
Basic	principl	es and	guideli	nes of	Design	of Ex	perimen	s – Sing	gle Fact	or Expe	eriments	5 -	CO- 2	1	
ANOV Treatr	'A – Mo ment Me	eans – I	equacy ntroduc	Check ction to	DOAE s	eterm oftwa	nining Sa are.	mple Si	ze – Co	mparın	ng Pairs	of	BTL-	.3	
MODI	JLE 2 – I	Randor	nized B	lock De	signs								(6L+6	P)	
Rando	mized o	complet	te block	desigr	ı – Latin	Squa	re Desig	n – Grae	eco-Latir	n Squar	e Desigi	1 – I	CO-2	2	
Baland	ced Inco	mplete	Block D	Design									BTL-	3	
MODU	ULE 3 – I	Factoria	al Desig	ns									(6L+6	P)	
Two L	evels – 2	2K Facto	orial De	signs –	Confou	nding	and Bloo	king in I	Factoria	l Desigr	ıs		CO-3	3	
MODI	ULE 4 – 1	Fractio	nal Fact	orial D	esigns								(6L+6	5 P)	
The C	Dne-Half	and Or	ne-Quar	ter Fra	ction of	the 2k	(Design -	- Genera	al 2K-P F	raction	al Facto	rial	CO-4	4	
Desig	n - Reso	lution					0						BTL-	3	
MOD	ULE 5 – I	Robust	Design										(6L+6I	?)	
Tague	Taguchi's Approach – Orthogonal Design – S/N ratio – Regression Analysis – Response CO-5														
Surfac	ce Meth	odolog	у.										BTL-	3	
	BOOKS	<u> </u>		(2047			Anakisi	<u>б Г</u>		La h := 144	:lau 0. C		10 th	J. 4. 1	
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	nilip J. R	ose, (20	JUU), Ia	guchi I	ecnniqu	ies to	rquality	Enginee	ring, Pri	ntice H	all				
2 K. Pu	2 K. Krishaiah, P. Shahabuddeen (2012) Applied Design of Experiments and Taguchi Methods. PHI Publications.														

E BOOKS

https://faculty.ksu.edu.sa/sites/default/files/douglas_c._montgomery-

1 https://faculty.ksu.edu.sa/sites/default/files/douglas_c._montgo design_and_analysis_of_experiments-wiley_2012_edition_8.pdf

https://books.google.co.in/books?hl=en&lr=&id=Q_JtuJ7uNRAC&oi=fnd&pg=PR1&dq=design+and+anal

2 ysis+of+experiments+paneerselvam+pdf&ots=WGrWA1O362&sig=ji4aBmj-

u7Nk3kshWWdCrqrjVug#v=onepage&q&f=false

COURSE TITLE		IN	DUSTR	IAL ENG	INEER		MAN	NT	CRED	ITS	TS 3			
COURSE CODE	E	AT5153	31	COUF	RSE CA	TEGORY		DE		L-T-P	P-S	2-0-	-2-2	
VERSION		1.0		APPR	OVAL	DETAILS	Э	86 [™] ACI	И	LEARN LEV	ING EL	BT	L-4	
ASSESSMENT SC	CHEME								_		_			
First Periodical Assessment (Theory)	S Pe Ass (T	econd riodica essme heory)	nt (Practica Assessm	l ient	Obser records by the Exa Comm	vation as ap Depar minat iittee	n / lab proved rtment ion "DEC"	At	tendanc	e	ESE		
15%		15%		10%			5%			5%		Theory	25%	
		13/0		10/0	,		370			3/0	F	Practical	25%	
Course Description	This Engir secto	course neer to or.	descr	ibes the case as a	a bette	ssary qua er admin	litativo istratio	e and q on and	uanti produ	tative sk ctivity ir	ills for 1 the n	an Indu nanufac	ustrial turing	
Course Objectives	1. 1 2. 1 3. 1 4. 1 5. 1	The aim of the course is to give the student theoretical insights and practical tools within the area of management and organisation of industrial corporations. To explain the business house to increase its production in the scientifical methods. To interpret the inventory and stores management for the effective introduction of control methods. To analyse the explain material requirement planning and store keeping procedure and list the PPC functions. To classify the training, industrial training methods in the organization.												
Course Outcomes	Upor 1. E 2. II 5. C 1. E 0 1. E 0 1. E 0 1. E 0 0 0 0 0 0 0 0 0 0 0 0 0	n comp Exhibit t of indus mplem ollowin Develop nethod Design a daptin Carry on notivat	letion of theorem trial co ent ne of the s. and eva g the P ut inno ional a	of this co tical and prporation w methescientific inventor aluate the PC functor ovative a ctivities	practions. hodolocal met ry and he mat tions. ind res	the stude cal tools ogy in th chods. I stores cerial req search or	ents w within e bus manag uireme iented	ill be ab the area siness h gement ent plan I person	le to a of m nouse by i ning a nal tra	anagem to incre ntroduci and store ining, ine	ent and ease it ng mo e keepi dustria	l organiz s produ dern co ng proc l trainin	zation uction ontrol edure g and	
CO. PO AND PS	D MAPI	PING												
		-			F	POs						PS	SOS	
COs PO 1	PO 2	PO 3	PO 4	PO 5	РО 6	PO 7	PO 8	РО 9	PO 10	PO 11	PO 12	1	2	
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CO-1 3 CO-2 3	2	1	2	2	2	2	1	3	2	3	1	3	2	
CO-1 3 CO-2 3 CO-3 3	2 2 3	1 2	2 2	2 3	2 3	2 3	1 2	3 3	2	3	1 1	3 3	2 2 2	
CO-1 3 CO-2 3 CO-3 3 CO-4 3	2 2 3 2	1 2 2	2 2 1	2 3 3	2 3 3	2 3 3	1 2 2	3 3 3	2 2 3	3 1 2	1 1 1	3 3 3	2 2 2 2	

Mod	ule: I -Introduction to Industrial Management	(6L+6P)
Indu Appli Indus Mana	strial Management –Concept Meaning and Definitions - Scope of Industrial Management - cation of Industrial Management -Objectives of Industrial Management -Significance of strial Management - Difference between Industrial Management & Production agement - Recent trends in Industrial Management.	CO-1 BTL-2
Mou	le: II -Productivity Management	(6L+6P)
Prod indus abou	uctivity Management: • Concept of Productivity, its importance & nature. Factors affecting strial productivity. Barriers of Productivity. Management of Productivity Misunderstanding t productivity. Productivity improvement techniques. Efficiency and effectiveness .	CO-2 BTL-2
Mod	ule III – Materials Management	(6L+6P)
Mate purch decer Inver Quar Mate packa	erial management-definition, functions, Purchase - objectives, purchasing systems, nase procedure, Storekeeping- functions, classification of stores as centralized and ntralized with their advantages, Functions of store, types of records maintained by store, ntory control- Definition- Objectives Derivation for expression for Economic Order atity (EOQ) and numeric examples. ABC analysis and other modern methods of analysis. rrial Requirement Planning (MRP)- concept, applications and brief details about software ages available in market.	CO-3 BTL-3
Mod	ule IV -Production Planning and Control (PPC).	(6L+6P)
Type their using techr	s and examples of production- PPC : Need and importance-Functions - Forms used and importance. Scheduling- meaning and need for productivity and utilization. Scheduling Gantt Chart . Meaning objectives- Importance- space- production planning – function, hiques of PPC- Routing-scheduling –Despatching- and follow-up Limitations PPC	CO-4 BTL-2
Mod	ule V – Human Resource Management	(6L+6P)
Emp traini Meth Indus Impo	loyee Training and Development: Introduction- Need for training- Steps in designing ng programme- Methods of training. Performance Appraisal: Meaning – Purpose- ods- Ethics in appraisal. Industrial Relations - Importance- objectives- Participants in strial Relations-Worker's Participations in Management. Employee Morale -Meaning- rtance- factors affection morale – Improving Morale.	CO-5 BTL-3
TEXT	BOOKS	
1.	P. Khanna, "Industrial Engineering and Management", Dhanpatrai publications Ltd, New	Delhi.
2.	Srivastava R.M. Management Policy and Strategic Management, concepts, skills and pra 1999.	ctices HPH-
REFE	RENCE BOOKS	
1.	K. Shridhara Bhat, "Materials and Logistics Management", Himalaya Publishing House, M	umbai
2.	Dinesh Seth and Subhash C. Rastogi, "Global Management Solutions", Cengage Learning, Second Edition. USA.	
3.	N.V.S. Raju, Industrial Engineering & Management, Cengage Group,2013, ISBN: 9788131519486	
E BOC	DKS	
1.	https://www.phindia.com/Books/BookDetail/9788120351103/industrial-engineering-and management-ravi	1-
2.	https://www.springer.com/series/11690	
3.	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470172339	
MOO	pc	
1.	https://onlinecourses.nptel.ac.in/noc22_me04/preview	
2.	https://www.shiksha.com/online-courses/nptel-project-management-course-course-npt	el19
3.	https://nptel.ac.in/courses/112107143	

Semester –VII

Department Elective-5

Specialization 1: ELECTRIC VEHICLE TECHNOLOGY

COURSE 1	TITLE		CON	ИРИТЕ	R ARCH	HITECT	URE AI	ND DA	TA ANL	YTICS		CRED	ITS		3
COURSE	CODE		EAT51	532	CC CAT	OURSE EGOR	Y	P	2	L-T	-P-S		2-0)-2-2	
VERS	ION		1.0		APF DE	PROVA	L	36 th A	СМ	LEAF G LI	RNIN EVEL		BT	[L-3	
ASSESSIV	IENT SO	CHEME													
First Per	riodical		Secor	nd	Prac	tical	Obse re appr	rvatior ecords oved k	n / lab as by the	Atte	enda	End Semester Examination			
Assess	ment	A	ssessm	hent	en	its	De Ex Comi	epartm aminat nittee	ent ion "DEC"	n	ce	The	ory	Prac	tical
15	%		15% 10% 5% 5% 25% 2!												%
Cou Descrij	rse ption	Thi arc	s cours hitectu	se intro ire con	duces cepts.	the pri	nciples	s of cor	nputer	organi	zation	and th	e basio	2	
Cou Object	rse tives	1. 2. 3. 4. 5.	Reca Fami arith Expla Knov issue Dem inter	II the b liarize metic c ain the v the d s. onstrat faces.	asic str with ar operati concer ifferen te diffe	ructure ithmet ons. ot of pi ce bet erent w	e and o tic and pelinin ween (vays of	peratic logic u g and p Cache a	on of a on on of a on one of a one one of a one one of a one one of a one of a one one on	compu implei ism. cual me ing wit	ter sys mentat emory :h I/O o	tem. tion of and re devices	differe lated p and s	ent perform standar	nance d I/O
Cou Outco	rse omes	Up 1. 2. 3. 4. 5.	on con Recal Famil arithi Expla Know issue Demo inter	I the b iarize w metic c in the d the d s. ponstrat	n of thi asic str with ar operatic concep ifference e diffe	s cours ucture ithmet ons. t of pip ce betw rent w	se, the and of ic and oelinin ween C vays of	studer peratio logic u g and p Cache a comm	nts will n of a c nit and paralleli nd Virt unicati	be able comput impler sm. cual me ng wit	e to ter syst mentat emory h I/O o	tem. tion of and re devices	differe lated p and s	ent perform standar	nance rd I/O
Prerequis	ites: N	IL													
CO, PO AI	ND PSC	MAPI	PING				Ţ	Ţ						1	T
Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	РО 9	PO 10	PO 11	PO 12	PS O1	PS O2	
CO-1	3	3	2	2	2	2	-	2	-	-	2	2	1	1	
CO-2	3	3	2	2	2	2	-	2	-	-	2	2	1	1	

CO-3	3	3	2	2	2	2	-	2	-	-	2	2	1	1		
CO-4	3	3	2	2	2	2	-	2	-	-	2	2	1	1		
CO-5	3	3	2	2	2	2	-	2	-	-	2	2	1	1		
	1	1 – We	akly Co	orrelate	d, 2 - N	Nodera	ately Co	orrelate	ed and	3 - Str	ongly C	orrela	ted			
MODULE	1: CON	ΙΡυτε	R TECH	INOLO	GIES								(6L	.+6P)		
Eight idea	s – Cor	npone	nts of a	a comp	uter sy	stem –	- Techn	ology -	– Perfo	rmanc	e –					
Power wa	III –Uni	proces	sors to	multip	rocess	ors; ins	structio	ons – o ddrocc	peratic	ons and doc	1					
operatios	- Tepie	esentin	ig ilisti	uctions	5 – Auu	II CSSIIIE	s anu a	uuress	ing mo	ues.				0 1		
Practical	Compo	nent:												1-0-1		
1 6	Practise	onGN	U Simi	ilator 8	085								BTL-3			
2. 9	Study th	he com	nplete i	instruct	tion se	t of 80	85 and	l write	the ins	tructio	ons in t	he				
i	instruction set of 8085 along with examples. Software/ Equipment required-GNUsim8085															
Software	Software/ Equipment required-GNUsim8085															
MODULE	MODULE 2: ARITHMETIC FOR COMPUTERS													.+6P)		
ALU - Integer Addition, Integer Subtraction, Dealing/Detecting with Overflow -																
Designing	ALU fo	or MIPS	5, Multi	iplicatio	on- Mu	ıltiply A	Algorith	nm-Opt	imized	Multi	olier-					
Faster Mu	ıltiplier	, Divisi	on-Div	ide Alg	orithm	-Optim	nized D	ivider -	- Floati	ng Poi	nt					
Operation	Derations-Standard- IEEE Floating-Point Format.															
Practical	ractical Component:															
1 \	N/rita a		mblula		aadai	C NU	~im 000		مصامحم	nt dat	a tranci	for	1	BTL-3		
1. N	nstruct	n asser ion	пріў іа	nguage	code	IN GINU	SIMBU	35 to in	npieme	ent data	a transi	rer				
2. \	Nrite a	n asser	nbly la	nguage	code i	n GNUs	sim808	5 to st	ore nur	nbers i	n rever	se				
c	order in	n memo	ory loca	ation.												
Software	/ Equip	ment	require	ed-GNU	lsim80	85										
MODULE	3: MIF	PS & PI	PELINI	NG									(6	L+6P)		
Basic MIP	S imple	ementa	ntion –	Buildin	g data	path –	Contro	ol Impl	ementa	ation s	cheme	-				
Pipelining	– Pipe	lined d	lata pa	th and	contro	l – Han	idling [Data ha	zards &	& Cont	rol					
hazards –	Except	tions.														
Practical	Compo	nent:														
1 \	Nrito a	n 2000	mbly	ממעסמ	o codo	in CN	l leim@	095 to	implor	nont a	rithmo	tic		CO-3		
1. v	nstruct	ion.		inguag			USIIIIO	085 10	impiei	nent a	nunne	uc	I	BTL-3		
2. ۱	Write a	n asser	mbly la	nguage	e code	in GNL	Jsim80	85 to a	dd two	numb	ers usi	ng				
l	xi instri	uction														
Software	/ Equip	mont	roquire		lcim80	95										
Software	, Ldaib	ment	equire	u-unc	511100	05										
MODULE	4 - INS	TRUCT	ION-LE	VEL PA	RALLE	LISM							()	6L+6P)		
Instructio	n-level	-parallo	elism –	Paralle	el proc	essing	challen	iges – F	-lynn's	classifi	cation	-				
Hardware	multit	nreadi	ng – Ivi	uiticor	e proce	essors.										
Practical	Compo	nent:														
1. \	1. Write an assembly language code in GNUsim8085 to add two 8 bit numbers												(CO-4		
S	tored i	n mem	nory an	d also s	storing	the ca	rry.	00- ·	.	r		,		/IL-J		
2. \	Write a	n asse	mbly la	anguag	e code	e in GN	Usim8	085 to	tind th	ne fact	orial of	ra				
Software	/ Equip	ment	require	ed-GNU	lsim80	85										
MODULE	5 – ME	MORY	AND I	/0								1	(6L	+6P)		

Memo	ory hierarchy - Cache Memory - Virtual memory, TLBs - Input/output system, ammed I/O, DMA and interrupts, I/O processors.	
Practi	cal Component:	
1	. Write an assembly language code in GNUsim8085 to implement logical	
	instructions.	
2	. Write an assembly language code in GNUsim8085 to implement stack and	CO F
	branch instructions.	CU-5
Softw	are/ Equipment required-GNUsim8085	DIL-3
TEXT	BOOKS	
	David A. Patterson and John L. Hennessy, "Computer organization and design', N	Morgan Kaufmann /
1.	Elsevier, Fifth edition, 2013.	
	William Stallings, "Computer Organization and Architecture", Tenth Edition, Pea	rson Education,
2	2016.	
REEE		
	V Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisatic	on" VI th edition Mc
1.	Graw-Hill Inc. 2012	, vi til edition, we
	Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Ec	dition, Pearson
2	Education, 2005.	
E- BO	OKS	
	https://theswissbay.ch/pdf/Books/Computer%20science/Computer%20Organiz	ation%20and%20De
1	sign-%20The%20HW_SW%20Inteface%205th%20edition%20-	
	%20David%20A.%20Patterson%20%26%20John%20L.%20Hennessy.pdf	
2	https://inspirit.net.in/books/academic/Computer%20Organisation%20and%20/	Architecture%208e%
MOO	2Uby%2UWIIIIam%2UStallings.pdf	
MOO		
1.	https://www.mooc-list.com/course/computer-architecture-coursera	
2	<u>https://www.mooc-list.com/course/tundamentals-computer-architecture-cour</u>	<u>sera</u>

COURSE TITLE		SMART GRID F	OR EV	CREDITS		3			
COURSE CODE	EAT51533	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2				
Version	sion 1.0 Approval Details 36th ACM LEARNING LEVEL								
ASSESSMENT SCH	IEME								
		CIA			E	SE			
First Periodical Assessment	Second Periodical Assessment	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	Theory	Practical			
15%	15%	10%	5%	5%	25%	25%			

Co Desc	ourse cription	Th wi co su re	nis cour ith strir ourse pr ich as p mote lo	se main ngent en rovides power g pocations	nly focu mphasis overvie generat s of Ind	usses o s on pra ew of s ion, tra ia.	n back actical a mart gr ansmiss	ground applica id and ion an	and fu tions in its pote d distri	indame the ex ential in bution	ental bu isting p n differ in Met	uilding ower s ent typ ro, Urt	blocks o ystem r bes of p ban/Sen	of smar network ower so ni urba	t grid c. This ectors n and	
Co Obj	ourse ective	1. 2.	To fa To u	amiliari ndersta	ze the l and the	oasic co variou	oncepts s measu	, comp uremer	onents nt techr	and are	chitectu s in sma	ire of s art grid	mart gr	id		
Upon completion of this course, the students will be able to 1. Apply economic fundamentals of power systems and electricity markets. 2. Solve problems of Optimal Power Flow 3. Explain the characteristics of smart grids 4. Explain concepts of various components of Smart Grid, and their impacts on the energy industry 5. Identify the threats and vulnerabilities of smart grid																
Prereq	Prerequisites: Power System, Power Electronics															
CO, PO	AND P	SO MA	PPING								1	1		[
со	PO- 1	РО- 2	РО- 3	РО- 4	РО- 5	РО- 6	РО- 7	РО- 8	РО- 9	РО- 10	PO- 11	PO- 12	PSO -1	PSO -2		
CO-1	3	3	2	2	2	-	-	-	-	-	-	-	-	1		
CO-2	3	3	2	2 2 2 - - - - - - 1 2 2 3 - - - - - - 1												
CO-3	3	3	2	2	3	-	-	-	-	-	-	-	-	1		
CO-4	3	3	2	2	3	-	-	-	-	-	-	-	-	1		
CO-5	3	3	3	2	3	-	-	-	-	-	-	-	-	1		
			1: W	eakly re	elated,	2: Mod	lerately	/ relate	d and 3	8: Stror	gly rela	ated				
MODU	LE 1: S	UPPLYS	SIDE AN	ND DEM	IAND S	IDE OF	ELECTR	RICITY						(6L+6P)		
Basics of energy Deman Sugges Lab Exp Integra	of elect - Suppl ad side i sted Rea perime ation of	ricity- I y curve manage ading: nts: Renew	Fossil fu - Load o ement- TNEB D vable Er	uel and charact Plug-in Demanc nergy So	hydro µ eristics hybrid I supply burces i	oower p - Load o vehicle v handb n Smar	blants- l curve and sook t Grid.	Renewa nd loac smart a	able an I durati pplianc	d alterr on curv es	native ve-			CO-1 BTL-3		
MODU	LE 2: 1	FRANS	MISSIO	N AND	DISTRI	BUTION	NETW	/ORKS	-				(6	L+6P)		
Physica commi Sugges Lab Ex _I Solutio	al laws o tment i sted Rea perime on of Op	of elect models adings: nts: otimal F	ricity; A - Distril Demar Power F	AC vs. D oution r nd Side low Pro	C Powe networl Manag oblem	er flow- k basics ement	Optim in India	al powe	er flow nology /	and un Assessr	it nent			CO-2 BTL-3		
MODU	LE 3: B	SASIC E	LEMEN	TS AND	DESIR	ABLE T	RAITS C	DF SMA	RT GRI	D		1	(6	L+6P)		
The ori grid-re Sugges Lab Ex Reliabi	igin of p liability sted Rea perime lity asso	oower g – secu adings: nt: essmen	grid – do rity –ec Smart t of Por	epende conomic Grid: Co wer Gri	ncy on c –effici oncepts d	power iency – s and D	grid – c environ eploym	desirab menta ient	le featu l friend	ires of ly – saf	oower ety.			CO-3 BTL-3		

MODU	LE 4: KEY CHARACTERISTICS OF SMART GRID	(6L+6P)
Deman on air p Sugges Lab Exp Calcula	d-side participation- Impacts of Smart Grid on reliability- Impacts of Smart Grid pollutant emissions reduction. Conformal mapping ted Readings: A Roadmap to Tamil Nadu's Electricity Demand-Supply by 2050 periment: tion of Air Pollution Reduction after Renewable Energy Source integration	CO-4 BTL-3
MODU	LE 5: ISSUES RELATED TO SMART GRID	(6L+6P)
Commu securit ^e Sugges Lab Exp Case St	unication and sensing in a smart grid- smart grid threats-vulnerabilities-cyber y strategies. ted Readings: Smart grid Challenges periment : udy on issues related to Smart Grid	CO-5 BTL-3
BOOKS		
1.	D. S. Kirschen and G Strbac , Fundamentals of Power System Economics, .Reprint & Sons Ltd., 2017.	ed edition. John Wiley
2.	G. M. Masters, Renewable and Efficient Electric Power Systems, John Wiley & S	ons, Inc., 2014.
REFEREN	CE BOOKS	
1	S.Stoft , Power System Economics: Designing Markets for Electricity, Wiley-Interse	cience., 2013.
2	A.Mazer, Electric Power Planning for Regulated and Deregulated Markets, John V 2014.	Viley & Sons, Inc.,
E Resc	urces for Reference	
1.	https://www.smartgrid.gov/files/sg_introduction.pdf	
2.	https://www.tandfonline.com/doi/full/10.1080/15325008.2013.868558	
MOOC	1	
1.	https://www.mooc-list.com/course/smart-grids-smart-cities-towards-zero-em	nissions-future learn

Specialization 2: INTELLIGENT MOBILITY

COURSE TITLE		SELF DRIV	ING CARS		CREDITS	3
COURSE CODE	EAT51534	CA	COURSE	DE	L-T-P-S	2-0-2-2
Version	1.0	Appr	oval Details	36TH ACM	LEARNING LEVEL	BTL-3
ASSESSMEN	T SCHEME					
First Periodical Assessmen t (Theory)	Second Periodical Assessment (Theory)	Practical Assessm ents	Observation as appro Departmen Commit	n / lab records ved by the t Examination tee "DEC"	Attendance	ESE
15%	15%	10%	!	5%	5%	Theory 25% Practical 25%
Course Description	This course provide and also knowledge	es knowled on python	ge on Hardwar programming	re and Software	architecture for	self-driving cars
Course Objectives	 To demonstration To design Safe To develop Log To install and 	e on Auton ty Assuranc ngitudinal a Jtilize Pytho	omy, Hardwar e, Vehicle Dyn nd Lateral con on-Variables au	e and Software amic Modelling trol for self-driv nd Expressions	architecture for s for self-driving ca ing cars	elf-driving cars ars

		5. To develop Conditional Code- Functions- Loops and Iteration using Python.																	
		U	pon cor	npletio	n of this	course,	the stu	udents v	will be a	able to									
		1. De	emonst	rate on	Autonoi	my, Har	dware	and Sof	ftware	archite	cture f	or self-	driving c	ars					
Course		2. De	esign Sa	afety As	surance,	Vehicle	e Dynar	nic Mo	delling	for sel	f-drivin	g cars							
Outcom	nes	3. De	evelop	Longitu	dinal and	d Latera	l contro	ol for se	elf-drivi	ng car	S								
		4. In	stall an	d Utiliz	e Python	-Variab	les and	Expres	sions										
		5. De	evelop	Conditi	onal Cod	e- Func	tions- L	oops a	nd Itera	ation u	sing Py	thon.							
Prerequ	isites:	Nil																	
CO, PO	AND P	SO MA	PPING			1		1	T			1		P					
	PO	PO	PO	PΟ		PO-	PΟ	PO	PO	Ρ	ΡO	PO	PSO	PSO					
СО	-1	-2	-3	-4	PO-5	6	-7	-8	-9	0 -	-11	-12	-1	-2					
	-	-	5	-		Ŭ	,	U	5	10		12	-	-					
CO-1	2	1	2	1	-	-	2	1	-	1	2	1	2	2					
CO-2	2	2	1	1	-	-	2	1	-	2	2	1	2	1					
CO-3	1	1	2	1	-	-	1	2	-	1	2	1	1	2					
CO-4	2	1	1	2	-	-	2	1	-	1	2	1	2	1					
CO-5	1	1	1 1 1 1 2 1 - 1 2 1 1 2 1 Workburgehand 2 Madamatakurgehand 2 Ctr																
		1: Weakly related, 2: Moderately related and 3: Strongly related																	
MODUL	E 1: Au	utonomy, Hardware and Software architecture (6L+6P)																	
Introduc	ction to	1 to Self-driving car – Taxonomy of Driving - Requirements for perceptions -																	
Autonor	my- Dr	iving de	ecisions	s - Self-	Driving I	Hardwa	re and	Softwa	are Arc	hitectu	ires for	self-	со)-1					
driving	cars.												BTI	L-3					
Practice	: Intro	duction	to MA	TLAB.															
MODUL	.E 2: Sa	afety, V	ehicle	Dynam	ic Model	ling							(6L	+6P)					
Safety F	ramev	vorks f	or Self-	-Driving	g - Meth	ods for	Safety	/ Assur	ance a	nd Tes	sting -S	afety							
Assuran	ce for a	Autono	mous \	/ehicles	- Vehicle	Dynam	nic Mod	deling -	Kinema	itic Mo	deling	in 2D	cc)-2					
-Dynam	ic Mod	eling in	2D - D	ynamic	Modelin	g in 3D.		_			-		BT	L-3					
Practice	: Kiner	natic M	lodeling	and D	un a nai a N		-Dynamic Modeling in 2D - Dynamic Modeling in 3D. BTL-3												
Practice: Kinematic Modeling and Dynamic Modeling using MATLAB.																			
MODUL	.E 3: Lo	ngitudi	inal and	d Latera	al contro	/lodelin	g using	MATLA	\В .				(6L+6	5P)					
MODUL Introduc	. E 3: Lo ction to	ngitudi Dongit	inal and	d Latera Control	- Longitu	/lodeling I dinal Ve	g using hicle N	MATLA	AB. g – Intr	oducti	on to La	ateral	(6L+6	5P)					
MODUL Introduc Control	E 3: Lo ction to - Later	ngitudi Longit al Vehio	inal and udinal (cle Mod	d Latera Control deling –	- Longitu Vehicle	/lodelin; I dinal Ve - Veh	g using hicle N icle Ac	MATLA Nodelin tuation	AB. g – Intr	oducti	on to La	ateral	(6L+6 CC	5P) D-3					
MODUL Introduc Control Practice	E 3: Lo ction to - Later : Longi	ngitudi Longit al Vehio Itudinal	inal and udinal (cle Moo and La	d Latera Control deling – teral co	- Longitu - Vehicle ontrol Mo	/lodelin; I dinal Ve - Veh odelling	g using hicle N iicle Ac using f	MATLA Nodelin tuation MATLAI	AB. g – Intr I. B.	oducti	on to La	ateral	(6L+6 CC BT	5P) D-3 L-3					
MODUL Introduc Control Practice MODUL	E 3: Lo ction to - Later : Longi E 4: Pr	ngitudi b Longit al Vehio itudinal ogramr	inal and udinal (cle Moo and La ming fo	d Latera Control deling – teral co r Every	- Longitu - Vehicle ontrol Ma body (Py	Aodelin; I dinal Ve - Veh odelling rthon)	g using hicle N iicle Ac using I	MATLA Nodelin tuation MATLAI	AB. g – Intr I. B.	oducti	on to La	ateral	(6L+6 CC BT (6L+	5P) D-3 L-3 H6P)					
MODUL Introduc Control Practice MODUL Introduc	E 3: Lo ction to - Later : Longi E 4: Pr ction to	ngitudi D Longit al Vehic itudinal ogramr o pytho	inal and udinal (cle Moo and La ming fo n - Insta	d Latera Control deling – teral co r Every alling Py	- Longitu - Longitu · Vehicle ontrol Mo body (Py /thon and	Aodelin _i dinal Ve - Veh odelling rthon) d Writin	g using chicle N licle Ac using I g A Pro	MATLA Nodelin tuation MATLAI	AB. g – Intr n. B. Variabl	oducti es and	on to La	ateral	(6L+6 CC BT (6L+	5P) D-3 L-3 H6P)					
MODUL Introduc Control Practice MODUL Introduc – Writin	E 3: Lo ction to - Later : Longi E 4: Pr ction to g pythe	ngitudi D Longit al Vehio tudinal ogram o pytho on prog	inal and udinal (cle Moc and La ming fo n - Insta gram fo	d Latera Control deling – teral co r Every alling Ργ r given	- Longitu - Longitu · Vehicle ontrol Mo body (Py /thon and expressio	Aodelin dinal Ve - Veh odelling rthon) d Writin on - Der	g using hicle M icle Ac using I g A Pro monstra	MATLA Nodelin tuation MATLAI ogram - ation o	AB. g – Intr I. B. Variabl f "Hello	oducti es and World	on to La Expres	ateral	(6L+6 CC BT (6L+	5P) D-3 L-3 +6P)					
MODUL Introduc Control Practice MODUL Introduc – Writin Practice	E 3: Lo ction to - Latera :: Longi E 4: Pr ction to g pythe e: writi	ngitudi b Longit al Vehid itudinal ogramr o pytho on prog ng prog	inal and udinal (cle Moc and La ming fo n - Insta gram fo gramme	d Latera Control deling – teral co r Every alling Py r given e using	Al contro - Longitu - Vehicle patrol Ma body (Py /thon and expression PYTHON	Aodelin dinal Ve - Veh odelling rthon) d Writin on - Der	g using chicle M iicle Ac using I g A Pro monstra	MATLA Nodelin tuation MATLAI ogram - ation o	AB. g – Intr I. B. Variabl f "Hello	oducti es and World	on to La Expres J".	ateral	(6L+6 CC BT (6L+	5P) D-3 L-3 +6P) D-4 L-3					
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COURSE	TITLE	P	POSE ESTIMATION AND STATE ESTIMATION OF SELF DRIVING CARS CREDITS 3												
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ASSESSN	IENT SC	CHEME													
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Cour Descrip	se tion	This from	This course provides knowledge on Position and orientation Estimation, Pose Estimation rom LIDAR Data, RADAR Data, GNSS/INS and Camera and computer vision												
Course Objective	25	1. 1 2. 1 3. 1 4. 1 5. 1	To unde To utiliz To const To deve To demo	erstand e the Po truct th lop Pos onstrate	the con ose Esti e Pose e Estim e the co	ncept of mation Estimat ation fr oncept o	Positio from L ion froi om GN of Came	in and c IDAR Da m RADA SS/INS era and	orientat ata AR Data compu	ion Es ter vis	timation ion				
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CO-4	2	2	1	2	-	2	1	2	2	2	1	2	2	1	
CO-5	2	1	1	2	1	-	-	1	-	1	1	1	1	2	
		1:	Weakl	y relate	ed, 2: M	loderat	ely rela	ted and	d 3: Stro	ongly	related				
MODULE	1: Posi	tion an	d orien	tation I	Estimat	ion							(61	.+6P)	

Introdu method Gradien	ction to Position and orientation Estimation – Methodology – Compute Jacobian – compute M Matrix method – Gauss Newton method – angle from quaternion – t descent – kalman Filter - error-state extended Kalman filter.	CO-1 BTL-2
MODUL	E 2: LIDAR Sensor Models and Point Clouds	(6L+6P)
LIDAR S 3D & 2 iterative acquire <i>Practice</i> <i>Box</i>	ensor -Pose (position and orientation) Estimation from LIDAR Data - Point Clouds – D Point Clouds - inverse and forward sensor models for a basic scanning LIDAR - e closest point (ICP) algorithm - problem of motion distortion can affect LIDAR scans d from a moving vehicle. e- Design perception system using LIDAR Sensor in MATLAB Automated Driving Tool	CO-2 BTL-3
MODUL	E 3: Pose Estimation from RADAR Data	(6L+6P)
RADAR plannin Practic Box	Sensor - Sensor Models - Pose Estimation from RADAR Data – localization – path g – decision making e- Design perception system using RADAR Sensor in MATLAB Automated Driving Tool	CO-3 BTL-3
MODUL	E 4: IMU for Pose Estimation	(6L+6P)
IMU- S equatic context <i>Practic</i> <i>Box</i>	ensor Models - Pose Estimation from IMU - coordinate acceleration - fundamental on of inertial navigation - gyroscope and accelerometer measurement models in the of navigation e - Design perception system using IMU Sensor in MATLAB Automated Driving Tool	CO-4 BTL-3
MODUL	E 5: Camera and computer vision - Pose Estimation methods	(6L+6P)
-		
Comput pinhole segmen Practice Box	<i>camera</i> model - intrinsic and extrinsic <i>camera</i> calibration - tracking, and semantic tation for drivable surface <i>estimation</i> <i>e</i> - Design perception system using Camera Sensor in MATLAB Automated Driving Tool	CO-5 BTL-3
Comput pinhole segmen Practice Box TEXT BC	<i>camera</i> model - intrinsic and extrinsic <i>camera</i> calibration - tracking, and semantic tation for drivable surface <i>estimation</i> <i>e</i> - Design perception system using Camera Sensor in MATLAB Automated Driving Tool	CO-5 BTL-3
Comput pinhole segmen Practice Box TEXT BC 1.	<i>camera</i> model - intrinsic and extrinsic <i>camera</i> calibration - tracking, and semantic tation for drivable surface <i>estimation</i> <i>e-</i> Design perception system using Camera Sensor in MATLAB Automated Driving Tool DOKS <u>Paul F. McManamon</u> , LiDAR Technologies and Systems, SPIE Publications, 2019	CO-5 BTL-3
Comput pinhole segmen Practice Box TEXT BC 1.	Paul F. McManamon, LiDAR Technologies and Systems, SPIE Publications, 2019 Changzhan Gu, Short-Range Micro-Motion Sensing with Radar Technology, IET, 201	CO-5 BTL-3 9.
Comput pinhole segmen Practice Box TEXT BC 1. 2. 3.	 Vision, Estimation, Random Sample Consensus (Ransac), Geometry - camera model - intrinsic and extrinsic camera calibration - tracking, and semantic tation for drivable surface estimation Design perception system using Camera Sensor in MATLAB Automated Driving Tool DOKS Paul F. McManamon, LiDAR Technologies and Systems, SPIE Publications, 2019 Changzhan Gu, Short-Range Micro-Motion Sensing with Radar Technology, IET, 201 Himanshu Prakash Jain, Anbumani Subramanian "Real-Time Upper-Body Human F Using a Depth Camera" Research Article. 	CO-5 BTL-3 9. Pose Estimation
Comput pinhole segmen Practice Box TEXT BC 1. 2. 3. REFERE	 Vision, Estimation, Random Sample Consensus (Ransac), Geometry - camera model - intrinsic and extrinsic camera calibration - tracking, and semantic tation for drivable surface estimation Design perception system using Camera Sensor in MATLAB Automated Driving Tool DOKS Paul F. McManamon, LiDAR Technologies and Systems, SPIE Publications, 2019 Changzhan Gu, Short-Range Micro-Motion Sensing with Radar Technology, IET, 201 Himanshu Prakash Jain, Anbumani Subramanian "Real-Time Upper-Body Human F Using a Depth Camera" Research Article. NCE BOOKS 	CO-5 BTL-3 9. Pose Estimation
Comput pinhole segmen Practice Box TEXT BC 1. 2. 3. REFERE	 Vision, Estimation, Random Sample Consensus (Ransac), Geometry - camera model - intrinsic and extrinsic camera calibration - tracking, and semantic tation for drivable surface estimation Design perception system using Camera Sensor in MATLAB Automated Driving Tool Paul F. McManamon, LiDAR Technologies and Systems, SPIE Publications, 2019 <u>Changzhan Gu</u>, Short-Range Micro-Motion Sensing with Radar Technology, IET, 201 Himanshu Prakash Jain, Anbumani Subramanian "Real-Time Upper-Body Human F Using a Depth Camera" Research Article. NCE BOOKS Christian Wöhler "3D Computer Vision: Efficient Methods and Applications X. me 2012. 	CO-5 BTL-3 9. Pose Estimation edia publishing,

Specialization 3: ENGINE AND VEHICLE TECHNOLOGY

COURS TITLE	E		v	IBRAT							CREDIT	rs		3		
COURS CODE	E	EATS	51536	COU CAT	IRSE EGORY	,		DE	E		L-T-P-S			2-0-2-	-2	
Versior	ı	1	.0	App Deta	roval ails			36 [™] A	СМ		LEARN LEVEL	ING		BTL-3	3	
ASSESS	MENT	SCHEN	1E													
						CIA										
Firs Perioc Assessi (Theo	First Second Practical riodical Periodical Assessments essment Assessment heory) (Theory)						records as approved by the Department Atter Examination Committee "DEC"					idance		ESE		
														heory	25%	
15%	5% 15% 10%							5%	6		5	%	Pr	actical	25%	
Cour	se	The students shall develop a basic understanding on automotive vibration ar										and its	contro	ol and		
Descrip	otion	apply	ipply on real example cases.													
Course Objecti Course Outcon	ive	 apply on real example cases. 1. To familiarize on various types of vibration with damping and without damping 2. To develop numerical methods for noise analysis 3. To demonstrate various types of noise and it's measurement and analysis techniques. 4. To identify various sources of noise from automobiles 5. To design various noise controlling techniques Upon completion of this course, the students will be able to 1. Familiarize on various types of vibration with and without damping effects 2. Develop and analyze numerical methods for noise analysis 3. Demonstrate various types of noise and it's measurement and analysis techniques 														
		4. lo 5. D	dentify Design v	variou: arious	s sourc noise o	es of n control	oise fro ling tec	m auto hnique	omobile s	es						
Prereq	uisite :	Design	of Mad	hine e	lemen	ts & Ba	isics of <i>i</i>	Acoust	ics							
CO, PO	AND F	SO MA	PPING		1	T	1		T	I	I	1		T	T	
со	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PSO	PSO	PSO	
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CO-2	2	2	2	3	3	-	-	-	-	-	1	2	2	2	2	
CO-3	3	2	1	2	1	-	-	-	-	-	2	3	3	2	3	
CO-4	2	1	2	3	3	-	-	-	-	-	1	2	2	1	2	
CO-5	3	1	3	3	2	-	-	-	-	-	1	3	2	3	3	
			1: Wea	akly re	lated, 2	2: Mod	lerately	relate	d and 3	B: Stro	ngly rel	ated				
MODU	LE 1: IN	NTROD	UCTION	TO VI	BRATI	ON								(6L+6	P)	
Single o modeli transm	degree ng an issibilit	e of free d simu ty, vibra	edom, 1 Ilation ation ab	wo de studie sorber	egree o es, mo r. Two o	of freed del o degree	dom, fr f an a of free	ee, for utomo dom sy	ced an bile, r vstem. l	d dam nagnifi Modal	ped vik ication analysi	factor s.	5	CO-1 BTL-3	3	
MODU	LE 2: N	IUMERI	CAL M	THOD	S									(6L+6	P)	
Approx Rayleig	Approximate methods for determining fundamental frequency, Dunkerleys lower bound, Rayleighs upper bound, Holzer method for closed coupled system and branched system. CO-2 BTL-3															
MODU	LE 3: V	IBRATI	ON CO	NTROL	TECHN	IIQUES	;							(6L+6	P)	

Vibration applicatio modal and	isolation, tuned absorbers, untuned viscous dampers, damping treatments, n dynamic forces generated by IC engines, engine isolation, crank shaft damping, alysis of the mass elastic model shock absorbers.	CO-3 BTL-3
MODULE	4: AUTOMOTIVE NOISE SOURCES	(6L+6P)
Noise Cha noise, ass engine ac brake nois	aracteristics of engines, engine overall noise levels, assessment of combustion essment of mechanical noise, engine radiated noise, intake and exhaust noise, cessory contributed noise, transmission noise, aerodynamic noise, tyre noise, se.	CO-4 BTL-3
MODULE	5: NOISE CONTROL TECHNIQUES	(6L+6P)
Methods analysis, g in enclos Measurer Sound abs coefficien	for control of engine noise, combustion noise, mechanical noise, predictive palliative treatments and enclosures, automotive noise control principles, sound sures, sound energy absorption, sound transmission through barriers. nent of noise, Acoustic Chambers, Anechoic Chamber, Reverberation chamber, sorbing materials, Sound Absorption and Reflection Coefficients, Noise reduction t, Methods of industrial noise control.	CO-5 BTL-3
BOOKS		
1.	Grover G.K. "Mechanical Vibrations" Nem Chand & Brothers, 2 nd edition, 2007.	
2.	Ambekar A.G. "Mechanical Vibrations and Noise Engineering" Prentice-Hall of 2^{nd} edition, 2006.	India, New-Delhi,
REFERENCE	BOOKS	
1	Liou L.W. and Liou F.W., "Rapid Prototyping and Engineering applications: A tool prototype development", CRC Press, 2010.	box for
2	Kamrani A.K. and Nasr E.A., "Rapid Prototyping: Theory and practice", Springer, 2	2010.
3	Thomson W.T "Theory of Vibration with Application" CBS Publishers & Distriburc edition, 1990.	ors, Delhi, 3 rd
4	Pujara K. "Vibration & Noise for Engineers", Dhanpat Rai & Sons, Delhi, 2nd editi	on, 1992.
E Resour	ces for Reference	
1.	https://www.pdhonline.com/courses/m104/m104.htm	
2.	www.springer.com/gp/book/9780857295637	
1	https://archive.pptel.ac.in/courses/112/106/112106225/	
2	https://www.mooc-list.com/course/introduction-advanced-vibrations-coursera	
<u> </u>		

COURSE TITLE	F	UEL CELL TECHNO	DLOGY	CREDITS	3
COURSE CODE	EAT51537	COURSE CATEGORY	DE	L-T-P-S	2-0-2-2
Version	1.0	Approval Details	36 [™] ACM	LEARNING LEVEL	BTL-3
ASSESSMENT	SCHEME				
		CIA			
First Periodical Assessmen t (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance	ESE
15%	15%	10%	5%	5%	Theory 25%

												Р	ractical	25%	
Course															
Descript	ion	The stud	lents sh	all deve	elop a b	asic un	derstan	ding or	n workir	ng of fu	el cell a	nd its a	pplicati	ons.	
Course		1. Top	oresent	in-dep	th knov	vledge	of fuel o	ell tech	nology						
Objectiv	e	2. To a	address	the un	derlyin	g conce	pts, me	thods a	and app	lication	of fuel	cell teo	hnolog	у	
Course Outcome	e	Upon co 1. Disc 2. Ider 3. Inte 4. Gain 5. Ana	mpletic cuss on ntify the erpret a n know alyze an	on of th various e Fuel C bout th ledge a d comp	is cours s types Cells for ne vario bout th parative	se, the s of Fuel autom us fuel e differ study o	student: Cells, it: otive ap cell con rent typ of fuel c	s will be s constr oplication oponen es of fu cells wit	e able to ruction ons. ts & its els useo h other	o & work perforr d in Fue types o	ing prin mance c el Cells. of alterr	ciples. haracte nate fue	eristics. els		
Prerequisite : Nil															
CO, PO AND PSO MAPPING															
0	PO- PO-														
	1	2	3	4	5	6	7	8	9	10	11	12	-1	-2	
CO-1	3	1	2	3	-	3	3	-	-	-	2	3	3	1	
CO-2	2	2	2 2 3 - 2 3 1 2 2 2												
CO-3	3	2	2 1 3 1 2 3 3 1												
CO-4	2	1	<u>1 2 3 2 2 3 - </u>												
CO-5	3 1 3 2 3 3 - - 1 3 2 3 1. Weekky related 2: Medewidely related and 2: Strength weekted														
MODULE	1 · CI			ly relat	ea, 2: N	lodera	tely rela	ated an	a 3: Str	ongiy r	elated		(6)	τ CD)	
	tion -	working	and typ	es of fu	el cell -	Polyme	r Flectr	olvte M	lemhrai	ne (PFN	A) Fuel	[(01	TUP	
Cells Dir	ect M	lethanol	Fuel Ce	ells Ph	osnhori	c Acid	Fuel Ce	olls Mo	lten Ca	rbonat	e Fuel				
Cells, Sol	id Ox	ide Fuel	Cells, R	egener	ative Fi	uel Cell	s Alkalii	ne Fuel	Cells -	low, m	edium		CO-1		
and high	temp	erature f	uel cell	, Liquid	and me	ethanol	types, I	Proton	exchang	ge mem	brane		BTL-3		
fuel cell s	solid c	oxide, Hy	drogen	fuel cel	ls - The	rmodyr	namics a	and eleo	ctroche	mical ki	inetics				
of fuel ce	ells.														
MODULE	2: Fl	JEL CELLS	S FOR A	UTOM	OTIVE A	APPLIC/	ATIONS						(6L+	-6P)	
Fuel cells	for a	utomotiv	/e appli	cations	- Techr	nology a	advance	s in fue	l cell ve	hicle sy	stems		CO-2		
– Onboa	rd hy	drogen :	storage	- Liqu	id hydr	ogen a	ind con	npresse	d hydro	ogen -	Metal		BTL-3		
nyarides	, Fuel	cell cont		em - Al	kaline f		- Koad	map to	market				101	(D)	
	: 3: FU		colvip							AINCE	nowor		(6L+	68)	
density	ohmi	r resista	nco Ki	netic n	erform		lage, vi Aass tr	nofor	offorts	.y anu - Mom	brane		CO-3		
electrode	- asse	mbly cor	nnoner	nts Fue	l cell st;	ark Bi-i	nolar nl	ate Hu	midifier	s and c	ooling		BTI-3		
plates.		,		,			· · · · ·	,							
MODULE	E 4: Fl	JELLING											(6L+	·6P)	
Hydroge	n stoi	rage tech	nnology	- Pres	sure cy	linders,	, Liquid	hydrog	gen, Me	etal hyd	drides,		<u> </u>		
Carbon f	ibers-	Reforme	er techr	ology -	Steam	reform	ing, Par	tial oxi	dation,	Auto th	nermal		RTI-3		
reformin	g - CC) remova	l, Fuel d	cell tech	nnology	based	on rem	oval like	e bio-m	ass.					
MODULE	5: Fl	JEL CYCL	E ANAL	YSIS									(6L+	6P)	
Introduc	tion 1	to fuel c	ycle ar	nalysis	- Appli	cation	to fuel	cell ar	nd othe	er com	peting		CO-5		
technolo	gies	like batt	ery po loctric	wered	venicie	is, si e	ingine	uelea	by nat	urai ga	s and		BTL-3		
BOOKS	i allu	TIYDITU E		enicie.											
1.	Fue	el Cells fo	or auto	motive	applica	tions –	· profes	sional e	enginee	ring pu	ıblishing	g UK. IS	BN 1-8	86058	
4233, 2004.															
2. Fuel Cell Technology Handbook SAE International Gregor Hoogers CRC Press ISBN, 2003.															
1	0'H	ayre, R.P	.,S. Cha	n, W. Co	olella, F.	.B.Prinz	, Fuel C	ell Fund	ament	als, Wil	ey, NY (2006).			
2	Bas	u,S.(Ed) F	-uel Cel	I Scienc	ce and T	echnol	ogy,Spr	inger, N	N.Y.(200)/).					
3	LIU,	н.,Princi	pies of	tuel ce	us, Tayl	or & Fra	ancıs, N	.Y. (200	ю).						

MOOC	
1.	https://archive.nptel.ac.in/courses/103/102/103102015/
2.	https://www.udemy.com/course/hydrogen-powered-fuel-cell-electric-vehicle/

Specialization 4: DESIGN AND MANUFACTURING

	SE	COMPUTATIONAL FLUID DYNAMICS									CREDITS	5		3	
COUR CODE	SE	EAT51538			COURSE CATEGORY				DE		L-T-P-S		2-0)-2-2	
VERSI	ION	N 1.0			APPROVAL DETAILS				36 TH	АСМ	LEARNING LEVEL BTL			L-5	
ASSES	SMENT	SCHEI	ME				-								
First Perioc Assess	dical sment	Second Periodical Assessment			Practio Assess	Observatio ctical records a essments by the Examinatio Committee			on / s appr Depart on e "DEC'	lab oved ment ,	Attenda	ance	ESE		
													Theory 25%		
15%		15%			10%		5%				5%		Prac 25	Practical 25%	
Cours Descri	e iption	This is Stude techn	This is an introductory course in CFD. In this course, students will be exposed to basics of CFD. Students will gain knowledge on FD/ FV strategy, formulation of the problem and solution technique												
CourseTo provide brief introduction of Computational Fluid Dynamics and application specObjectivesanalysis of fluid mechanics and heat transfer related problems.											ifically,				
Cours Outco	ie Imes	 To understand the underlying theoretical basics of CFD. Use Finite Difference and Finite Volume methods To Illustrate various discretization techniques used to solve PDE. To Apply linearization techniques, boundary conditions, direct and iterative approaches To develop a foundation for understanding the different finite volume numerical schemes for structured and unstructured grids, boundary and initial conditions, linear algebraic and differential algebraic equations solvers To understand the underlying complex phenomenon in turbulent flows and modelling approaches. 													
Prerec	uisites	: Basic	course	on Flui	d Mecha	anics, Tł	nermo	dynami	cs and	Numeri	cal Meth	nods			
СО, РС) and f	PSO MA	APPING		1			T	T	r	1	1			
COs	PO1	PO2	PO3	PO4	PO5	PO6	P07	P08	PO9	PO10	РО 11	РО 12	PSO1	PSO2	
CO-1	3	3	2	3	2	2	2	2	2	3	3	3	3	3	
CO-2	3	3	2	2	2	2	2	2	2	2	2	2	3	3	
CO-3	2	2	3	3	3	1	3	2	1	1	1	2	3	3	
CO-4	1	2	1	3	2	3	1	2	2	2	1	2	3	3	
CO-5	2	3	3	3	3	3	2	2	2	2	2	2	3	3	
1 - Weakly Correlated, 2 - Moderately Correlated and 3 - Strongly Correlated															
Module 1 – Introduction and Governing Equations													(6L+6P)		
Principles of Conservation: Continuity Equation, Navier Stokes Equation, Energy Equation and General Structure of Conservation Equations, Classification Partial differential equations- Parabolic, Hyperbolic and Elliptic equation and Physical Behaviour. LAB: Perform geometry modeling for simple fluid flow problems.												CO-1 BTL-3			
Modu	le 2 – Fi	undam	entals	of Disc	retizatio	n							(6L+6P)		
Finit and Impl Accu LAB- gene	te Element Method, Finite Difference and Finite Volume Method, Consistency, Stability Convergence. 1-D Steady State Diffusion Problems- Source term linearization, ementation of boundary conditions Convergence, Consistency, Error and Stability, aracy, Boundary conditions, CFD model formulation. 2D/3D geometry creation; Structured mesh generation; Unstructured mesh eration	CO-2 BTL-3													
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Mod	ule 3 – Finite Volume Method	(6L+6P)													
1-D Finit Upw conv conv and	unsteady state diffusion problems: implicit, fully explicit and Crank-Nicholson scheme. e volume discretization of convection-diffusion problem. Central difference scheme, rind scheme, Exponential scheme and Hybrid scheme, Power law scheme, Generalized vection-diffusion formulation, Finite volume discretization of two-dimensional vection-diffusion problem. The concept of false diffusion, QUICK scheme, TVD schemes flux limiter functions.	CO-3 BTL-4													
LAB	- Develop different types of mesh suited for the accurate capturing of flow field														
Mod	ule 4 – Solution Algorithms	(6L+6P)													
Discretization schemes for pressure, momentum and energy equations - Explicit and implicit Schemes, First order upwind scheme, second order upwind scheme, QUICK scheme, Algorithm-SIMPLE, SIMPLER and PISO, pressure-velocity coupling algorithms, velocity- stream function approach, solution of Navier-Stokes equations															
Mod	(6I +6P)														
Deal	and of Tankalance Flours - Origin of tankalance impactation three disconcised														
Back moti ener tech Mod wake bour simu mod LAB-	CO-5 BTL-5														
TEXT	BOOKS														
1.	Versteeg, H.K., and Malalasekara, W, "An Introduction to Computational Fluid Dynam Volume Method, 2007.	ics", The Finite													
2.	Muralidhar, K., and Sundararajan T. Computational Fluid Flow and Heat Transfer, Nar House (1995).	osa Publishing.													
3	Patankar, S.V., "Numerical Heat Transfer and Fluid Flow", Hemisphere Publishing Corpo	ration, 1980.													
REFE	RENCE BOOKS														
1.	Anderson J.D. Computational Fluid Dynamics, Mc-Graw Hills (1995).														
2.	J H Ferziger and M Peric, Computational Methods for Fluid Dynamics, Springer (2002)														
F BO	UKS Anderson D.A. Tannahill I.C. and Platcher P.H. (1997) Computational Fluid Mask	anics and Heat													
1.	Transfer, Taylor & Francis	anits and fiedt													
2.	Pope, S.B., 2003, Turbulent Flows, Cambridge University Press. ISBN: 0-521-59886-9.														
	JL https://pptol.ac.in/courses/112105045														
<u> </u>	https://www.coursera.org/lecture/modeling_cimulation_natural_processes/computation	nal-fluid-													
2.	dynamics-overview-jTjAc	mar nulu-													
3.	https://archive.nptel.ac.in/courses/112/106/112106294/														

COU TIT	RSE LE		LEAN	ΜΑΝΙ	JFACTU	IRING A	ND SIX	SIGMA		CR	EDITS		3		
COU CO	JRSE DE	E	AT515	39	CO CATE	URSE EGORY		DE		Ŀ	T-P-S		2-0-2	-2	
VERS	SION		1.0		APPI DE1	ROVAL FAILS		36 [™] AC	M	LEA L	RNING EVEL		BTL-	3	
ASSES	SMENT	SCHEN	ΛE												
First Period Assess	lical sment	Seco Perio Asses	nd dical ssment	Pra Ass	ictical sessmei	nts	Obser recor appro Depa Exam Com	rvation ds oved l rtment ination mittee '	/ lab as by the "DEC"	Atte	ndance	1	End Semester Examination		
15	5%		15%		10%	,)		5%			5%		Theory Practical	25% 25%	
Cou Descri	Course This is course defines the requirement of the process monitoring, improvement and sustainable development. With respect to the industry and application the respective methods from the six sigma can be applied to obtain the continual improvement and sustainment.									nt and pective nt and					
Course Objectives		1. T 2. T 3. T 4. T 5. T 5. T Upor	 To analyze the process through the tools and techniques of six sigma and teah To analyze the process through the tools and techniques of six sigma for the various applications. To apply the methodologies for the processes and to evaluate the results To analyze the challenges in the implementation to the suppliers and the stake holders – six sigma method To demonstrate the effectiveness of the continuous improvement in various types of process. Upon completion of this course, the students will be able to 												
Course Outco	e mes	 Apply the method of six signals in the respective processes Create the techniques for the application for the effective implementation Analyze the specific methodology with respect to the industry and application Evaluate the limitations and the methods for overcoming the challenges in the process Create the continual improvement in the applications and the respective processes 										cesses. ses			
Prereq	uisites:	Nil	-												
CO, PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO1	PSO2	
CO-1	3	3	3	3	2	2	2	2	2	2	1	1	3	3	
CO-2	3	3	3	3	2	2	2	2	2	2	1	1	3	3	
CO-3	3	3	3	3	2	2	2	2	2	2	1	1	3	3	
CO-4	3	3	3	3	2	2	2	2	2	2	1	1	3	3	
CO-5	3	3	3	3	2	2	2	2	2	2	1	1	3	3	
		1 - W	eakly C	orrelat	.ed, 2 -	Modera	tely Co	rrelated	d and 3	- Strong	ly Corr	elated			
Modul	e 1 – In	troduc	tion to	six sigr	na met	hods an	d lean	manufa	acturing	8			(6L+	⊦6P)	
Histor manuf change Cost of	ical Ove facturin es – six f Poor (erview g and sigma o Quality	– Defir six sign capabili (COPQ)	nition o na- six ty – six , Cost o	of qualit sigma sigma sigma of Doing	ty – Wha and pro need as g Nothin	at is six ocess to sessme og – ass	c sigma oleranc ents - in essmen	-TQM a e – Six nplication nt quest	and Six sigma ons of q ions.	sigma - and cu uality le	lean Itural evels,	CC BT)-1 L-3	
Modul	e 2 – T	ools an	d Tech	niques	Include	ed							(6L+	+6P)	
Tools – Tools and ef Measu SWOT, innova	Module 2 – Tools and Techniques Included(6L+6P)Tools for definition – IPO diagram, SIPOC diagram, Flow diagram, CTQ Tree, Project Charter – Tools for measurement – Check sheets, Histograms, Run Charts, Scatter Diagrams, Cause and effect diagram, Pareto charts, Control charts, Flow process charts, Process Capability Measurement, Tools for analysis – Process Mapping, Regression analysis, RU/CS analysis, SWOT, PESTLE, Five Whys, interrelationship diagram, overall equipment effectiveness, TRIZCO-2 BTL-3														

techi for c	nique, SMED, 5S, mistake proofing, Value stream Mapping, forced field analysis – Tools ontrol – Gantt chart, Activity network diagram, Radar chart, PDCA cycle, Milestone							
Mod	ule 3 –Methodology of Six Sigma	(6L+6P)						
Desi (FME leade Stake	Design For Six Sigma (DFSS), Design For Six Sigma Method - Failure Mode Effect Analysis (FMEA), FMEA process - Risk Priority Number (RPN)- Six Sigma and Leadership, committed leadership - Change Acceleration Process (CAP)- Developing communication plan - Stakeholder.CO-3 BTL-3							
Mod	(6L+6P)							
Tool Func leade and t vs six metr	s for implementation – Supplier Input Process Output Customer (SIPOC) – Quality tion Deployment or House of Quality (QFD) – alternative approach –implementation – ership training, close communication system, project selection – project management team – champion training – customer quality index – challenges – program failure, CPQ sigma, structure the deployment of six sigma – cultural challenge – customer/internal ics.	CO-4 BTL-3						
Mod	ule 5 – Validation of the method and further scope of improvement	(6L+6P)						
Evalu poor focus proce – Kaiz	ation strategy – the economics of six sigma quality, Return on six Sigma (ROSS), ROI, project estimates – continuous improvement – lean manufacturing – value, customer, Perfection, focus on waste, overproduction – waiting, inventory in process (IIP), essing waste, transportation, motion, making defective products, underutilizing people zen – 5S.	CO-5 BTL-4						
TEXT	BOOKS							
1.	Michael L.George, David Rownalds, Bill Kastle, What is Lean Six Sigma, McGraw – Hill 2	003						
2.	Thomas Pyzdek, The Six Sigma Handbook, McGraw-Hill,2000							
1	Fred Soleimanneied Six Sigma Basic Stens and Implementation Author House 2004							
2.	1. Fred Soleimannejed , Six Sigma, Basic Steps and Implementation, Author House, 2004 2. Forrest W. Breyfogle, III, James M. Cupello, Becki Meadows, Managing Six Sigma: A Practical Guide to Understanding, Assessing, and Implementing the Strategy That Yields Bottom-Line Success, John Wiley & Sons, 2000							
E BOO	DKS							
1.	https://leanmanufacturingpdf.com/downloads/lean-manufacturing-pdf-list/							
2.	https://cdn2.hubspot.net/hubfs/3418759/Worximity_Lean_Manufacturing_ebook.pd	f						
3.	nttp://www.advice-manufacturing.com/Lean-Manufacturing-eBook.html							
1	https://onlinecourses.nntel.ac.in/noc22_ce/19/preview							
2.	https://onlinecourses.nptel.ac.in/noc20_get9/preview							
3.	https://archive.nptel.ac.in/courses/110/105/110105123/							

NON DEPARTMENT ELECTIVES

Semester-IV

COURSE TITLE	AUTOMOT	TIVE VEHICLE TE	CREDITS	3					
COURSE CODE	EAT51700	COURSE CATEGORY	NE	L-T-P-S	2-0-2-2				
VERSION	1.0	APPROVAL DETAILS	36 [™] ACM	LEARNING LEVEL	BTL-3				
ASSESSMENT	ASSESSMENT SCHEME								

Fir Perio Assess	st dical ment	Second Prace al Periodical Asse nt Assessment					Ob ap I Coi	servati record proved Depart Examin mmitte	on / lak ls as l by the ment ation e "DEC	Atte	endance		ESE		
15	%		15%		1	0%		5%	,)		5%		Theory	25%	
		Thic c		arrato	- tho ha	sic fund	tions	classific	ation a	nd pract	ical dom	I	Practical	25%	
Cou Descri	rse ption	the di Drive Also,	ifferent ine sys the fut	tems, s ure sco	e sub sy teering pe in th	/stems , brakin ie mode	like cla g and si ern veh	ssificati uspensi icle tec	ion of t ion syst hnolog	ransport ems for ies.	: vehicle, passenge	autor autor	notive e ty and co	ngines, omfort.	
Course Objectives1. To Familiarize various types of Automobiles and Nomenclature 2. To Understand the Working Principles of Automotive Engines at system. 3. To Know the Working Principles of various components of drive line 4. To Understand the need of safety and comfort system for automobile 5. To Understand the new technologies to meet the future challenges.								nd its an system. les.	uxiliary						
Course Outcoi	Upon completion of this course, the students will be able to1. Familiarize various types of Automobiles and Nomenclature2. Understand the Working Principles of Automotive Engines and its auxiliary system3. Know the Working Principles of various components of drive line system.4. Understand the need of safety and comfort system for automobiles.5. Understand the new technologies to meet the future challenges.							ystem.							
Prereq	uisites:	Nil													
СО, РО		SO MA	PPING								PO	PO			
COs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	11	12	PSO1	PSO2	
CO-1	3	2	-	-	3	2	3	2	3	2	-	-	3	3	
CO-2	3	2	-	-	3	2	2	2	3	2	-	-	3	3	
CO-3	3	2	-	-	3	2	3	2	3	2	-	-	2	2	
CO-4	3	े २	-	-	<u> </u>	2	े २	2	3	2	-	-	<u> </u>	<u></u> २	
	5	1 - W	'eakly (Correlat	ed. 2 -	Modera	ately Co	prrelate	ed and 3	3 - Stron	glv Corre	lated	5	5	
Modul	e 1 – IN	TRODU	JCTION]	,		,				57		(6L+	-6P)	
Evolut	ion- Cla	assificat	ion of	Automo	obile - (General	Layout	of Aut	omobil	e- Chass	is and		•		
Frame	- Mater	ials.													
Practio	cal:														
1. S	Study a vehicle	nd mea	isurem	ent of t	he chas	ssis fran	nes: He	avy du	ty vehio	cle & Ligi	nt duty		CC BT)-1 L-3	
Sugges	ted Re	ading:													
https:/	/araiind	lia.com	/hmr/(Control	/AIS/11	292016	<u>510224</u>	4AMAIS	S_053.F	<u>PDF</u>					
Modul	e 2 – EN	IGINE /	AND AL	JXILIAR	Y SYST	EMS							(6L+	-6P)	
Engine	es-Class	ificatio	n and N	lomend	latures	- Comp	ression	lgnitio	n Engir	nes and S	park Ign	ition			
Engine – CRDI Practio 1. Di	Engines - Injection and Ignition System- Cooling and Lubrication System - Latest Technology - CRDI, GDI, VVT and Dual Fuel Engines Practical: 1. Dismantling, Study and Assembling of Single cylinder and Multi Cylinder SI Engine							D-2 'L-3							
2. Di	smantl	ing, Sti	idy and	Assem	ioling o	i single	cylinde	er and l	viulti Cy	nnaer C	i Engine			6-)	
Modul	e 3 – DI	RIVELIN	IE SYST	EMS									(6L+	-6P)	

Clut Slip	tch – Types and Construction – Gear Boxes- Manual and Automatic –Propeller shaft – Joint – Universal Joints – Differential and Rear Axle- Automatic Transmission, CVT and						
rece	ent developments.	CO 3					
Prac	tical:	BTI -3					
1.	Dismantle, study and assembling of various clutch assemblies						
2.	Dismantle, study and assembling of various gear boxes and transfer case						
3.	Dismantle, study and assembling of various joints and propeller shafts.						
Мос	ule 4 – SAFETY AND COMFORT SYSTEM	(6L+6P)					
Bra of st - Air							
Prac	tical:	CO-4 BTL-3					
1.	Dismantle study and assemble of various Steering systems.						
2.	Dismantle, study and assemble of various Braking systems – including ABS						
3.	Dismantle, study and assembling of dependent and independent suspension systems						
Мос	ule 5 –FUTURE TRENDS IN AUTOMOTIVE FUELS	(6L+6P)					
Fut	ure Fuels- Biomass- Alcohols - Hydrogen - Fuel cells- Electric and Hybrid						
Veh	icles						
Prac	tical:						
1.	Port timing and Valve timing Diagram	CO-5					
2.	Performance test on SI Engine	BIL-3					
3	Performance test on C Engine						
0.							
TEV	T BOOKS						
1	Sethi H M. Automobile Technology, Tata McGraw-Hill-2013						
2	Kirnal Singh Automobile Engineering Vol 1& 2 Standard Publishers New Delhi 2012						
3	Ioseph Heitner Automotive Mechanics 2 nd edition East-West Press						
REFE							
1	Crouse and Anglin, Automotive Mechanism, 9th Edition. Tata McGraw-Hill.						
2	Newton, Steeds and Garet, Motor vehicles, Butterworth Publishers.						
3	3 Srinivasan.S., Automotive Mechanics, 2nd edition, Tata McGraw-Hill, 2013.						
4	4 K.K. Ramalingam, Internal Combustion Engines, Sci-Tech Publications, 2015.						
E BO	OKS						
1	https://www.sae.org/publications/books/content/bosch10/						
2	https://easyengineering.net/internal-combustion-engines-by-v-ganesan/						
MO	DC						
1	https://nptel.ac.in/courses/112103262/						

COURSE TITLE	ELEMEN	ITS OF	MOTORSPO	DRT ENGINEERING	CREDITS	3
COURSE CODE	EAT51701		COURSE CATEGO RY	NE	L-T-P-S	2-0-2-2
VERSION	1.0		APPROV AL DETAILS	36 TH ACM	LEARNING LEVEL	BTL-2
ASSESSMEN	T SCHEME					
First Periodical	Second Periodical Assessment	Practical Assessments		Observation / lab records as approved by the Department	Attendanc e	End Semester Examination

Assessi t	men					Examination Committee "DEC"								
15%	6		15%		10%			5%			5%		Theory	/ 25%
	-	This (aims t	o provide vo	u with		nd und	erstand	ling of	the fur	dam	Practica ental sci	al 25%
Cour	se	engin	eering	and r	nanagerial p	rinciple	s invo	lved ir	n moto	rsport,	and th	ieir ii	npleme	ntation
Descrip	tion	withi	n a higł	n-perfc	ormance tech	nology	contex	d.						
		1. To	unders	tand b	asics of Moto	orsport	s histoi	ry and i	its deve	elopmer	nt.			
Course	1	2.10 3 To	get kno	owledg	e on Motors he advancem	ports co ent in r	ompeti ace ev	tions. ents ar	nd race	tracks				
Objecti	ves	4. To	unders	tand t	he basic rules	and re	gulatic	ons of r	acing.	tracks.				
		5. To	unders	tand t	he role of mo	torspo	rts and	its car	rier gro	wth.				
Upon completion of this course, the students will be able to														
	1. Gain the knowledge on Motorsport Engineering.									in arou	ind the			
Course		2. 1	globe.			guiutic	115 01	various	, cvent	s and c	ompet			
Outcon	nes	3. I	Develo	o the c	areer toward	s Moto	rsport	Engine	ering					
		4. I	Discuss	on the	e basic rules a	ind reg	ulation	s of ra	cing					
Dreregi	icitos	5. I • Nil	Develo	o the r	ole of motors	ports a	ind its (carrier	growth	1.				
CO, PO	AND I	PSO M	APPINO	6										
	PO	PO	PO	PO			PO	PO	PO	P O1	PO	PO	PS	PSO
COs	1	2	3	4	PO5	PO6	7	8	9	0	11	12	0	2
CO-1	3	3	1	3	1	3	-	-	1	-	-	3	1	1
CO-2	3	3	-	3	1	3	-	1	-	-	1	3	2	2
CO-3	3	3	-	3	-	3	2	-	2	-	-	3	1	1
CO-4	-	-	-	-	-	-	-	-	-	-	-	-	2	1
1 - Wea	- klv Co	- prrelate	- ed. 2 - I	- Moder	- ately Correla	- ted and	- d 3 - St	- rongly	- Correla	- ated	-	-	1	Z
Module	2 1 – II	NTROD	UCTIO	N TO N	OTORSPOR	FENGI	NEERIN	IG					(6L	+6P)
The his	torv	of mo	torspo	rt Eng	ineering-Revi	iew of	moto	rsport	Engine	ering-P	ioneer	s of		
Motors	, port e	enginee	ering N	lotorsp	ort technolo	ogy evo	lution	review	/- Secr	ecy in I	Notors	port	CC BT)-1 1_7
enginee	ering													L-2
Module	2 –	мото	RSPOR		IPETITIONS								(6L	+6P)
A brief l	ook at	t all the	event	s stude	nts can take	part to	develo	p their	skills -	Formula	a SAE -	Baja	C	0-2
SAE - SA	E Sup	er mile	eage. G	o-Karti	ng, Solar Veh	nicle an	d E Bik	e					B	۲L-2
Module	e 3 – P	ROFES	SIONA		ORSPORT EV	ENTS							(6L·	+6P)
The var	ious ty	ypes of	profes	sional	motorsport e	events t	hat tal	ke plac	e aroui	nd the v	vorld -	Cars		
– Form	ula O	ne, Wo	orld rai	lly cha	mpionship, 1	Fouring	car cl	hampio	onship,	GP2, G	6P3, W	orld	C	0-3
drag ra	cing -	- Moto	rcvcles	s – M	oto GP. Supe	erbike.	Fndur	, muy (ance.	Motoci	ross. Su	inny rai	nes, oto.	BT	۲L-2
Freestyl	e, Tria	als, Cro	ss-coui	ntry ra	llies, Speedwa	ay, Boa	rd trac	k, drag	racing	,		,		
Module	e 4 – R	ULES A	ND RE	GULAT	IONS								(6L	+6P)
All abou	ut the	most i	mporta	ant boo	ok for a moto	rsport	engine	er – th	e rule	book - /	About -	the	_	
world g	overn	ing boo	dies of	the sp	ort - Why the	e rule b	ook ke	eps ch	anging	- How t	o inter	pret	C	0-4 1-2
the rule	book	- Rules	for car	races	- Rules for bil	kes rac	es.							L-Z
Module	5 – C	AREER	IN MO	TORSE	PORT								(6L+	-6P)
A sneak / Rider ·	peek Desi	into all gn engi	the aw neer - I	vesome Race te	e jobs- Motor: echnician -Ae	sport Ei rodyna	nginee mics Ei	r Race I ngineei	Driver / r - Race	' Rider - official	Test Di / stew	iver ard.	C BT	D-5 'L-2
TEXT BO	OOKS												I	

1.	Basic Motorsport Engineering: Andrew Livesey Publication Date: 17 Feb 2011 ISBN-10: 0750689099 ISBN-13: 978-0750689090
2.	
REFE	RENCE BOOKS
1.	Smith's Fundamentals of Motorsport Engineering by Josh Smith Publication Date: 26 April 2013 ISBN- 13: 9781408518083 Edition: New edition
2.	Hillier's Fundamentals of Motor Vehicle Technology Book 1Sixth Edition by Alma Hillier Publication
E BO	OKS
1.	www.motorsportwebsites.co.uk / www.motorsportmagazine.comand others.
2.	www.motorsport.com
MOC	DC
1.	Mahindra AQ - https://mahindraaq.com/aq-quiz

	JRSE TLE		ENE	ERGY FF		NEWAE		CR	EDITS		3			
COL	URSE DDE	EA	AT51702	2	COUR CATEGO	SE DRY		NE		Ŀ	Г-Р-S		2-0-2-	2
VER	SION		1.0		APPRO DETAI	VAL LS	3	6 TH ACI	N	LEA	RNING EVEL		BTL-3	6
ASSESSMENT SCHEME														
Fi Perio Asses	irst odical ssment	P As	Second eriodica sessme	al nt	Practica Assessm s	ll nent	Obse record by the Exa Comr	rvation s as app Departaminati nittee "	/ lab proved tment on DEC"	Atte	ndance	Er Ex	ıd Seme caminat	ester tion
1	5%		15%		1.0%			5%			5%	Т	heory 2	25%
1.	J/0		13/0		10/0	2		3/0			J /0	Pi	actical	25%
Cor Descr	Course DescriptionThis course narrates the possibility, availability and method for utilizing the energy from t resources other than the conventional fossil fuel resources. This course is necessitating t utilization of the waste to energy and low cost resources for the energy.										m the ng the			
Course Objectives		2. 1 3. 1 4. 1 5. 1	available Fo learn Fo desig Dumping Fo unde energy f Fo analy geother	e conve the fur g and el erstand from oc yze the mal ene	entional ndament l turbine lectricity the wor ean, feasibili ergy syst	fuel res tal cond blade genera rking of ty and tem	erves w cepts ab s and k ation f OTEC plan fo	vill last. yout sola now ab system r Bioma	ar energ out app and dif	gy syste blicatior ferent gy, min	ms and ns of wi possible i-micro	devices nd ene ways o hydro	;. rgy for of extra systems	water cting and
Cours Outco	se omes	Upc 1. 2. 3. 4. 5.	on comp Discus Gain k Under Develo Interp therm	oletion of s on ren nowled stand th op capa ret the al, hydr	of this connewable lge about he applit bility to application, geoth	ourse the and no it working cation of do basing ations of mermal	he stude on-rene ing prine of wind ic design of diffe energy o	ents are wable s ciple of energy n of bio rent re etc	able to sources various and wir gas pla newabl	: of ener solar e nd ener nt e ener	gy nergy sy gy convo gy sour	vstems ersion s ces like	ystem e ocear	1
Prerec	quisites	: Nil												
CO, PC	D AND F	PSO MA	PPING	r	1	1	г	[1		[1	1	[
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO 11	PO 12	PSO 1	PSO 2
CO-1	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO-2	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO-3	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO-4	3	3	3	3	-	-	-	-	-	-	-	-	3	3

CO-5 3 3 3 3	3 3				
1 - Weakly Correlated, 2 - Moderately Correlated and 3 - Strongly Correlated					
Module 1 – INTRODUCTION TO ENERGY STUDIES	(6L+6P)				
Introduction, Energy science and Technology, Forms of Energy, Importance of Energy Consumption as Measure of Prosperity, Per Capita Energy Consumption, Roles and responsibility of Ministry of New and Renewable Energy Sources, Needs of renewable energy, Classification of Energy Resources, Conventional Energy Resources, Non- Conventional Energy Resources, World Energy Scenario, Indian Energy Scenario	CO-1 BTL-3				
Module 2 – SOLAR ENERGY	(6L+6P)				
Introduction, Solar Radiation, Sun path diagram, Basic Sun-Earth Angles, Solar Radiation Geometry and its relation, Measurement of Solar Radiation on horizontal and tilted surfaces, Principle of Conversion of Solar Radiation into Heat, Collectors, Collector efficiency, Selective surfaces, Solar Water Heating system, Solar Cookers, Solar driers, Solar Still, Solar Furnaces, Solar Greenhouse. Solar Photovoltaic, Solar Cell fundamentals, Characteristics, Classification, Construction of module, panel and array. Solar PV Systems (stand-alone and grid connected), Solar PV Applications. Government schemes and policies	CO-2 BTL-3				
Module 3 – WIND ENERGY	(6L+6P)				
Introduction, History of Wind Energy, Wind Energy Scenario of World and India. Basic principles of Wind Energy Conversion Systems (WECS), Types and Classification of WECS,Parts of WECS, Power, torque and speed characteristics, Electrical Power Output and Capacity Factor of WECS, Stand alone, grid connected and hybrid applications of WECS, Economics of wind energy utilization, Site selection criteria, Wind farm, Wind rose diagram.					
Module 4 – BIOMASS ENERGY	(6L+6P)				
Introduction, Biomass energy, Photosynthesis process, Biomass fuels, Biomass energy conversion technologies and applications, Urban waste to Energy Conversion, Biomass Gasification, Types and application of gasifier, Biomass to Ethanol Production, Biogas production from waste biomass, Types of biogas plants, Factors affecting biogas generation, Energy plantation, Environmental impacts and benefits, Future role of biomass, Biomass programs in India	CO-4 BTL-3				
Module 5 – HYDRO POWER AND OTHER RENEWABLE ENERGY SOURCES	(6L+6P)				
Hydropower: Introduction, Capacity and Potential, Small hydro, Environmental and social impacts. Tidal Energy: Introduction, Capacity and Potential, Principle of Tidal Power, Components of Tidal Power Plant, Classification of Tidal Power Plants. Ocean Thermal Energy: Introduction, Ocean Thermal Energy Conversion (OTEC), Principle of OTEC system, Methods of OTEC power generation. Geothermal Energy: Introduction, Capacity and Potential, Resources of geothermal energy					
TEXT BOOKS					
1 Twidell, J.W. & Weir, A. Renewable Energy Sources, EFN Spon Ltd., UK, 2006					
2 B. H. KHAN, NON-CONVENTIONAL ENERgy Resources, , The MicGraw Hill					
REFERENCE BOOKS					
1. G.D. Rai, Non-Conventional Energy Sources, Khanna Publications, New Delhi, 2011.					
2. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", OxfordUniversity	Press, U.K.				
E BOOKS					

	https://www.google.co.in/search?q=non+renewable+energy+ebooks+free&sxsrf=APwXEdeKfeXJ48_Z
	ns46TfydC-ujyk8wMw%3A1684469146689&ei=mvVmZOTPKdzp4-
1	EP9cqD0Ao&ved=0ahUKEwjkhP7IwID AhXc9DgGHXXIAKoQ4dUDCA8&uact=5&oq=non+renewable+en
Т	ergy+ebooks+free&gs lcp=Cgxnd3Mtd2l6LXNlcnAQAzIHCCEQoAEQCjIHCCEQoAEQCjIHCCEQoAEQCjIH
	CCEQoAEQCjoKCAAQRxDWBBCwAzoICCEQFhAeEB1KBAhBGABQ0gFYgQhgygpoAXABeACAAaMDiAH0B
	5IBBzItMS4xLjGYAQCgAQHIAQLAAQE&sclient=gws-wiz-serp
МО	OC
1	https://nptel.ac.in/courses/102104057
2	https://archive.nptel.ac.in/courses/121/106/121106014/
3	https://archive.nptel.ac.in/courses/115/103/115103123/

COU	RSE LE		Future Fuels for IC Engines CREDITS 3													
COU COI	RSE DE	E	AT517	03	COU CATEC	RSE GORY		NE		L-1	Г-Р-S		2-0-2	-2		
VERS	SION		1.0		APPR DETA	OVAL AILS	3	86 ^{тн} АС	м	LEAI	RNING EVEL		BTL-	4		
ASSES	SMENT	SCHE	ME													
Fir Perio Assess	st dical ment	S Per Asso	econd riodica essmer	Pi I A nt	ractical ssessmei	nts	Obse record by the Ex Com	rvation ls as ap e Depai aminat mittee	i / lab proved rtment ion "DEC"	Atte	ndance		ESE	:		
15	%		15%		10%			5%			5%		Theory	25%		
15	/0		13/0		10/6			J/0			J /0		Practica	25%		
Cou Descri	rse ption	The c produ differ with insigh	Practical 25% e course provides an overall insight about utilization of renewable energy source for power iduction. Also provide in-depth analyses about properties and production methods of erent renewable liquid and gaseous fuels. Testing Methods of such fuels in Engines along h its significances will be educated to the learners. Finally, course also provide detailed ights about advance technologies in the domain of future renewable fuels													
		1	1. To examine the Constructions, working and Testing of Automotive Engines													
Course	•	2	. To e	explain	the impo	ortance	of Fuel	Proper	ties and	d Fuel ar	nd Engii	ne Mo	odificatio	n.		
Ohiect	e ives	3	. To a	analyze	the utili	zation o	f liquid	fuels ir	n IC Eng	ines						
0.0,000		4	. То а	analyze	the utili	zation o	f gaseo	us fuels	s in IC E	ngines						
		5	. То	investi	gate the	advance	e techn	ologies	in utiliz	ing futu	re rene	wable	e fuels			
		Upon	compl	etion o	f this cou	irse, the	studer	nts will	be able	to						
		1	. Exp	lain the	e Constru	ictions,	workin	g and T	esting o	of Auton	notive E	ingine	S			
Course	e	2	. Exp	lain im	portance	of Fuel	Proper	ties and	d Fuel a	ind Engi	ne Mod	lificati	on.			
Outcor	mes	3	. Ana	alyze th	e utilizat	ion of li	quid fu	els in IC	Engine	es						
		4	. Ana	alyze th	e utilizat	ion of g	aseous	fuels in	IC Eng	ines						
		5	. Elu	cidate t	he advar:	nce tech	nologie	es in uti	lizing fu	uture rer	newable	e fuels	5			
Prereq	uisites	Nil														
CO, PO	AND P	SO MA	PPING													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO1	PSO2		
CO-1	3	2	2	2	2	3	3	1	2	1	1	3	3	3		
CO-2	3	2	2	2	2	3	3	1	2	1	1	3	3	3		
CO-3	3	2	2 2 3 3 3 1 2 1 2 3 3													
CO-4	3	2 2 3 3 3 1 2 1 2 3 3														
CO-5	3	2	2	3	3	3	3	1	2	1	1	3	3	3		
1 - Wea	akly Co	rrelate	d, 2 - N	/lodera	tely Corr	elated	and 3 -	Strong	y Corre	elated						
Modul	Module 1 – Introduction to IC Engines (6L+6P)															

Basi Engi Case	c Terminology and Concepts of IC Engines – Classification- Construction – Working – ne power and Efficiencies – Performance, emission and combustion characteristics – Study.	CO-1 BTL-3
Mod	ule 2 – Fuel and Engine Modification	(6L+6P)
Fuel Mod	s – Properties – Constraints – World Scenario – Future Fuels – Types-Fuel and Engine ification – Types – Emulsion – Transesterification – Dual Fuel Engines – Case Study.	CO-2 BTL-3
Mod	ule 3 – Liquid Fuels	(6L+6P)
Type Utiliz	es – Biofuels – Alcohols – Source –Production Techniques – Storage- Properties – eation – Challenges – Limitations – Case Study.	CO-3 BTL-4
Mod	ule 4 – Gaseous Fuel	(6L+6P)
Type Chal	es – Biogas – Hydrogen – Source – Production Techniques - Properties – Utilization – lenges – Limitations – Case Study.	CO-4 BTL-4
Mod	ule 5 –Emerging Technologies	(6L+6P)
Emis – Ca:	ssions Norms – Standards – Fuel – Engine – HCCI – PCCI. GDI – VVT – CRDI – Downsizing se Study.	CO-5 BTL-4
TEXT	BOOKS	
1.	Ganesan V, "Internal Combustion Engines", Tata McGraw-Hill.	
2.	Heywood J. B, "Internal Combustion Engine Fundamentals", McGraw Hill Book Co. NY.	
	Mathur M. L and Sharma. R. P, "A Course in Internal Combustion Engines", Dharpat Ra	ai & Sons.
1.	Internal Combustion Engine Handbook, 2 nd English Edition, Richard Van Basshuysen, Fre	ed Schaefer SAE
2	Bosch Automotive Handbook 10 th Edition Robert Bosch ISBN of 978-0-7680-9567-8	
3	Heldt, P.M. High Speed Combustion Engines, Oxford IBH Publishing Co., Calcutta, 2011.	Knothe
4	Maleev, V.M., Diesel Engine Operation and Maintenance, McGraw Hill, 2010.	
5	Hydrogen – A fuel for Automatic Engines, Prashukumar G P, ISTE	
6	William.H.Crouse, Automotive Engines, McGraw Hill Publishers, 2014	
7	Tomorrow's Energy – Hydrogen Fuel Cells and the Prospects for Cleaner Planet, Peter	
/	Hoffman, MIT	
E BO	DKS	
1.	https://myxfpzg.files.wordpress.com/2015/08/robert-bosch-automotive-electronics-h pdf.pdf	andbook-
2.	http://opac.vimaru.edu.vn/edata/EBook/NH2014/CSDL_CS2014_2/HH0074.pdf	
_	Karthic, S. V., M. Senthil Kumar, G. Nataraj, and P. Pradeep. "Experimental investi	gations on the
3	influence of hydrogen and LPG mixtures on performance behavior of a mahua bio of	I-powered dual
	Vinoth Kanna, L. and Ballavi Paturu. "A study of hydrogon as an alternative fuel." Intern	ational Journal
4	of Ambient Energy 41, no. 12 (2020): 1433-1436.	
5	Ramesohl, Stephan, and Frank Merten. "Energy system aspects of hydrogen as an alt	ernative fuel in
MOC	C	
1	https://nptel.ac.in/courses/112104033	
2.	https://nptel.ac.in/courses/112103262	
3	https://onlinecourses.nptel.ac.in/noc22_ch66/preview	

Semester V

COUR	SE TITLE	E SI	SMART MATERIALS FOR AUTOMOTIVE APPLICATIONS CREDITS 3												
COUR	SE COD	EE	AT5170	4 CC	OURSE ATEGOR	Υ		NE		1	T-P-S			2-0-2-2	
Versio	on		1.0	Aj De	pproval etails		:	36 [™] AC	М	1	.EARNI G LEVE	IN L		BTL-3	
ASSES	SMENT	SCHEN	1E												
					CIA									ESE	
First P Asse	Periodica	al P As	Second eriodica sessme	al nt A	Practic	al ents	Observ rec approv Depa Exan Commi	ation / ords as /ed by t artmen nination ttee "D	lab :he t n EC"	Atten	dance	T	heory	Prac	tical
1	15%		15%		10%			5%		5	%		25%	25	5%
Co Deso	ourse cription	Th fie pie sec ap	15%10%5%25%25%This course deals with smart materials, types of smart material and application in various rields; shape memory alloy, processing methods and its application in various sector; piezoelectric material, its types, processing and application in the various engineering sector and Magneto Rheological Fluid & Electro Rheological Fluid, its compositions and application in various field												
Course Objec	e tive	1. 2. 3. 4. 5.	To act variou To ga variou To ob the va To ac comp To do	is fields in know us secto tain kno arious e quire k ositions case st	vledge c or owledge ngineer nowledge s and ap udy of s	e on shap e on pie ing sec ge on N oplicatic smart m	e memo zoelecti tor Magneto on in var naterials	ory alloy ric mate o Rheol rious fie s in varie	rypes 7, proc erial, it ogical Id ous en	cessing ts type Fluid gineer	s, proc & Elec	ods essi tro plica	and its ing and Rheolo	applica applica applica gical Fli	tion in tion in uid, its
Cours Outco	e me	Up 1. 2. 3. 4. 5.	on com Acquin variou Gain I variou Obtain variou Acquin compo Case s	pletion re know is fields knowled is secto n knowl is engin re know ositions study of	of this of vledge dge on r edge or eering s vledge and ap <u>smart r</u>	course, on sma shape piezoe sector on Ma plicatio materia	the stud art mate memory electric r gneto I n in var Is in var	dents w erials, t y alloy, materia Rheolog ious fiel ious en	ill be a ypes o proce l, its ty ical F Id gineer	able to of sma ssing vpes, p luid & ring ap	nrt ma metho rocess Elect plicatio	teria ds a ing a ro F on	al and and its and app Rheolog	applicat application dication	tion in tion in n in the uid, its
CO. PO			PPING												
	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO	- P() -	PO-	PSO	PSO
со	1	2	3	4	5	6	7	8	9	10	1	1	12	-1	-2
CO- 1	2	2	1	1	-	-	-	-	-	-	1	L	1	2	1
CO- 2	3	1	2	2	-	-	-	-	-	-	- 1 2 3 2				2
CO- 3	2	2	1	1	-	-	-	-	-	-	2	2	2	2	3
CO- 4	3	1	2	1	-	-	-	-	-	-	2	2	1	3	1

CO- 5	2	2	1	2	-	-	-	-	-	-	1	1	2		3
			1: Wea	kly rela	ted, 2:	Moder	ately re	lated a	nd 3: St	rongly	related	1			
MOD	JLE 1-	INTRO	DUCTIO	IN TO S	MART	/IATERI	ALS							(6L	+6P)
Define of sma applic	e smart art mate ation o	materia erials –1 f smart	al-smart Types of materia	: materi f smart Is	als Vs o materia	ther ma Is-adva	aterials ntage a	-History nd disad	v of sma dvantag	art mate ge of sm	erials-pr Iart mat	opertie erials –	S	C B'	0-1 TL-3
MOD	JLE 2 –	SHAPE I	MEMOR	Y ALLO	Y									(6L	+6P)
Introd memo isosta select shape	luction bry alloy tic pres ive lase memo	to shap /-proces sing, me r meltin ry alloy	e memo ssing of etal inje og –adva	ory alloy shape r ction m antage a	v-history nemory olding - and disa	y of safe alloys- additiv dvanta	e memo powde ve proce ge of sh	ory alloy r metall essing, s ape me	-workir urgy pr elective mory a	ng princ ocessin e laser s lloy-app	iple of s g, sinter intering plicatior	hape ring, Ho g, 1 of	t	C B	0-2 TL-3
MOD	JLE 3 –	PIEZOE	LECTRIC		RIAL									(6L	+6P)
Introd Phenc Proces mater	luction omena-f ssing of ial-app	to piezo types of Piezoel lication	electric piezoe ectric C of piezo	materi lectric n eramic pelectric	al-histo naterial Materia c materi	ry of pi -piezoe als-adva al.	ezoelec lectric s intage a	tric mat sensor - and disa	erial-Pi piezoel dvanta	ezoelec ectric ac ge of pi	tricity - ctuators ezoelec	Physica ; - tric	I	C B'	O-3 TL-3
MODULE 4 -MAGNETO RHEOLOGICAL FLUID & ELECTRO RHEOLOGICAL FLUID														(6L	+6P)
Introd MR m of MR Mode	luction aterial- F-advai of ERF-	to Magr working ntage ar advanta	neto Rh g of MRI nd disad age and	eologica ⁼ –Mate Ivantage disadva	al Fluid(erial con e of MR antage (MRF) & npositic F-Work of ERF-4	Electro on of M ing of E Applicat	Rheolo RF- Prep RF-Mat ion of b	ogical Fl paratior erial co poth MF	uid(ERF n of MR mpositi RF&ERF	[:]) –Smai F Fluid- ion of El	rt fluid- Mode RF-		C B'	0-4 TL-3
MOD	JLE 5 –	CASE	STUDY	ON SM	ART MA	TERIAL	•							(6L	+6P)
Case s medic	tudy of al field.	smart ı	materia	l in vari	ous field	d like Au	utomoti	ve , Aer	onautio	cal , Aer	ospace	and		С В ⁻	0-5 TL-3
TEXT	BOOKS														
1.	E	Brain Cu	lshaw –	Smart	Structu	re and I	Materia	ls Artec	h House	e – Bort	on. Lon	don-19	96.		
2.	E	Inginee	ring Ana	alysis of	Smart I	Materia	l Syster	ns", Doi	nald J. L	.eo, Wil	ey, 200	7			
REFER	ENCE B	OOKS													
1	В	rian Cul	shaw, S	imart St	ructure	s and N	1aterial	s, Artec	h House	e, 2000					
2	G	iauenzi,	P., Sma	rt Struc	tures, \	Viley, 2	009								
E Res	ources	for Refe	erence												
1. https://books.google.co.in/books?id=5NyH0h1OgisC&printsec=frontcover&source=gk ummary_r&cad=0#v=onepage&q&f=false													bs_	ge_s	
2		https: umma	//books iry_r&ca	.google ad=0#v=	.co.in/b onepag	ooks?id ge&q&f	d=y4ntE =false	DwEpJ4	/C&prin	tsec=fr	ontcove	er&sour	ce=g	bs_	ge_s
MOO	C														
1		https:	//nptel.	ac.in/co	ourses/1	112/104	1/11210)4251/							
1. https://nptel.ac.in/courses/112/104/112104251/ 2. https://nptel.ac.in/courses/112/104/112104173/															

COURSE TITLE	INDUSTRIAL	INDUSTRIAL SAFETY AND HAZARD MANAGEMENT CREDITS 3									
COURSE CODE	EAT51705	COURSE CATEGORY	NE	L-T-P-S	2-0-2-2						
VERSION	1.0	APPROVAL DETAILS	36 [™] ACM	LEARNING LEVEL	BTL-3						
ASSESSMENT	ASSESSMENT SCHEME										

First Periodica Assessme	ıl nt	Seco Period Assessr	nd ical nent	P Asso	ractical essmen	ts	Observ rec appro Dep Exar Commi	vation , ords as ved by artmer ninatio ittee "E	/ lab 5 the nt 0 DEC"	Atten	dance	En Ex	End Semester Examination		
15%		15%	6		10%			5%		5	%	T Pr	heory 2 actical	25% 25%	
Course Descriptio	n ^T	hese sul	ojects d	leal wit	h vario	us indu	strial sa	fety m	easures	and h	azard m	anagei	ment		
Course Objectives	6	1. Toi 2. Too 3. Too 4. Too 5. Too	dentify liscuss o levelop lesign s levelop	design on safe enviro afety ir safety	process ty in pro nments n therm in trans	s, desig oducin of occ al syste sportat	n of sin g engine upation ems ion	nple eq eering i al haza	uipmer industr rd, fire	nt y safety,	dust, e	nvironr	mental	safety	
S. To develop safety in transportation The student will be confident about the safety aspects. 1. Identify design process, design of simple equipment 2. Discuss on safety in producing engineering industry Outcomes 3. Develop environments of occupational hazard, fire safety, dust, environmental 4. Design safety in thermal systems 5. Develop safety in transportation Prerequisites: Physics, Chemistry												ental sat	fety		
CO. PO AN	D PSC	295: Physics, Chemistry													
COs	PO1	PSO MAPPING PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO1 PO PO 11 12											PSO 1	PS O2	
CO-1	2	-	2	-	-	2	3	-	-	-	-	3	1	2	
CO-2	2	-	2	-	-	2	3	-	-	-	-	3	1	2	
1CO-3	2	-	2	-	-	2	3	-	-	-	-	3	1	2	
CO-4	2	-	2	-	-	2	3	-	-	-	-	3	2	1	
CO-5	2	-	2	-	-	2	3	-	-	-	-	3	2	1	
1 - Weakly	Corre	lated, 2	- Mode	erately	Correla	ted an	d 3 - St	rongly	Correla	ted					
MODULE	1 - IN	TRODUC	TION T	O THE	DESIGN	PROC	ESS, DE	SIGN O	F SIMP	LE EQU	IPMEN	т	(6L+	6P)	
Concepts stress cor high and between Hazards (Suggested	of me ncentr low te Hazar eartho Read i	echanica ation, fa mperatu d Disasto quake, Ti ing: Desi	I failure tigue fa ures on er Catas sunami gn of Si	es: Stre ailure, F strengt strophe), do's a imple E	ess - str actor o ch of ma e, Mann and dor quipme	ain dia f safety aterials nade (f nt's at t ent - Ex	gram (d /, Impad . Hazar ire, rele he time plosives	uctile & ct and s d Mana ase of t e of Haz s chemi	& brittle shock lo agemer toxic ga ard oco ical mix	e mater bading, ht: diffe bses) an currenc bing & c	ials), effect c erence d Natu e. utting k	of ral knife.	CC BT)-1 L-3	
MODULE 2	- SAF	ETY IN P	RODU	CING EN	IGINEE	RING I	NDUSTI	RY					(6L+	6P)	
Suggested Reading: Design of Simple Equipment - Explosives chemical mixing & cutting knife.MODULE 2 - SAFETY IN PRODUCING ENGINEERING INDUSTRY(6L+6P)Safety in use of machinery: Introduction to turning, boring, milling, planning, shaping, grinding, CNC, wood working, arc & gas welding, forging, hot & cold rolling, punching, printing press,(6L+6P)Personal safety & material handling devises: Helmets, different hand gloves, aprons, eye protection, pushing and pulling. cranes, forklifts trolleysCO-2Safety Regulations: Operating and Support Hazard Analysis (OSHA), Hazard and Operability (HAZOP), safety survey, safety inspection, safety sampling, fault tree analysis, event tree analysis, failure modes and effect analysis. Guarding: Principles of m/c guarding, zero mechanical state (ZMS), definition, policy for ZMS.CO-2Suggested Reading: use of personal safety gadgets (different gloves, goggles, ear plugs, eye wash station, static charge devises), instruments.With the safety gadgets (different gloves, goggles, ear plugs, eye wash station, static charge devises), instruments.)-2 1-3			

MODULE 3 - ENVIRONMENTS OF OCCUPATIONAL HAZARD, FIRE SAFETY, DUST,							
ENVIRON	MENTAL SAFETY	(6L+6P)					
Environr industry, difference extinguis charge p Environr fumes fr Suggestee	 ments of Occupational Hazard: Dust – wood working, Glass grinding, powder handling, stone crushers, fireworks room layouts. Fire Safety: Fire triangle, fuel classification, ce between combustion & explosion, fire detectors with fire alarm, types of fire shers and their fire -fighting applications, Automatic fire extinguishing systems, static revention, lightening arresters, mental safety: Cement dust, toxic gas, explosives, acid manufacture and handling, acid om electro plating, spray paints, Material Safety Data Sheet. d Reading: Centrifugal separator in carpentry section, fireworks – mixing & filling 	CO-3 BTL-3					
chamber,	water spray in stone crusher						
MODULE	4 - SAFETY IN THERMAL SYSTEMS	(6L+6P)					
Steam P oil, coal, electric p Nuclear: passage, from pla Refrigera cut outs, cold stor Instrume plug, pre	ower Plant: constructional safety, fuel storage and handling safety system (Fuel - ash, dust), O&M safety, corrosion of tubes, scale formation on tubes, fly ash precipitator, : LOCA, Sodium and air reaction, failure of control rods, debris collection in flow changing of fuel rods, safe recycle of fuel, safe disposal of used fuel and waste nt, ation, Air Conditioning & Cryogenics: over current protection, low & high pressure , use of gases like Ammonia, + ve & -ve air pressures in rooms, cold burn, safety in rages, low temperature properties of metals, handling high pressures. ents: safety instruments - like different safety valves, liquid level indicator, fusible essure gauge etc., importance of instrument calibrations.	CO-4 BTL-3					
Juggeste	ed Reading. Boner blasts, three-threasand and chernoby accidents						
Modulo E							
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Cou Descri	rse ption	The c Also Testir learne doma	e course provides an overall insight about utilization of hydrogen for power production. so provide in-depth analyses about properties and production methods of hydrogen. sting Methods of Hydrogen in Engines along with its significances will be educated to the arners. Finally, course also provide detailed insights about advance technologies in the pmain of Hydrogen Energy Technology													
		1	omain of Hydrogen Energy Technology 1. To examine the need of alternate energy resources and explain the basics of													
Course Object	e ives	2 3 4 5	 To examine the need of alternate energy resources and explain the basics of combustion and emission norms. To explain the production methodologies of hydrogen and Compare the properties of hydrogen. To analyze the performance of hydrogen as fuel in IC Engines. To analyze the performance of hydrogen as fuel in Fuel Cell To investigate the challenges and opportunities in hydrogen energy technology. 													
		Upon	comple	etion of	this co	ourse, t	he stud	lents wi	ll be ab	le to						
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CO-2	3	2	2	2	2	3	3	1	2	1	1	3	3	3		
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CO-4	3	2	2	3	3	3	3	1	2	1	2	3	3	3		
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Module	e 1 – Ir	ntroduc	tion				·				•		(6L+	6P)		
Engine Types -	es - Con · Availa	nbustio bility -	n – Emi Propert	ission F ties - G	ormatio overnm	on – Im nent No	pact - N orms an	Need of Id Subsi	Alterna diary.	ite Energ	gy Sour	ces. –	CO BTI	-1 -3		
Module	e 2 – Hy	droge	n as Fu	el									(6L+	6P)		

Hydi Hydr	rogen pathways - World Scenario – Indian Scenario - Properties of Hydrogen as Fuel- ogen Production Technologies.	CO-2 BTL-3
Mod	ule 3 – Engine Technologies	(6L+6P)
En Com	gine Testing - Dual Fuel Engines – Hydrogen Injection – Performance – Emission – bustion Characteristics.	CO-3 BTL-4
Mod	ule 4 – Fuel Cell Technologies	(6L+6P)
Fuel Integ	Cell - Thermodynamics - Performance Evaluation – Types - Characterization - System gration - Application	CO-4 BTL-4
Mod	ule 5 – Challenges and Opportunities	(6L+6P)
Prop Mate Strat	perties – Storage – Handling – Emissions. Metal Hydride Storage – Carbon Based erials for Hydrogen Storage - Hydrogen Powered Vehicles - NOx Control Techniques and egies.	CO-5 BTL-4
TEXT	BOOKS	
1.	Ganesan V, "Internal Combustion Engines", Tata McGraw-Hill, 2003.	1000
2. 2	Heywood J. B, "Internal Combustion Engine Fundamentals", McGraw Hill Book Co. NY,	1989
3	Pundir R. P. "IC Engines Compustion and Emissions" Narosa Publishing House 2010	ii & SONS, 1993.
5	Flectrochemical Methods by A L Bard and L B Faulkner, John Wiley & Sons, Inc.	
REFE	RENCE BOOKS	
1.	Internal Combustion Engine Handbook, 2 nd English Edition, Richard Van Basshuysen, Fre International ISBN of 978-0-7680-8024-7	ed Schaefer SAE
2.	Bosch Automotive Handbook, 10 th Edition Robert Bosch ISBN of 978-0-7680-9567-8	
3	Heldt.P.M. High Speed Combustion Engines, Oxford IBH Publishing Co., Calcutta, 2011.	Knothe,.
4	Maleev, V.M., Diesel Engine Operation and Maintenance, McGraw Hill, 2010.	
5	Hydrogen – A fuel for Automatic Engines, Prashukumar G P, ISTE	
6	Fuel Cells: Theory and Applications, Hart A B and Womack G J, Chapman and Hall	
7	Tomorrow's Energy – Hydrogen Fuel Cells and the Prospects for Cleaner Planet, Peter Hoffman, MIT	
E BOO	DKS	
1.	https://myxfpzg.files.wordpress.com/2015/08/robert-bosch-automotive-electronics-h pdf.pdf	andbook-
2.	http://opac.vimaru.edu.vn/edata/EBook/NH2014/CSDL_CS2014_2/HH0074.pdf	
3	Karthic, S. V., M. Senthil Kumar, G. Nataraj, and P. Pradeep. "Experimental investi influence of hydrogen and LPG mixtures on performance behavior of a mahua bio oi fuel engine "International Journal of Green Energy 16, no. 12 (2019): 878-889	gations on the I-powered dual
4	Vinoth Kanna, I., and Pallavi Paturu. "A study of hydrogen as an alternative fuel." Intern of Ambient Energy 41, no. 12 (2020): 1433-1436.	ational Journal
5	Ramesohl, Stephan, and Frank Merten. "Energy system aspects of hydrogen as an alt transport." Energy policy 34, no. 11 (2006): 1251-1259.	ernative fuel in
6	Koroneos, C., Aris Dompros, George Roumbas, and Nicolas Moussiopoulos. "Life cycle hydrogen fuel production processes." International journal of hydrogen energy 29, no. 1 1450.	assessment of 4 (2004): 1443-
7	Cheng, Xuan, Zheng Shi, Nancy Glass, Lu Zhang, Jiujun Zhang, Datong Song, Zhong-She Wang, and Jun Shen. "A review of PEM hydrogen fuel cell contamination: Impacts, me mitigation." Journal of Power Sources 165, no. 2 (2007): 739-756.	ng Liu, Haijiang echanisms, and
8	Trimm, David L., and Z. Ilsen Önsan. "Onboard fuel conversion for hydrogen-fuel-cell-d	riven vehicles."
MOO	C	
1.	- https://nptel.ac.in/courses/112104033	
2.	https://nptel.ac.in/courses/112103262	
3	https://onlinecourses.nptel.ac.in/noc22_ch66/preview	

COUI TITI	RSE LE		E-Mobility: Policy and Business CREDITS												
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Course Object	e ives	2. 3. 4. 5.	 To Examine the need of e-mobility and explain the process of feedback collection and stakeholder's involvement. To Explain the Supply Side Policy Measures and types of Subsidies To Explain Demand side policy measures and regulatory bodies To Analyze the importance in building sustainable charging infrastructure. To Investigate the challenges and opportunities in developing an ecosystem for E- Mobility 												
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Modul	e 1 – Ir	ntroduct	ion										(6L+6	5P)	
EV– La -Electri Types o	EV- Layout - Policy - National - International - Objectives - Stakeholders - Data Collection CO-1 -Electric Motor Vs Combustion Engine-Comparing drivetrains-sizing of the EV powertrain- BTL-3 Types of electric motors. (61+6P)														
Modul	e 2 – Sı	ipply Sig	te Polic	v Mea	sures								(6L+6	DP)	

Eli Sul of	gibility – Research & Development – Investment Promotion Subsidy – Turnover-based osidy – Taxes – Capital Subsidy – Electricity Tax Exemption – Stamp Duty – Subsidy on Cost Land – Employment & Intellectual Property Creation Incentive-	CO-2 BTL-3
Mo	dule 3 – Demand Side Measures	(6L+6P)
Su Ma Re Co	pport Measures – Electrification of Vehicular Fleets in the State – Promoting EVs in nufacturing Facilities– Demand Aggregation – Regulatory Measures & Concessions – <i>v</i> ised Transport Regulation of Electric Vehicles – Private Vehicles, Shared Mobility & mmercial Vehicle Segments – Road Tax/Registration Charges	CO-3 BTL-3
Мо	dule 4 – Charging Infrastructure	(6L+6P)
Go Pu Ba	vernment Interventions – Tariff for EV Charging – Incentives for Charging Stations – olic Charging Stations – Private e-Aggregator Charging Stations – Incentives for Public stery Swapping Stations- wireless charging of cars-Battery swap	CO-4 BTL-3
Mo	dule 5 – Ecosystem Development	(6L+6P)
Ca Eco Inv tre	pacity Building & Skilling R&D and Business Incubation Creation of a Circular Sustainable pnomy Creation of EV Parks & Vendor Ecosystem Promoting Startups in the EV Sector estment Facilitation Safety & Awareness Sanctioning & Implementing Agency-Future nds in electric cars-Charging EV from renewables.	CO-5 BTL-3
TE)	AT BOOKS	
1	Electrical Vehicle Technology. : The Future Towards Eco-Friendly Technology. Prof. Sunil R. Press; 1st edition , ISBN-10 : 1685545610	Pawar, Notion
2	EV Engineering Fundamentals : A beginner's guide to e-mobility, Ashhar Ahmed Shaikh, No edition (12 July 2022), ISBN-13 : 979-8887496443	otion Press; 1st
RE	ERENCE BOOKS	
1	Electric Cars: The Ultimate Guide, Keith Chamberlain, 2019, Greentech Publishing, ISB 1916141407	N-13 : 978-
2	Bosch Automotive Handbook, 10 th Edition Robert Bosch ISBN of 978-0-7680-9567-8	
3	The Future of Electric Vehicles: A Sustainable Solution, Taiwo Ayodele, ISBN-13 : 978-169	0837107,2019
4	Peter Gray, "The Beginners' Guide to RC Electric Cars", 2011, The Modelers world Series.	
5	David Beeton and Gereon Meyer, "Electric Vehicle Business Models: Global P 2015.Springer.	erspectives ",
6	Tomorrow's Energy – Hydrogen Fuel Cells and the Prospects for Cleaner Planet, Peter Hoffman, MIT	
EB	DOKS	
1	https://investingintamilnadu.com/DIGIGOV/StaticAttachment?AttachmentFileName=/pdf Electric Vehicles Policy 2023.pdf	f/poli_noti/TN
2	https://powermin.gov.in/sites/default/files/uploads/EV/Tamilnadu.pdf	
3	https://www.iea.org/reports/ev-city-casebook-and-policy-guide-2021-edition	
4	https://www.niti.gov.in/sites/default/files/2021- 08/HandbookforEVChargingInfrastructureImplementation081221.pdf	
MC	000	
1	https://onlinecourses.nptel.ac.in/noc21_ee112/preview_	
2	https://archive.nptel.ac.in/courses/108/103/108103009/	
3	https://onlinecourses.nptel.ac.in/noc22_ee53/preview_	

Semester VI

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Cou Outco	About the working of vehicle vision safety systems 1. To Design and validate the vehicle structure with respect to crash worthiness 2. To know the various types of safety aspects such as active and passive safety, the active safety components and the working passive safety components such as air bags, seatbelts Outcomes 3. To know about various object detection system and working of various comfort, convenience system and environment information system. 4. To analyze and simulate vehicle in barrier impacts. 5. To analyze pedestrian safety by use of light measurement and testing														
Prerequ	isites: N	lil													
CO, PO	AND PS	O MAP	PPING												
COs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO1 0	PO 11	PO 12	PSO 1	PS O2	
CO-1	3	3	2	3	2	1	1	1	1	3	3	3	3	3	
CO-2	3	3	1	2	1	2	2	1	2	2	2	2	3	3	
CO-3	2	2	3	3	3	2	3	2	2	1 2	1	2 1	3	3	
CO-4	2	1	2	3	3	3	2	2	2	2	2	1	3	ר ר	
1 - Wea	kly Corr	elated,	2 - Moo	derate	ly Corre	lated ar	nd 3 - S	trongly	 Correla	ted	_	-	0	5	
Module TESTING	1- INTR G	ODUC	TION TO	VEHI		ETY, STF	RUCTUI	RAL CRA	SHWO	RTHINE	SS AND	O CRASH	I (61	.+6P)	
Automo Definition deceleration and mo Vehicle Barrier Photogr LAB- Mo	TESTINGCollectoryAutomotive Safety-Active and Passive Safety, Driver Assistance Systems in Automobiles, Definitions and Terminology, Design of the body for safety, energy equation, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle, concept of crumble zone, safety sandwich construction. Optimization of Vehicle Structures for Crash Worthiness, Types of Impacts, and Impact With Rebound, Movable Barrier Tests, Roll Over Crash Tests, Behavior of Specific Body Structures in Crash Testing, Photographic Analysis of Impact Tests.CO-1LAB- Modeling and Simulation StudiesLAB- Modeling and Simulation StudiesCO-1														
Module	2 – VEH	IICLE S	AFETY S	SYSTEM	۸S								(61	.+6P)	
The concept of vehicle safety; Need of safety, Active safety: driving safety, conditional safety, perceptibility safety, operating safety-crash safety passive safety: exterior safety, interior, B C												CO-2 TL-3			

passenger compartment on impact. Safety equipment: Seat belt, regulations, automatics of belt tightened system, Anti-locking braking system (ABS), Speed limiting device (SLD), automatic vehicle stability control, Collapsible steering system, tilt able steering system, air bags, electronic system for activating air bags, bumpers design for safety. Warning devices, indicators, hinges, latches, wipers, horns, etc.									
LAB-	Fire detection and suppression system (FDSS), automatic traction control								
Module 3 – VEHICLE INTEGRATION AND NAVIGATION SYSTEM									
Looking out sensors and Looking in sensors, Intelligent vision system, Vehicle Integration system. Global Positioning System. Vehicle Navigation System. Road Network.V2V, SAE levels of automation LAB- Sensors									
Modu	ule 4 – ERGONOMICS AND HUMAN RESPONSE TO IMPACT	(6L+6P)							
Importance of Ergonomics in Automotive Safety, Locations of Controls, Anthropometry, Human Impact Tolerance Determination of Injury Thresholds, Severity Index, Study of Comparative Tolerance, Application of Trauma for Analysis of Crash Injuries. Injury Criteria's and Relation with Crash and Modeling and Simulation Studies in Dummy									
Made									
Module 5 – LIGHT MEASUREMENTS, TESTING EQUIPMENT, CALIBRATION AND PHOTOMETRIC PRACTICE									
Basics of Standards and Detectors, Spectral Measurements and Colorimetry, Illuminant Meters and Luminance Meters, Colorimeters. Fundamentals of Equipment Used for Light Measurement in Automotive Field - Gonio- Photometer, Reflecto-Meter, Colorimeter, Integrating Sphere, Types, Application, Coordinates System, Types of Sensors and Working Principle, Construction, Characteristics Etc. Used in Different Equipment. National and International Regulations, Test Requirements and Testing Procedure									
LAB-C	Case Studies								
TEXT	BOOKS								
1.	Johnson W and Mamalis A.G., "Crashworthiness of Vehicles", Mechanical Engineering P 2002.	ublications,							
2.	Ljubo Vlacic, Michel Parent, Fumio Harashima – "Intelligent Vehicle Technologies 1 Applications" -Butterworth-Heinemann 2001	heory and							
REFE	RENCE BOOKS								
1.	J. Marek, HP. Trah, Y. Suzuki, I. Yokomori - "Sensors for Automotive Applications " - WILEY	VCH Verlag							
2.	ARAI Safety standards								
E BOC	DKS								
1. Matthew Huang, "Vehicle Crash Mechanics", CRC Press, 2002									
2. J. Marek, HP. Trah, Y. Suzuki, I. Yokomori - "Sensors for Automotive Applications " -WILEYVO GmbH & Co. 2003									
3. Ronald.K.Jurgen - "Automotive Electronics Handbook" - Second edition- McGraw-Hill Inc., - 2									
MOO	c								
1.	https://onlinecourses.nptel.ac.in/noc20_de06/preview								
2.	https://www.edx.org/course/road-traffic-safety-in-automotive-engineering								

COURSE	INTRODUCTION	TO INTELLIGEN	IT TRANSPORT SYSTEMS	CREDITS	3
TITLE					
COURSE CODE	EAT51709	COURSE CATEGORY	L-T-P-S	2-0-2-2	
Version	1.0	1.0 Approval 36 th ACM Details		LEARNING LEVEL	BTL-3

First Periodical Assessment Practical Assessment Practical Assessment Observation / lab records as approved by the Department Examination Committee Attendance e 15% 15% 10% 5% Theory 25% Course Description This course provides knowledge on intelligent transport system and vehicle to vehicle technology Theory 25% Course Objectives This course provides knowledge on intelligent transportation Systems (TS) Theory 25% 1. To discuss on Intelligent Transportation Systems (TS) To design ITS functional areas 3. To description of this course, the students will be able to Discuss on Intelligent Transportation Systems (TS) Discuss on Intelligent Transportation Systems (TS) 2. To describe ITS user needs and services To describe ITS user needs and services Description 3. Design ITS functional areas Describe ITS user needs and services Description 3. Design ITS functional areas Describe ITS user needs and services Describe ITS user needs and services 5. Develop Vehicle-to-Vehicle (V2V) Communications T 1 1 1 Course 0 P PO	ASSESSMENT SCHEME															
15% 15% 10% 5% Theory 25% Course Description This course provides knowledge on intelligent transport system and vehicle to vehicle technology Practical 25% Course Objectives 1. To discuss on intelligent Transportation Systems (ITS) . . 1. To describe ITS user needs and services . . . 3. To describe ITS user needs and services . . . 0 upon completion of this course, the students will be able to . . . 0 upon completion of this course, the students will be able to . . . 0 utcomes 2. Describe ITS user needs and services . . . 5. Develop Vehicle-to-Vehicle (V2V) Communications Prerequisites: Nil CO. 1 2 2 1 . 1 . 1 1 1 1 2 CO-1 2 1 3 . 1 . 1 1 1 1 2 CO-1 2 1 2 . . 1 1 1 1 2 CO-1 2 1 2 . . 1 </td <td>Firs Period Assessr</td> <td>it lical ment</td> <td>P As</td> <td>Secon Periodic ssessmo</td> <td>d :al ent</td> <td>Practi Assess s</td> <td>cal sment</td> <td>O reco t Exan</td> <td>bservatio rds as ap he Depar nination C "DEC</td> <td>on / lab proved tment Commit 2″</td> <td>by tee</td> <td>Attene</td> <td>danc</td> <td>ES</td> <td>ε</td>	Firs Period Assessr	it lical ment	P As	Secon Periodic ssessmo	d :al ent	Practi Assess s	cal sment	O reco t Exan	bservatio rds as ap he Depar nination C "DEC	on / lab proved tment Commit 2″	by tee	Attene	danc	ES	ε	
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CO-521121-11<	CO-4	2	2	1	2	-	2	1	2	2	2	1	2	2	1	
1: Weakly related, 2: Moderately related and 3: Strongly related MODULE 1: Introduction to Intelligent Transportation Systems (ITS) (6L+6P) Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection. CO-1 MODULE 2: Telecommunications in ITS (6L+6P) Telecommunications in ITS – Importance of telecommunications in the ITS system, Information Management, Traffic Management Centers (TMC). Vehicle – Road side BTL-2 CO-2 MODULE 3: ITS functional areas (6L+6P) ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle CO-3 Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS). BTL-3 MODULE 4: ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management. Automated Highway Systems. ITS CO-4 Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS BTL-2 Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries. Gel+6P)	CO-5	2	1	1	2	1	-	-	1	-	1	1	1	1	2	
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INICUDULE 2: Telecommunications in TTS(6L+6P)Telecommunications in ITS – Importance of telecommunications in the ITS system, Information Management, Traffic Management Centers (TMC). Vehicle – Road side communication – Vehicle Positioning System.CO-2 BTL-2MODULE 3: ITS functional areas(6L+6P)ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).BTL-3MODULE 4: ITS User Needs and Services(6L+6P)ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management. Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.(6L+6P)MODULE 5: Vehicle-to-Vehicle (V2V) Communications(6L+6P)	Geogra	ohic In	tormat	ion Sys	tems (0	S), vid	eo data	collect	ion.							
Telecommunications in TrS – importance of telecommunications in the TrS system, Information Management, Traffic Management Centers (TMC). Vehicle – Road side ommunication – Vehicle Positioning System.CO-2 BTL-2MODULE 3: ITS functional areas(6L+6P)ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).CO-2 (6L+6P)MODULE 4: ITS User Needs and Services(6L+6P)ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management. Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.Get+6P)MODULE 5: Vehicle-to-Vehicle (V2V) Communications(6t+6P)	Toloos		ecom			n IIS	co. cf. +	olocor	municati	one in	the		tom	(61+61	1	
Information Wanagement, Hame Wanagement Centers (HWC): Venicle – Koad side communication – Vehicle Positioning System.BTL-2MODULE 3: ITS functional areas(6L+6P)ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).CO-3MODULE 4: ITS User Needs and Services(6L+6P)ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management. Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.(6I +6P)MODULE 5: Vehicle-to-Vehicle (V2V) Communications(6I +6P)	Informa	tion N	Janag	omont	5 – III Troffi	nportan	ce or t	Contr	IMUMCAU) Vohi	ido	Dood	sido	CO)-2	
MODULE 3: ITS functional areas(6L+6P)ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).BTL-3MODULE 4: ITS User Needs and Services(6L+6P)ITS User Needs and Services – Travel and Traffic management, Public Transportation 	commu	nicatio	n – Ve	hicle Pr	nann Isitioni	ng Syste	m	Cente		J. Veni		NUau	side	BT	L-2	
ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).CO-3 	MODUL	E 3: IT:	S funct	ionala	reas	18 5 9 5 10								(6L+6	P)	
Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).CO-3 BTL-3MODULE 4: ITS User Needs and Services(6L+6P)ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management. Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.GI + 6P)MODULE 5: Vehicle-to-Vehicle (V2V) Communications(6I + 6P)	ITS fun	ctional	areas	– Adva	nced T	raffic N	lanagen	nent Sv	stems (A ⁻	TMS). A	dvan	ced Tra	veler	(01-10	.,	
Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).BTL-3MODULE 4: ITS User Needs and Services(6L+6P)ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management. Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.BTL-2MODULE 5: Vehicle-to-Vehicle (V2V) Communications(6L+6P)	Informa	tion S	ystem	s (ATIS), Com	mercial	Vehicl	e Oper	rations (0	CVO), A	Advan	ced Ve	hicle	со)-3	
Transportation Systems (ARTS).(6L+6P)MODULE 4: ITS User Needs and ServicesTravel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management. Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.BTL-2MODULE 5: Vehicle-to-Vehicle (V2V) Communications(6L+6P)	Control	Syster	<i>.</i> ns (AV	CS), Ad	lvanced	l Public	Transpo	ortatior	n Systems	s (APTS), Adv	anced	Rural	BT	L- 3	
MODULE 4: ITS User Needs and Services(6L+6P)ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management. Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS 	Transpo	ortatio	n Syste	ms (AR	TS).											
ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management. Automated CO-4 Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS BTL-2 Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries. MODULE 5: Vehicle-to-Vehicle (V2V) Communications (61+6P)	MODUL	E 4: IT:	S User	Needs	and Se	rvices								(6L+6P))	
Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management. Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries. MODULE 5: Vehicle-to-Vehicle (V2V) Communications	ITS Use	er Nee	ds and	d Servi	ces – [·]	Travel a	and Tra	ffic ma	nagemen	it, Pub	lic Tra	ansport	ation			
Management, Advanced Vehicle safety systems, Information Management. Automated CO-4 Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS BTL-2 Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries. MODULE 5: Vehicle-to-Vehicle (V2V) Communications (61+6P)	Manage	ement,	Elec	tronic	Paym	ent, C	Commer	cial V	ehicle (Operati	ons,	Emerg	gency			
Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS BTL-2 Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries. BTL-2 MODULE 5: Vehicle-to-Vehicle (V2V) Communications (61+6P)	Management, Advanced Vehicle safety systems, Information Management. Automated									со	-4					
Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries. MODULE 5: Vehicle-to-Vehicle (V2V) Communications (61+6P)	Highwa	y Syste	ems - V	/ehicles	s in Pla	toons –	Integra	tion of	Automat	ed Higł	יway מיי	System	s. ITS	BTL	2	
MODULE 5: Vehicle-to-Vehicle (V2V) Communications	Progran	ns in ti	ne Wo	ria – 0	verviev	v ot ITS	Implem	nentatio	ons in de	veloped	a cour	ntries, l	15 IN			
INCOULD STREET VEHICLE IVEVICULIATIONS			bicle +	to_Vahi		VI Com	municat	ions						(<u>61</u> , 4	(D)	

Dedica Import Detect mesh r	CO-5 BTL-2							
TEXT B								
1.	Kan Paul Chen, John Miles, ITS Handbook: Recommendations for World Road Association (PIARC)							
2.	Sussman, J. M., Perspective on ITS, Artech House Publishers, 2015.							
3.	Dimitrakopoulos, George: Current Technologies in Vehicular Communication, Springer, 2017.							
REFERE	INCE							
1.	National ITS Architecture Documentation, US Department of Transportation, 2017.							

COURSE TITLE				FUE	L CELL 1	ECHN	OLOGY			(CREDITS		3			
COURSE CODE		EAT	51710	c	COURS	E RY		NE		I	T-P-S		2-0-2	2-2		
Version		1	0	Aj De	oproval etails			36 [™] AC	м	L	.earnin Level	G	BTL-3			
ASSESSN	1ENT	SCHEME														
First Periodical Assessmen t Second Periodical Assessment				A	Practica ssessme s	al ent	Observation / lab records as approved by the Department Examination Committee "DEC"				Attenda	nce	ESI	E		
													Theory	25%		
15% 15% 10% 5%							5%		Practica	l 25%						
Course Descript	ion	The stuc	he students shall develop a basic understanding on working of fuel cell and its applications.													
Course		1. To	1. To present in-depth knowledge of fuel cell technology													
Objectiv	e	2. To	address	the ur	derlyin	g conce	epts, me	ethods a	and app	licatio	n of fuel	cell te	chnolog	у		
Course Outcome	e	Upon cc 1. Dis 2. Ide 3. Inte 4. Gai 5. Ana	ompletic cuss on ntify the erpret a n know alyze an	on of th variou e Fuel (bout th ledge a d com	his cours s types Cells for ne vario about th parative	se, the of Fuel autom us fuel e diffe study	student Cells, it notive ap cell cor rent typ of fuel o	s will be s const oplication nponen ses of fu cells wit	e able to ruction ons. ts & its iels use ch other	o & wor perfo d in Fu	king prir rmance c iel Cells. of alteri	nciples charac nate fu	teristics. iels			
Prerequi	site :	Nil														
CO, PO A	ND F	SO MAP	PING													
0	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PSO	PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	-1	-2		
CO-1	3	1	2	3	-	3	3	-	-	-	2	3	3	1		
CO-2	2	2	2	3	-	2	3	-	-	-	1	2	2	2		
CO-3	3	2	1	3	1	-	-	-	-	-	2	3	3	1		
CO-5	2	1	2	2	2	2	2	-	-	-	1	2	2	2		
CO-5	5	1	· Weak	v relat	ed 2. M	Jodera	telv rel	ated an	d 3∙ Str	ongly	related	5	2	5		
MODULE 1: FUEL CELL TYPES (61+6												+6P)				
Introduc Cells Dir Cells, Sol	MODULE 1: FUEL CELL TYPES Introduction - working and types of fuel cell - Polymer Electrolyte Membrane (PEM) Fuel Cells Direct Methanol Fuel Cells, Phosphoric Acid Fuel Cells, Molten Carbonate Fuel Cells, Solid Oxide Fuel Cells, Regenerative Fuel Cells Alkaline Fuel Cells - low, medium												CO-1 BTL-3			

and high t									
and high temperature fuel cell, Liquid and methanol types, Proton exchange membrane									
fuel cell so	lid oxide, Hydrogen fuel cells - Thermodynamics and electrochemical kinetics								
of fuel cel	S.								
MODULE	2: FUEL CELLS FOR AUTOMOTIVE APPLICATIONS	(6L+6P)							
Fuel cells	or automotive applications - Technology advances in fuel cell vehicle systems	CO-2							
 Onboar 	d hydrogen storage - Liquid hydrogen and compressed hydrogen - Metal	BTI -3							
hydrides,	Fuel cell control system - Alkaline fuel cell - Road map to market.	DIE-5							
MODULE	(6L+6P)								
Fuel cell p	erformance characteristics - Current/voltage, Voltage efficiency and power								
density, d	hmic resistance, Kinetic performance, Mass transfer effects - Membrane	CO-3							
electrode	assembly components, Fuel cell stack, Bi-polar plate, Humidifiers and cooling	BTL-3							
plates.									
MODULE	4: FUELLING	(6L+6P)							
Hydrogen	storage technology - Pressure cylinders, Liquid hydrogen, Metal hydrides,	CO-4							
Carbon fil	ers- Reformer technology - Steam reforming, Partial oxidation, Auto thermal	BTI-2							
reforming	- CO removal, Fuel cell technology based on removal like bio-mass.	DIE-5							
MODULE	5: FUEL CYCLE ANALYSIS	(6L+6P)							
Introduct	on to fuel cycle analysis - Application to fuel cell and other competing	CO-5							
technolog	ies like battery powered vehicles, SI engine fueled by natural gas and	CO-5							
hvdrogen and hvbrid electric vehicle.									
nyarogen	and hybrid electric vehicle.	BTL-3							
BOOKS	and hybrid electric vehicle.	BTL-3							
BOOKS 1.	Fuel Cells for automotive applications – professional engineering publishing 4233, 2004.	BTL-3 ; UK. ISBN 1- 86058							
BOOKS 1. 2.	Fuel Cells for automotive applications – professional engineering publishing 4233, 2004. Fuel Cell Technology Handbook SAE International Gregor Hoogers CRC Press I	BTL-3							
BOOKS 1. 2. REFERENCI	Fuel Cells for automotive applications – professional engineering publishing 4233, 2004. Fuel Cell Technology Handbook SAE International Gregor Hoogers CRC Press I BOOKS	BTL-3 ; UK. ISBN 1- 86058 SBN, 2003.							
BOOKS 1. 2. REFERENCI 1	Fuel Cells for automotive applications – professional engineering publishing 4233, 2004. Fuel Cell Technology Handbook SAE International Gregor Hoogers CRC Press I BOOKS O'Hayre, R.P.,S. Cha, W. Colella, F.B.Prinz, Fuel Cell Fundamentals, Wiley, NY (2000)	BTL-3 ; UK. ISBN 1- 86058 SBN, 2003. 2006).							
BOOKS 1. 2. REFERENCI 1 2	 Fuel Cells for automotive applications – professional engineering publishing 4233, 2004. Fuel Cell Technology Handbook SAE International Gregor Hoogers CRC Press I BOOKS O'Hayre, R.P.,S. Cha, W. Colella, F.B.Prinz, Fuel Cell Fundamentals, Wiley, NY (2007). 	BTL-3 ; UK. ISBN 1- 86058 SBN, 2003. 2006).							
BOOKS 1. 2. REFERENCI 1 2 3	 and hybrid electric vehicle. Fuel Cells for automotive applications – professional engineering publishing 4233, 2004. Fuel Cell Technology Handbook SAE International Gregor Hoogers CRC Press I BOOKS O'Hayre, R.P.,S. Cha, W. Colella, F.B.Prinz, Fuel Cell Fundamentals, Wiley, NY (2007) Basu,S.(Ed) Fuel Cell Science and Technology, Springer, N.Y. (2007). Liu, H.,Principles of fuel cells, Taylor & Francis, N.Y. (2006). 	BTL-3 ; UK. ISBN 1- 86058 SBN, 2003. 2006).							
BOOKS 1. 2. REFERENCI 1 2 3 MOOC	 and hybrid electric vehicle. Fuel Cells for automotive applications – professional engineering publishing 4233, 2004. Fuel Cell Technology Handbook SAE International Gregor Hoogers CRC Press I BOOKS O'Hayre, R.P.,S. Cha, W. Colella, F.B.Prinz, Fuel Cell Fundamentals, Wiley, NY (2007). Basu,S.(Ed) Fuel Cell Science and Technology, Springer, N.Y. (2007). Liu, H.,Principles of fuel cells, Taylor & Francis, N.Y. (2006). 	BTL-3 ; UK. ISBN 1- 86058 SBN, 2003. 2006).							
Anydrogen BOOKS 1. 2. REFERENCI 1 2 3 MOOC 1.	 and hybrid electric vehicle. Fuel Cells for automotive applications – professional engineering publishing 4233, 2004. Fuel Cell Technology Handbook SAE International Gregor Hoogers CRC Press I BOOKS O'Hayre, R.P.,S. Cha, W. Colella, F.B.Prinz, Fuel Cell Fundamentals, Wiley, NY (2007). Basu,S.(Ed) Fuel Cell Science and Technology, Springer, N.Y. (2007). Liu, H.,Principles of fuel cells, Taylor & Francis, N.Y. (2006). https://archive.nptel.ac.in/courses/103/102/103102015/ 	BTL-3 ; UK. ISBN 1- 86058 SBN, 2003. 2006).							

COURSE	SENSOR TE	CHNOLOGY & SE	NSOR FUSION FOR	CREDITS	3						
TITLE		AUTONOMOUS	S CAR								
COURSE	EAT51711	COURSE	NE	L-T-P-S	2-0-2-2						
CODE		CATEGORY			2-0-2-2						
VERSION	1.0	APPROVAL	36 th ACM	LEARNING	BTL-3						
		DETAILS		LEVEL							
ASSESSMENT SCHEME											
			Observation / lab								
First	Second	Practical	records as approved		End Somostor						
Periodical	Periodical	Assessments	by the Department	Attendance	End Semester						
Assessment	Assessment		Examination		Examination						
			Committee "DEC"								
15%	15%	10%	5%	5%	Theory 25%						
1576	1370	10/0	5/0	5/0	Practical 25%						
Course	The goal of the	course is to int	roduce students to the	various Senso	r technologies and						
Description	techniques used i	n autonomous ca	ar.								
	The course shoul	d enable the stud	dent to:								
	1. To learn the	concept of autor	omous car and its archite	ecture							
Course	2. To learn the	concept of an en	vironment perception sy	stem							
Objectives	3. To learn the	concept of the p	ositioning system								
	4. To learn the	concept of the st	ate estimation and locali	zation							
	5. To learn the	concept of Senso	or Fusion and system inte	gration technic	lues						

		Upor	n compl	etion o	of this cou	urse, the	studer	nts will	be able	e to				
		1 1	dentify	the co	ncent of	autonon	nous ca	ir and it	ts archi	tecture				
Cours	е	2. 1	Interpre	et the c	oncept of	f an env	ironme	nt perc	ention	system				
Outco	mes	3 1	Discuss	the co	ncent of	the nosit	ioning	system	eption	System				
		4. 1	Develor	the co	incept of	the stat	e estim	ation a	nd loca	alization				
		5. 1	Design	the con	icept of S	iensor Fi	usion ar	nd svste	em inte	gration	technio	ues		
Prerequisites: Nil														
CO, PO	O, PO AND PSO MAPPING											-		
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO1	PSO2
CO-1	-	2	-	-	1	-	1	-	-	-	-	-	2	-
CO-2	2	-	-	3	-	-	-	-	-	-	-	-	-	2
CO-3	-	-	2	-	-	2	-	1	-	-	-	-	-	1
CO-4	- 2	2	-	-	-	-	-	-	-	1	-	-	2	-
0-5	2	- 1 - V	- Veakly (orrela	 ted 2 - N	- Aoderate	- lv Corr	- elated	- and 3 -	Strong	v Corre	- lated	-	2
Modul	e 1 – Ir	troduc	ction to	Auton	omous C	ars and	its Arch	nitectu	re	otrongi	,	latea	(6L+	-6P)
Тахор	omy of	Drivin		iromor	ats for Bs	rcontion	Drivir		cions a	nd Actio	nc Sor	sore	•	•
and C	onny or omput	ing Ha	ardware	Harı -Harı	dware C	onfigura	tion D	lg Deci Jesign	-Softw	are Arc	hitectu	re -		
Enviro	nment	Repres	sentatio	on -Safe	ety Frame	eworks fo	or Self-I	Driving			meetu		cc)-1
Case S	tudies	on Goo	ogle car	– Ube	r car			U					BT	L-3
Practic	e on M	ATLAB	Autom	ated D	riving To	ol Box –	Introdu	iction						
Modul	e 2 – Ei	nvironi	ment Po	ercepti	on Syste	m							(6L+	-6P)
Dociti	on and	orionta	ation Ec	timatic		P. Soncor		Sonco	r Mode		oint Cl	aude	•	•
	Fstima	tion fr	om LID	AR Data	οπ - LIDA a -RΔΠΔΕ	R Sensor	-LIDAR	a senso ar Mod	r ivioue els - Pr	els anu P Nee Estin	nation f	from		ר ר
RADAF	R Data -	Camer	a and c	omput	er vision	- Pose Es	stimatio	on met	hods.	JSC LStin	lation	10111	BT	J-2 'L-3
Practic	e on M	ATLAB	Autom	ated D	riving To	ol Box us	ing LID	AR/ RA	DAR/ C	Camera	Sensor			
Modul	e 3 – P	osition	Estima	tion Sy	vstems a	nd advar	nced m	echatro	onics sy	/stems			(6L⊦	⊦6P)
GNSS/	'INS Se	nsing	for Pos	e (posi	ition and	l orienta	ition) E	stimati	on -Ul	trasonic	Senso	r-IR		
Sensor	- IMI	Js -Nig	ght Visi	ion Teo	chnology	– adva	nced r	nechat	ronics	system	-Intelli	gent	С	D-3
mecha	tronics	- intel	ligent c	omputa	ation -EC	U Archit	ecture	- Senso	r hardv	ware arc	hitectu	re.	ВТ	'L-3
Practic	e on M	ATLAB	Autom	ated D	riving To	ol Box –	Design	technic	ques					
Modul	e 4 – St	ate Es	timatio	n, Loca	lization	and Veh	icle cor	ntrol					(6L⊦	+6P)
State	Estima	tion a	nd Opt	imizing	- The	Challeng	es of S	State E	stimati	on -Pat	h Plani	ning,		
Auton	omy ar	nd Deci	ision M	laking ·	- Vehicle	control	and A	ctuatio	n - Lor	ngitudina	al & La	teral	cc)-4
Vehicle	e Mode	eling an	id conti	ol	<u>+</u>								BT	L-3
Practic		ATLAB	Autom	ated D	riving To	DI BOX -	venicie	contro	logic				(1
Modul	e 5 – So	ensors	Fusion	and In	tegratior	n of Sens	or Data	9					(6L-	-6P)
Fusior	Meth	ods in	Perce	otion S	ystems	Fusion	Methoo	ds in P	osition	ing Syst	ems -N	∕lulti		
sensor	Fusion	for Sta	ite Estir	nation	-Sensor (Calibratio	on-use	of sens	or fusic	on data -	Integra	ation	CC BT)-5 I_/I
or sen	sor Dat		I-BOard		JI System	is - Integ		took -	jues.				DI	
Practic		ATLAB	Autom	ated D	iving 10	U ROX –	resting	techni	ques					
TEXT B	UUKS	rades	Handle		Modern	Concess	Contract	or 2	- :+: -	2010				
<u>1</u>	Simon I		Wilev	Semico	nductor	Sensors	Inters	cience	3 editi	1, 2010.)			
REFER		OOKS	wiicy,	Jennet	muuctur	3613013	, inters	cience,	Jeun	511, 2012				
1.	Google	car –w	/aymo -	Uber o	ar – Tov	ota cars ·	– Volvo	cars						
E BOOI	(S				,									

1.	https://www.amazon.in/Introduction-Self-Driving-Technology-Artificial-Intelligence
MOO	C
1	

1. https://www.coursera.org/specializations/self-driving-cars

Semester-VII

COURS TITLE	E		PLANT	LAYOL	JT AND	MATER	RIAL HA	NDLIN	3		CREDIT	s	3	
COURS CODE	SE E	EAT51712 COURSE NE CATEGORY								L-T-P-S	;	2-0-2	2-2	
VERSIC	DN		1.0		APPRO DETAI	VAL LS		36 th AC	M	L	EARNIN LEVEL	IG	BTL	-3
ASSESSM	IENT S	CHEME												
First Periodio Assessm (Theor	cal ent y)	Se Per Asse (Tl	econd iodical essmen neory)	t A	Practical Assessm	l Ient	Obse recore by th Ex Com	ervation ds as ap e Depa caminat mittee	n / lab oprovec rtment tion "DEC"	I A1	tendar	ice	ESI	E
														25%
15%		15% 10% 5% F											Pract 25%	ical %
Course DescriptionThe aim of this course is to empower students on selection of plant location, design plant layout and analyses of suitable material handling equipment's for the prevailing environment.														
Course Objective	es	 To familiarize on Selection of plant location To acquire the knowledge on design the Plant layout. To obtain knowledge on Material handling Equipment. To gain knowledge on Packing of the Products and storage techniques. To expertise in various analysis of Material Handling Equipment. 												
Course Outcome	:5	Upon c 1. 2. 3. 4. 5.	omplet Identi Acqui Obtai Gain I Exper	ion of t fy the f re the l n know knowled tise in v	his cou actors o nowled ledge o dge on various	rse, the on Sele dge on o n Mate Packing analysi:	e studer ction of design t rial har g of the s of Ma	nts will plant l he Plar ndling E Produc terial H	be able ocation It layou quipme ts and s andling	to t on the ent for T storage ; Equipr	eir own Their Pla technio nent.	ant. ques.		
Prerequis	ites: N	lil												
CO, PO A	ND PS	О МАРР	ING											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO 11	PO 12	PSO 1	PS O2
CO-1	3	2	-	1	2	-	3	1	-	2	3	-	3	-
CO-2	3	2	-	1	2	-	3	1	-	2	3	-	2	-
CO-3	3	2	-	1	2	-	2	1	-	2	3	-	3	-
CO-4	3	2	-	1	2	-	2	-	-	-	2	-	2	-
CO-5	3	2	-	1	2	-	3	-	-	-	2	-	1	-
1 - Weakl	y Corr	elated,	2 - Mod	lerately	/ Correl	ated ar	nd 3 - S	trongly	Correla	ted			- <i>i</i> I	
Module 1	– PLA		ATION	AND SE	RVICES								(6L+	+6P)

Plant Location: Factors to be considered – Influence of location on plant layout – Selection of plant site – Equipment required for plant operation – Capacity, serviceability and flexibility – Analysis in selection of equipment and space requirements – Buildings. Plant Services: Lighting, heating, ventilation and air conditioning – Utilities supply	CO-1 BTL-3						
Practical : Case study on selection of location for an automobile manufacturing plant.							
Module 2 – PLANT LAYOUT	(6L+6P)						
Factors influencing layout – Work center layout – Process and product layout – Tools and techniques for developing a proper layout – Process chart – Flow diagram – Scale model – Machine data – Visualization of layout – Revising and improvising existing plant layout – Balancing of fabrication and assembly lines Practical: Layout design softwares							
Module 3 – INTRODUCTION TO MATERIAL HANDLING	(6L+6P)						
Importance and scope of material handling – Principles of material handling – Planning, operating and costing principles – Types of material handling systems – Factors influencing choice of material handling systems Practical: Field study on material handling devices	CO-3 BTL-3						
Module 4 – PACKAGING AND STORAGE	(6L+6P)						
Importance of packaging industry – Packaging machinery – Cushion materials – Wrapping and packaging of materials. Stores - planning and design - Storage systems and procedures – Different types and arrangement of storage racks – Automated storage and retrieval systems. Practical; Design of simple storage systems							
Module 5 – ANALYSIS OF MATERIAL HANDLING	(6L+6P)						
Factors in material handling analysis – Motion analysis – Flow analysis – Safety analysis – Equipment cost analysis – Palletization analysis – Analysis of operation Practical: Case study on safety measures.	CO-5 BTL-3						
TEXT BOOKS							
1. Plant Layout & Material Handling G K Agarwal, Publisher: Jain Brother, 2017							
REFERENCE BOOKS							
1. Dougals Considine, Standard Handbook of Industrial Automation, Chapman & Hall, 2012							
2. Immer, Material Handling - McGraw Hill., 2007							
3 James Apple, Plant Layout and Material Handling - John wiley, 1991							
1 https://www.smartzworld.com/potes/plant-layout-material-handling-potes-pdf-plmh-pot	es-ndf						
2 http://www.smarizwonu.com/notes/plant-layout-material-nanuling-notes-put-pimn-notes-par							
MOOC							
MOOC 1. https://www.mooc-list.com/course/materials-and-materials-processing-saylororg							

COURSE	ELECTRIC VEHICLE	TECHNOLOGY		2							
TITLE		WHEELER	CREDITS	3							
COURSE CODE	EAT51713	COURSE CATEGORY	NE	L-T-P-S	2-0-2-2						
VERSION	1.0	APPROVAL DETAILS	36 th ACM	LEARNING LEVEL	BTL-3						
ASSESSMENT SCHEME											

Fir: Perio Assess (The	st dical ment ory)	Second Practical records as al Periodical Assessment Department Attendance () (Theory) (Theory) Committee "DEC"					e	End Semester Examination							
15	%		15%		10%			5%			5%		Theory Practica	25% I 25%	
Cou Descri	irse ption	This c a flag	ourse v ship Er	will ena ngineer	ble the s ⁻ in the E\	tudents / market	to deve t.	elop stu	udents'	skills ma	aking t	hem c	ו competent and		
Course Object Course Outcor	e ives e mes	 To identify Battery Technologies To recognize on motor and controllers To describe the charging technologies To evaluate the troubleshooting techniques Upon completion of this course, the students will be Recall concepts of electric vehicle & performance of electric vehicles. Identify Battery Technologies Recognize on motor and controllers Describe the charging technologies Evaluate the troubleshooting techniques 													
Prerequisites: Nil															
COs			POS	PO4	PO5	PO6	PO7	POS	PO9	PO10	РО	РО	PSO1	PSO2	
co 1	2	0	0	0	1	0	0	0	0	0	11 0	12 0	1	1	
CO-1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	
CO-3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
CO-4	0	0	0	0	1	0	0	0	0	0	0	0	1	2	
CO-5	0	0	3	0	1	0	0	0	0	0	0	0	3	3	
		1 - W	eakly C	Correlat	ted, 2 - M	oderate	ly Corr	elated	and 3 -	Strongly	/ Corre	lated	(6)		
Module	e 1 – EL	ECTRIC		LES									(OL-	ror)	
Electric Basic p	: Vehicl rincipal	e – Hist and co	ory, Im mpone	pact o ents of	n Environ an Electri	ment – ic Vehicl	Well to e, HEV,	Whee PHEV	l conce	pt, Futu	re of E	V.	CC BT)-1 L-3	
Module	e 2 – B/	ATTERY	TECHN	IOLOG	Y								(6L-	⊦6P)	
Termin in Auto	ology a motive	nd Des Batter	criptior ies for	n about Dynam	Integral ic Applica	part of a ations.	BEV, B	attery 1	rechnol	ogy and	Innova	ation	C(B1	D-2 "L-3	
Module	e 3 – N	1OTOR	AND C	ONTRO	OLLERS								(6L-	⊦6P)	
Propuls Electro	sion Sy nics Co	stem - ntroller	- Tract	ion M	otor / H	ub Mot	or, Ba	ttery N	Manage	ment S	ystem	and	C(B1	D-3 TL-3	
Module	e 4 – Cł	IARGIN	IG TECI	HNOLO	GY								(6L+6P)		

EV C	harging – External and On Board Chargers. Various Methods of Charging.	CO-4 BTL-3							
Mod	ule 5 – TROUBLESHOOTING	(6L+6P)							
Basic	: Troubleshooting, Fault Tree Analysis (FTA)	CO-5 BTL-4							
TEXT	BOOKS								
1.	Longo, Stefano, et al. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles. United Sta Press, 2018.	ites, CRC							
2.	James Larminie and John Loury, "Electric Vehicle Technology-Explained", John Wiley & Sons Ltd., 2013.								
REFE	RENCE BOOKS								
1.	Robert Bosch Automotive Handbook, 10th Edition (2018)., BOSCH 10, ISBN of 978-0-768	30-9567-8.							
2.	Tom Denton., "Electric and Hybrid Vehicles" 2020.								
E BO	OKS								
1.	https://shorturl.at/ahvAJ								
2.	https://shorturl.at/arxzH								
MOC									
1.	https://elearn.nptel.ac.in/shop/iit-workshops/completed/e-mobility-and-electric-vehicle- engineering/								
2.	https://nptel.ac.in/courses/108106170								

COURSE	INTR	3				
TITLE						
COURSE	EAT51714	COURSE	NE		L-T-P-S	2-0-2-2
CODE		CATEGORY				
VERSION	1.0	APPROVAL DETAILS	36 th ACM		LEARNING LEVEL	BTL-5
ASSESSMENT	SCHEME					
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessment	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance End S Exam		End Semester Examination
15%	15%	10%	E%		E%/	Theory 25%
15%	15%	10%	5%		3%	Practical 25%
Course Description	This course wil commonly use self-driving sof frameworks an	ll provide comp d hardware use ftware stack, F d current indus	lete knowledge to the un ed for self-driving cars , I Program vehicle modellir try practices for vehicle d	dergra dentif ng and levelo	aduate stude fy the main c d control , A pment	nts on Understand components of the Analyze the safety
Course Objectives	 To impart To educate To impart To impart To instruct To educate 	the knowledge e about condition the knowledge the knowledge e about Control	on Self-Driving Hardware on of Object Detection in on Sensor Fusion & Perce on Localization and Plan & Trajectory Tracking for	and S an Url eption ning Auto	Software Arch ban Environn nomous Vehi	nitectures nent cles
Course Outcomes	Upon completi 1. Discuss on 2. Identify Ol 3. Develop th 4. Discuss the 5. Develop th	on of this cours Self-Driving Ha bject Detection he Sensor Fusion e Localization a he Control & Tra	e, the students will be ab rdware and Software Arc in an Urban Environment n & Perception nd Planning ajectory Tracking for Auto	le to hitect	ures ous Vehicles	

Prere	Prerequisites: Nil																				
CO, F	PO AND	PSO M	IAPPIN	G																	
COs		1	1		[1	F	POs					PS	iOs 🛛							
	1	2	3	4	5	6	7	8	9	10	11	12	1	2							
CO-1	3	3	2	2	2	1	1	-	-	-	1	-	3	1							
CO-2	3	2	2	3	2	1	-	-	-	-	-	-	3	2							
CO-3	2	3	3	2	1	1	1	-	-	-	-	-	2	2							
CO-4	2	2	2	2	2	1	-	-	-	-	1	-	3 2	2							
0-5	5	1_1) Waakh	S (Corre	- 2 hatele	 2 - Mod	- orat	- ely Correlat	- And and 3	- Strong	The second se	- I	2	5							
Mod	ule I – II	ntrodu	iction	, cont		2 10100				5001		.cu	(6	L+6P)							
The	Requiren	oonts f	for Aut	onom	ر. ارامک	Driving	Hard	lware and S	oftware	Architer	turos			0 1							
Safety Assurance for Autonomous Vehicles - Vehicle Longitudinal Control - Vehicle Lateral Control									B	.0-1 TI -2											
Jaiet	y Assula	nce io	n Auto		us veni	cies- ve		ELUNGILUUN		JI- Verno		Control									
Mod	ule II – (Compu	uter Vi	sion									(6	L+6P)							
Obje	ct Detec	tion ir	n an Ur	ban Ei	nvironm	nent - T	he N	lachine Lea	rning Wo	orkflow -	Sensor &	Camera		0-2							
Calib	oration -	From I	Linear	Regre	ssion to	Feedfo	rwa	rd Neural N	etworks	- Image	Classificati	on with	E	BTL-2							
Conv	olutiona	l Neur	ral Net	works	- Objec	t Detec	tion	in Images													
Mod	ule III – S	Sensor	r Fusio	n									(6	L+6P)							
Introduction to Sensor Fusion & Perception - The Lidar Sensor- 3D Object Detection - 3D lidar											CO-3										
point clouds - Kaiman Filters - Extended Kaiman Filters - Multi-Tracking Tracking											51L-3										
										(6	L+6P)										
Intro	oduction	to Loo	calizati	on- M	arkov L	ocalizat	ion-	Creating Sc	an Match	ning											
Algo	orithms-	Utilizi	ng Sca	n Ma	tching i	n 3D-	Scar	Matching	Localizat	ion - N	lotion Plar	ning &	C	0-4							
Deci	sion Mal	king fo	or Auto	nomo	us Vehi	cles - B	ehav	ior Plannin	g - Trajeo	tory Ge	neration -	Motion	B	TL-2							
Plan	ning - a d	lecisio	n maki	ng tra	mewor	k to pla	nav	/ehicle's mo	otion in a	n urban	environme	ent									
Mod	ule V–	Contro	ol & Tr	ajecto	ory Trac	king fo	r Au	tonomous \	/ehicles				(6	L+6P)							
Cont	rol & Tra	jector	ry Tracl	king fo	or Autor	nomous	s Veł	nicles – PID	Control F	PID and	MPC for tra	jectory									
track	king usin	g the P	ID con	troller	- contr	oller wi	th no	on-linear dy	namics -	Recogni	ze the obse	rvation	C	0-5							
of th	e state o	of the v	vehicle	(posit	ion, vel	ocity),	the						B	TL-3							
actio	on (steer	ing, ac	celera	tor, br	ake) an	d the p	ossi	ble perturba	ations												
TEXT	BOOKS																				
1.	Hanky	Sjafrie	, Introd	ductio	n to Sel	f-Drivin	g Ve	hicle Techn	ology, 20	19, CRC	PRESS										
2	Michae	IE. M	lcGrath	ı, Aut	onomo	us Vehi	cles	: Opportuni	ities, Stra	tegies a	nd Disrupt	ions: Up	odate	d and							
	Expand	ed Seo	cond E	dition	2019																
REFE	RENCE B	OOKS																			
1. Andreas Herrmann and Johann Jungwirth , Inventing Mobility for All: Mastering Mobility-as-a										is-a-s	ervice										
E BO	E BOOKS																				
	Shaosh	an Liu	ı, Liyu	n Li,	Jie Tan	g , Shu	ang	Wu , Creat	ing Auto	nomous	Vehicle Sy	stems ,	Mor	gan &							
1.	Claypo	ol Pub	licatio	n 2020)		-														
2	Sreeva	tsan E	Bhaska	ran ,	Kai Zho	u , And	drew	Baab , Ro	nald Call	oun"/	Autonomo	us Vehio	le Lio	dar: A							
۷.	Tutoria	l"Kind	lle																		
MOC	C																				
1.	https:,	//www	v.cours	era.or	g/learn	/intro-s	self-	driving-cars													
2.	https:,	//www	v.udaci	ty.con	n/cours	e/self-c	lrivi	ng-car-engir	neer-nan	odegree	2. https://www.udacity.com/course/self-driving-car-engineer-nanodegreend0013										

COU TIT	RSE LE	AUTOMOTIVE AIRCONDITIONING AND CLIMATE CONTROL CREDITS											3	
cou co	JRSE DE	E	AT5171	5	COU CATEC Y	RSE GOR		NE			L-T-P-	s	2-0-2	2-2
VERS	SION		1.0		APPR AL DETA	ROV 		36 th AC	CM	I	LEARNII LEVEI	NG -	BTL	-3
ASSES	SMEN	SCHEN	ΛE											
Fir Perio Asses t (The	rst dical smen eory)	Sec Peric Asses (The	ond odical sment ory)	Pract Asses	ical sment		Observa as aı E Examin	ition / I oproved epartm ation C "DEC	ab reco I by the nent ommitt "	tee	ttenda	nce	End Semester Examination	
15	5%	15	5%		10%			5%			5%		Theory Practica	25% al 25%
Cou Descr r	irse riptio 1	To ena contro	able the I and Ai	stude r condi	nts gair tioning	n know service	ledge o	n Autor	notive	air con	ditionin	g, Elec	tronic c	limate
Cours Object	e tives	The co 1. To 2. To 3. To 4. To 5. To	 To Know about the automotive air conditioning fundamentals. To understand the concepts and components of automotive cooling and heating systems To learn about the refrigerants and handling of refrigerants. To Know the working of automotive sensors used for climate and temperature control. To Know about the servicing of automotive air conditioning system. 											
Cours Outco	se Imes	Upon 1. Fa 2. G Sy 3. Aa 4. At 5. Fa	comple amiliariz ain kno vstems. cquire t ttain th ontrol. amiliariz	tion of e on fu wledge he know e know	this cou indament on the wledge vledge c ervicing	orse, th ntals of conce on refrion on worl	e studen automo pts and gerants king of motive	nts shou otive air compo and its automo air cono	uld be a condit onents handlir otive se ditionin	ble to: ioning s of auto ng. nsors fo g syster	systems motive or clima n.	coolin ate and	g and h d tempe	eating rature
Prerec	quisites	: Nil												
СО, РС	D AND F	PSO MA	PPING	1	1	1	1		1		1			
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	РО 11	РО 12	PSO 1	2 2
CO-1	3	3	2	3	1	2	-	2	-	-	1	1	1	1
0.2	<u>う</u>	1	2	1	1	1	-	1 2	-	-	1	1	2 1	1 2
CO-4	3	1	2	1	1	1	_	1	_	_	1	1	1	1
CO-5	3	1	2	1	1	1	-	1	-	-	2	1	2	2
1 - We	akly Co	rrelate	d, 2 - M	oderat	ely Corr	elated	and 3 -	Strong	y Corre	lated	•			
Module 1 – AUTOMOTIVE AIRCONDITIONING FUNDAMENTALS											(6L+6	SP)		
Introdu layer c vehicle mixtur	uction f depletic e refrig res- Psy	to Heati on- Loca geration chrome	ng, Ven tion of syster tric Cha	tilation air con n. Psy rt- Rela	and Aiı ditionin chrome ited sim	r Condi Ig comp try – Iple bas	tioning- oonents Basic t ic probl	Enviror in a ca ermino ems	nmenta r – Scho logy ai	l Conce ematic nd Psy	rns- Oz layout (chrome	one of a etric	CO- BTL	1 -3
Modu	le 2 – A	итомс	DTIVE CO	DOLING		IEATIN	G SYSTE	м					(6L+6	5P)
Vehic systen condit electri	Vehicle Refrigeration System and related problems- Fixed thermostatic and Orifice tube system- Variable displacement thermostatic and Orifice tube system- Vehicle air conditioning operation Types of compressor- Compressor Clutches- Compressor Clutch BTL-3CO-2 BTL-3electrical circuit- Compressor lubrication- Condensers- Evaporators- Expansion devices-BTL-3													

Eva hos								
Мос	(6L+6P)							
Diffe Auto Auto	CO-3 BTL-3							
Мос	dule 4 – AUTOMOTIVE ELECTRONIC CLIMATE AND TEMPERATURE CONTROL	(6L+6P)						
Diffe Auto Auto	CO-4 BTL-3							
Мос	(6L+6P)							
Tem Retr	Temperature measurements – Refrigerant recovery, recycle and charging-system flushing, Retrofitting – Replacement and adjustment of compressor componentsCO-5 BTL-3							
TEX	T BOOKS							
1.	Steven Daly- "Automotive Air –Conditioning Climate Control Systems" - Butterworth Elsevier Publications -2011.	– Heinemann –						
2.	William H. Crouse and Donald I. Anglin - "Automotive Air conditioning" - McGraw Hill Ir	nc 1990.						
REF	ERENCE BOOKS							
1.	Boyce H.Dwiggins - "Automotive Air Conditioning" - Delmar – 2002. Mitchell informatic "Mitchell Automatic Heating and Air Conditioning Systems" - Prentice Hall Ind. – 1989	on Services, Inc -						
2.	Paul Weiser - "Automotive Air Conditioning" - Reston Publishing Co., Inc., - 1990							
E BO	OKS							
1. https://www.elsevier.com/books/automotive-air-conditioning-and-climate-control-systems/daly/978- 0-7506-6955-9								
2.	2. https://link.springer.com/book/10.1007/978-3-319-33590-2							
MO	oc							
1.	https://nptel.ac.in/courses/112107208							
2.	https://www.edx.org/course/distribution-and-control-of-heat-cold-and-air-flows-in-bu	uildings						

MANDATORY COURSES I

COURSE TITLE	INTRODU	CTION TO WOME	N AND GENDER STUDIES	CREDITS	Non Credit Course
COURSE CODE	GGE51011	COURSE CATEGORY	L-T-P-S	30-0-2	
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3
ASSESSMENT SCH	IEME				
		CIA			
First Periodical Assessment	Second Periodical Assessment	Seminar/Assi gnments/Proj ect	Surprise Test / Quiz etc., as approved by the Department Examination Committee "DEC""	Attendance	ESE
15%	15%	10%	5%	5%	50%

Cou Descri	irse iption	This idea gen ens this	This course has been introduced in the light of NEP-2022. It is a mandatory course idea is to sensitize the student in understanding gender and women and issues rela- gender in general and women in particular. To dispel 'stigma' shun 'social taboos' ensure break the glass ceiling. Change in perceptions through knowledge is the ob- this course.										course s relat boos' a he obj	e. The ing to and to ect of
Course Objectiv	'e	1. 2. 3. 4.	To und To kno To hav To ma	lerstand ow abou ve an ins ke the s	d the co It Femir sight inf tudent	oncept o nism – a to healt s – geno	of Gend and the h and le der sens	er – no types – egal issi sitized-	rms- th - jurispr ues- spe to shur	eories - udence ecific to n 'stigm	- types e of fem women a' and '	etc. inism. n – Socia social ta	l barri boos'	ers.
Course Outcom	e	 enumerate the basis of gender norms and related theories. sensitize on issues relating to gender -orientation- issues therein. appraise the concept of feminism – as a doctrine. classify the types of feminism and highlight the essential features of them summarise women related laws and connect to women centric issues i arena 										n s in sc	ocietal	
CO, PO	CO, PO AND PSO MAPPING													
со	РО- 1	РО- 2	РО- 3	РО- 4	РО- 5	РО- 6	РО- 7	РО- 8	РО- 9	РО- 10	PO- 11	PO- 12	PS 0- 1	PSO -2
CO-1	-	-	-	-	-	-	2	3	2	2	-	1	-	-
CO-2	-	-	-	-	-	-	2	3	2	2	-	1	-	-
CO-3	-	-	-	-	-	-	2	3	2	2	-	1	-	-
CO-4	-	-	-	-	-	-	2	3	2	2	-	1	-	-
0-5	-	-	-	-	-		2	<u>з</u>	2	2		Ŧ	-	-
		1	: Weak	y relate	ed, 2: N	loderat	ely rela	ited an	d 3: Str	ongly r	elated			
Module theories	1: Basis	s of Ger	nder no	rms an	d									(9L)
Key con theory, (Matriarc National	cepts ir Gender chy and I Comm	Gende and So Patriar ission f	er studio cial ord chy - W or Won	es - Ger er omen's nen.	ider an Mover	d Sexua nents –	lity, Sex	k and G	ender, (y Debat	Gender :es- " <i>M</i> o	and So ee Too'	cialist -	C(B1	D-1 TL-3
MODUL	E 2: Ty	oes of g	gender										-	(9L)
Types of Sexuality	f gende y, 6. Inte	r – 1. N er Sex	lasculin	e, 2, Fe	minine,	, 3, Trar	nsgende	er, 4, Tr	ans-Sex	uality,	5, Bi-		C(B1	D-2 "L-3
MODUL	E 3: Sex	ual												(01)
Hetro-9	Sexuality	v. Hor	nosexu	als	1. Les	bian an	d their	"ism"	2 6	iavs an	d			(9L) D-3
their "T	their "Theory", Trans Sexulism , BI - Sexualism BTL-3													
MODUL Feminis	MODULE 4: Introduction to Feminism (9L)													
Feminisr Feminisr	Feminism Theory, Types of Feminism (More than 12 feminisms) , 1, Social Feminism 2, Radical Feminism , 3, Black Feminism , 4, Dalit Feminism , 5, Queer Theory -CO-4 BTL-3									D-4 "L-3				
MODUL	E 5: Wo	men, H	lealth a	nd										(01)
Law Health –	Life Cv	cle Ann	roach-	Health	Status -	- Renro	ductive	Righte-	Sex Rat	tio - We	men ha	ave		(9L) 2-5
always G	Glass Ce	iling,	- ouch's	. icuiti i		nepro-		115115					BT	L-3

Women Rights as Human Rights- Constitution and Women – Gender Equality –										
Discriminatio	n-									
Personal Law	rs- Family Courts – Crime Against Women-Children-Sexual Harassment at Work									
Place Act-202	13. Human Trafficking -									
Women as se	econdary to men in social context / order, Women centric issues in Societal arena									
TEXT BOOKS										
1.	Mamatha Rao – 'Law Relating to Women and Child'- EBC Publishers, Lucknow									
2.	'Feminist Jurisprudence'- Rosanne Kennedy, 1993									
3.	Sexual Harassment and Violence against Women- Charles V. Dale									
4.	Sexual Harassment of Working Women- Catharine Mackon									
References										
1	Feminist Legal Theory- Rosanne Kennedy, 1993									
2	Sexual Harassment of Women at Workplace- R.C. Jiloha, 2021									
3	Human Trafficking- Virendra Mishra, 2013									
E Resources										
1.	Theory of Feminism- https://en.wikipedia.org/wiki/Feminism									
	Sexual Harassment of Women at Workplace-									
2.	https://www.legalservicesindia.com/article/2114/Sexual-Harassment-of-Women-at-									
	Workplace.html									
	Human Trafficking- https://www.unodc.org/unodc/en/human-trafficking/human-									
3. trafficking.html										

COURSE 1	TITLE		PUBLIC A ADMI	AND PER NISTRAT	CREDITS		Non Credit Course			
COURSE COI	DE	GGE51012	COURSE I CATEGORY				L-T-P-S		3-0-0-2	
Version	1.0	Appro	oval Details		36th ACM		LEARNI LEVE	NG L	BTL-3	
			ASSESS	SMENT S	CHEME					
First Periodical Assessment	Secon Periodi Assessm	d cal ient	ar/Assign s/Project	ar/Assign Surpri s/Project Qui		At	tendance		ESE	
15%	15%		10%	!	5%		5%		50%	

Course Descrip	otion	Pub adm imp scal subj adm	Public Administration has gained immense importance since the emergence of the administrative state. In Ancient Greek, Roman and Indian political system gave more importance to the concept of Administration. Kautilys's "Arthasathra" contributed large scale in the administrative system; it deals every aspect of the state and its relation to subjects. Public Administration is state mechanism. In every Political System, administration have a significant role.												the nore large on to tem,
Course Objecti	ive	1. T 2. T 3. T 4. T 5. T	o unde o analy o exan o iden o evalu	erstand /ze the hine the tify the uate the	the co Bases e types Princip e contr	ncept and typ and typ and fu ples of rol over	and im pes of (Inction Manag r Public	portan Drganiz s of exe ement Admir	ce of Po ation. ecutive iistratio	ublic A on.	dminis	tration			
Course Outcon Prerequ	ne uisites:	 Upon completion of this course, the students will be able to acquire knowledge of public administration. summarize the administrative principles of management. Review the salient features of different theories of administration. Enumerate the roles and responsibilities of District administration and Panchayati raj Identify the societal needs and recommend the strategies for administration of public financial funds. 													
CO, PO AND PSO MAPPING															
со	P O	P O	P O	P O	P O	P O	P O	P O	P O	P O	P O	P O	PS O-1	PS O-2	
	-1	-2	-3	-4	-5	-6	-7	-8	-9	- 10	- 11	- 12			
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CO-3	-	-	-	-	-	3	1	2	1	1	2	-			
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	2	2	5 1: \	- Veaklv	- relate	3 d. 2: M	2 Ioderat	э telv rel	z ated a	2 nd 3: 5	z trongly	2			
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MODULE	E 1: Coi	mpone	nts of I	Public /	Admini	stratio	n							9 Ho	urs
Meanir Admini Relatio Theorie	Meaning, Nature and Scope of Public Administration – Public Administration and Private Administration–Public Administration Arts, Science or Both–Public Administration and Its Relations with Other Social Sciences – New Public Administration- Classical & Neo-Classical Theories of Administration.CO-1BTL-2														
MODU	LE 2: P	rinciple	es of O	rganiza	tion									9 Ho	ours
Meanir of orga control Disinter	Meaning, Nature, Scope and Importance of Organization-Types and kinds of organization - Bases of organization – Steps in Organizational Process- Principles of Organization – Hierarchy- Span of control – Unity of Command – Delegation of Authority – Co-Ordination- Integration Vs. Disintegration – Centralization Vs. Decentralization.														

M	ODULE 3: Theories Of Administration	9 Hours
Sci Bu	ientific management (Taylor and movement)- Classical theory- Fayol, Urwick and others- ireaucratic theory- Max Weber- Ideas of Mary Parker Follett- C.I. Barnard- Behavioural	СО-3
Ар	pproach - Systems Approach	BTL-3
M Ho	ODULE 4: District Administration And Panchayati Raj purs	9
Dis	strict Administration- Block Administration- Constitutional Body under 73rd and 74th	CO-4
0	institutional Amendment- Planning and Development- Rural and Orban	BTL-3
M	ODULE 5: Financial Administration	9
пс		
Bu Fir	dget concept and forms - Formulation - Enactment of Budget - Execution of Budget - Deficit nancing- Public Debt	CO-5
		BTL-3
TE	XTBOOKS	
1	Avasthi, A. and Maheswari, S.R Public Administration, Laxshmi Narain Publications, 2017.	
2	Dr.G. Venkatesan, Public Administration, VC Publishers, Rajapalayam, 2009.	
3	Mohit Bahattacharya, New Horizons of Public Administration, Macmillan Publishers, 2002	
RE	FERENCE BOOKS	
1	Shriram Maheswari, Administrative Theory: An Introduction, New Delhi, Macmillan India Lto	1.,1984.
2	Vishnoo Bhagwan and – Public Administration, Chand & co., New Delhi1994	
3	Bhambhri, C.P – Public administration – Theory and Practice, Jain Prakash, Nath&co., Meeru	ıt, 2002.
EE	BOOKS	
1	Sapru, Administrative Theories and Management Thought, Prentice Hall of India, New Delhi	, 2005.
2	Sharma. M. P.: Public Administration in theory and practice, Kithab Mahal, Allahabad ,2006.	

COURSE TITLE	CONSTITUTION OF INDIA CREDITS									
COURSE CODE	GGE51013	COURSE CATEGORY	МС	L-T-P-S	3-0-0- 2					
Version	1	Approval Details	LEARNING LEVEL	BTL-3						
ASSESSMENT SCHEME										
CIA										
First Periodical Assessment	Second Periodical Assessment	Seminar/Assignmen ts/Project	r/Assignmen Surprise Test / Quiz etc., as /Project approved by the Af		ESE					

								Department Examination Committee "DEC""						
15	%		15%		10	%		5% 5%						50%
Cou Descri	rse ption	The very purpose of the course is to learn basic law of the land- to know about constitutional values- to carry our constitutional legacy and to imbibe constitutional discipline. To make the student as an informed citizen about his rights and duties expecting a vibrant role in democratic polity of the pation												
Course Object	e tive	 To understand the Constitution and Governance of our country. To inspire the students towards -Constitutionalism and its core values To imbibe the values cherished in our Constitution. 												
Course Outco	e me	 Upon completion of this course, the students will be able to 1. summarize the basic notions on which the Indian Constitution is based. 2. appraise the functioning of democracy and related systems in place. 3. classify the center and state relations and various Constitutional forums. 4. identify and discuss upon Governor's rule and related amendments 5. interpret Indian Polity and its challenges for modern India 												
СО, РС	AND	PSO N	IAPPING	1	1	T		-	1	1	1	-		
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CO-1	-	-	-	-	-	2	2	2	2	1	-	1	-	-
CO-2	-	-	-	-	-	2	2	2	2	1	-	1	-	-
CO-3	-	-	-	-	-	2	2	2	2	1	-	1	-	-
CO-4	-	-	-	-	-	2	2	2	2		-	1	-	
CO-5	-	-	- 1. Wo	- akly rol	- ated 2:	∠ Moder	∠ atoly r	_∠ alated a	2 × 2	trongly	- rolato	4 <u>+</u>	-	
Module 1: Indian Constitution and Governance (9L)														
Constitution – salient features, Preamble, - Core values – Democratic - Secular, Socialist, Republic, Sovereign, - Basic structure – Constitutional Morality – Federal Features – Fundamental Rights – Fundamental duties									CO-1 BTL-3					
MODULE 2: Democracy – in functioning (9L)														
Democracy- Elections - Union Government- State Governments - Systems in place – Legislative- Executive- Judiciary- Constitutional Bodies: Election Commission – UPSC- Controller and Auditor General of India.									r- Dr	CO-2 BTL-3				
MODULE 3: Center -State Relations (9L)														
Legislative powers of the Central Government – State Government – Center-State Relations – Roll of Governor - Niti Ayog – National Integration Council									Roll	CO-3 BTL-3				
MODULE 4: Emergency – and Amendments (91)														
Governors Rule – National Emergency – Financial Emergency- Constitutional Amendments – 42 nd Amendment - Procedures- Number of Amendments									2 nd	CO-4 BTI-3				
MODULE 5: Indian														
Roll of the Civil Society –Roll of the Youth - – Major Challenges before the nation - Political parties – Programs- in the Country – Indian polity at cross roads.									ties	CO-5 BTL-3				
TEXT BOOKS														
	1.	M.P. Jain Indian Constitutional Law, Wadhwa & Co. 2005												
	2.	'Indian Parliament' –National Book Trust of India publications – New Delhi , 2007												
3.	'Indian Judiciary'- National Book Trust of India publication., 2013													
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REFERENCES														
1	Constitution of India – visit Union Ministry of Law and Justice website – for latest text.													
2	Lectures on Administrative Law – C.K. Takwani, 2021													
3	Separation of Powers and Independence of Judiciary- Steve Cann, 2013.													
E Resources for R	eference													
1.	Constitution of India- Administrative & Adjudicatory process- <u>https://www.strath.ac.uk/research/subjects/law/constitutionaladministrative</u> <u>law/</u>													
2.	Lectures on Administrative Law- http://msrlawbooks.in/file/ADMINISTRATIVE_LAW_FF.pdf													
3.	Separation of powers & Independence of Judiciary- https://blog.ipleaders.in/separation-of-powers-and-its-relevance/													

COURSE TITLE		LAW FOR ENGINEERS									CREDITS	5	Non C	redit
COURSE CODE		EGE51006 COURSE CATEGORY MC									L-T-P-S		3-0-	-0-2
Version		1	L .0	O Approval Details				36 th ACM			LEARNII LEVEL	NG	BT	L-3
ASSESSIV	SSESSMENT SCHEME													
		CIA												
First Periodic Assessm t	al en	Sec Perio Asses	Second Periodical Assessment /Project Surprise Test / Quiz etc., as approved by the Department Examination Committee "DEC""						Quiz ved nent n EC""	Attend	ance	ES	SE	
15%		1	5%		10	%			5%		5%	, >	50)%
Course Descript n	e tio	Every one of us should know the Law of the land. This is truer when it comes to engineers, wherein they are expected to work in a legal environment. Basic knowledge about the legal systems, the redressal mechanism in place. Legal knowledge will help them to start their own enterprise/startup/and also when it comes to IPR relate issues.												
Course Objectiv	e	 To To To To To 	o unders o appriso o have a o familia	tand the st the st n insigh rize wi	ne Cons adents nt into g th intell	titution of their general ectual p	and Go rights laws in propert	overnan - local to general y laws a	ce of ou o natior , labour and prac	ur coun hal redr r and er ctices.	try. essal me nployme	echanis ent law	m. in parti	cular.
Course Outcome	 Upon completion of this course, the students will be able to Classify the basic concepts of Indian Constitution, Governance and the role of citizens. acquire knowledge in significant legislations that affect their lives. enumerate the laws that governs corporate and business world along with legislations that govern management – worker relations. relate to Intellectual Property Rights and related aspects. 											ns. ns that		
CO, PO A	ND	PSO MA	APPING		l	l	1	I	1		T		l	l
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Module	1: In	ndian	Constitu	tion and	d									
Governa	nce												(9)	L)
Constitu	ution	– sali	ent featu	ures, Pre	eamble,	- Funda	amental	Rights	and dut	ties.			CO-1	
Democra	acy- E	Electic	ns Unio	n Gover	nment-	State G	Governm	nents –	System	s in plac	e -			
Judiciary	·- the	e Supre	eme Cou	irt and H	ligh Cou	urts, Go	od Gov	ernance	2.				DIL-3	
MODUL	E 2: S	Signifi	ant Leg	islation	s									
													(9	IL)
Consum	er Pr	otecti	on Act -	2019;	Right t	o inforr	mation	Act 200	5. Prov	ident Fu	ind		CO-2	
Act – ES	I – Er	nploy	ment (St	anding	Orders)	Act 194	46 Mate	ernity Bo	enefit A	ct-2017	',		BTI-3	
Labor Co	odes-	- Cour	ts											
MODUL	E 3: I	ndust	rial, Cor	porate a	and Lab	our								
laws													(9	L)
Busines	s Law	vs in g	eneral –	Partner	ship Ac	t - Com	panies /	Act – 20	13- Priv	ate and	l		CO-3	
Public Li	mite	d Com	panies,	LLP, OP	C, Corpo	orate Go	overnan	ce – Dir	rectors	positior			BTL-3	
MODULI	E 4: L	.aws r	elated to	D										
IPR													(9)L)
Introduc	tion	to IPR	– mean	ing and	scope, l	Patents	- Copy F	Right – 1	Frade N	larks –			CO-4	
Industria	al Des	sign- (il – Trad	e Secre	ts – WIP	90.							BTL-3	
MODULI	E 5: L	.aw of											1-	
Contract	ts	_											(9	L)
Essentia	Is of	a Con	tract – E	nforcea	ability. N	/arious	Legal fo	orums t	hat pro	vide rel	iet in		CO-5	
various r	natte	ers.											BTL-3	
	OVC													
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			F	Professio	onal offs	set.					,		, -	,
3	3.		F	Ramapp	a (2010)), Intelle	ectual P	roperty	Rights	Law in I	ndia, A	sia Law	House.	
4	1 .		S	Singh, Av	vtar (20	07), Cor	mpany l	. <i>aw</i> , Eas	stern Bo	ook Co.				
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REFEREN	ICES													
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				Áct – ete	C.	•			,					
2	2	Τ		R.F, Rus	tamji (19	967) <i>,</i> In	troduct	ion to th	he Law o	of Indus	trial Dis	sputes, A	Asia Pub	olishing
			I	House.										
3	3			Copyrig	ghts Act,	,1957, T	radema	arks Act	1999.					
E Resou	irces	for Re	eterence											
1	•		Intellec	tual Pro	perty ri	ghts an	d Comp	etition						
			Law- h	ttps://e	n.wikipe	edia.org	g/wiki/Ir	ntellectu	ual_pro	<u>perty</u>			<u> </u>	
2			Patent	search f	or engir	neers ar	nd Lawy	ers - <u>ht</u> i	<u>tps://w</u>	<u>ww.wip</u>	<u>o.int/p</u>	atents/e	<u>en/</u>	

	E	INDIAN KNOWLEDGE SYSTEM (IKS) CREDITS											Non	Credit
COURS CODE	E	G	GE5101	5	COURSE	CATEG	ORY	мс			L-T-P-	s	3-0	-0-2
Version	า		1.0		Approva	l Detail	s	3	36 th ACN	N	LEARN LEVEL	NING	ВТ	L - 2
ASSESS	MENT	SCHEN	1E											
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Cou Descri	irse iption	The cont wisc syste shap	course tempora lom, in ems har ping Ind	prov ary s cludii ve be ia's h	vides an a ociety. In ng traditi en passed istory and	apprecia Idian Ki Ional m d down d culture	ation o nowled edicine throug 2.	f Indiar ge Syst , astrol h gener	n Know em en logy, yo ations a	ledge S compas oga, me and hav	ystem s a wid editation e playe	and its de rang n, and d a sign	relevar e of a more. ificant	nce to incient These role in
Course Objecti	ive	To p stud relat	o provide a general introduction to Indian Knowledge System (IKS) and sensitize the tudents to the contributions made by ancient Indians in the field of Science, Philosophy and elated applications and concepts.											
Course Outcor	ne	 Upon completion of this course, the students will be able to 1. Explain the salient features of Indian Knowledge System and Vedic Corpus 2. Summarize the concepts of Philosophical systems and wisdom through puranas 3. Describe the Indian Knowledge Framework and Linguistics 4. Brief on ancient strategies to focus on Health, Wellness and Psychology 5. Approximate Town Planning and Architecture, Covernance and Public Administration 											on	
CO, PO	AND P	SO MA	PPING											
со	PO	PO-2	РО- 3	РО 4	- PO- 5	РО- 6	РО- 7	РО- 8	РО- 9	РО- 10	РО- 11	РО- 12	PSO -1	PSO -2
CO-1	-	-	-	-	-	2	2	2	2	1	-	1	-	-
CO-2	-	-	-	-	-	2	2	2	2	1	-	1	-	-
CO-3	-	-	-	-	-	2	2	2	2	1	-	1	-	-
CO-4	-	-	-	-	-	2	2	2	2	1	-	1	-	-
CO-5	-	-	- 1. We:	- aklv r	elated 2:	2 Moder	∠ atelv re	2 Lated a	∠ nd 3· St	rongly	- related	T	-	-
MODU	LE 1: In	dian K	nowled	ge Sv	stems an	d Vedic	Corpus	S	114 5. 51	iongry				(9L)
India Knowledge Systems – Organization, History and Salient features – synopsis of the four Vedas - Sub-classification of Vedas - Messages in Vedas - Introduction to Vedangas - Prologue on Siksa and Vyakarana - Basics of Nirukta and Chandas - Introduction to Kalpa and Jyotişa - Vedic Life: A Distinctive Feature										ne four ologue votișa -	C(BT	0-1 1-2		
MODU	LE 2: Pł	ilosop	hical S	ystem	s and Wi	sdom								(9L)
Philosophical systems - Development of philosophy - Features of philosophy - Sankhya approach of philosophy - Introduction to Yoga - Tenet of Nyaya philosophy - Principles of Vaiseşika - Doctrine of Purva Mimamsa Darsana - Thesis of Vedanta and synopsis of Advaita - Philosophy of Visistadvaita - Ideology of Dvaita - Tenets of Jaina - Doctrine of Buddhism - Notions of Carvaka Gateways of ancestral wisdoms - Introduction to Purana - The Puranic repository - Issues of											ankhya ples of lvaita - hism - sues of	CC BT	D-2 TL-2	
interes	t in Pur	anas -	Introdu	ction	to Itihasa	as - Key	messag	es in Iti	hasas -	Wisdom	n throug	gh Niti-		
sastras	8. Wisc	lom th	rough S	Subha	șita									
MODU	LE 3: Kr	nowled	lge Frai	newo	ork and cl	assificat	tions. L	inguisti	CS				(9L)

Indian scheme of knowledge - The knowledge triangle – Prameya - A vaiseşikan approach to physical reality - Dravyas - the constituents of the physical reality – Attributes - the properties of substances and Action - the driver of conjunction and disjunction - Samanya, viseşa, samavaya - Pramana - the means of valid knowledge - Samsaya - ambiguities in existing knowledge - Framework for establishing valid knowledge - Deductive or inductive logic framework - Potential fallacies in the reasoning process - Siddhanta: established tenets in a field of study Linguistics - Aşţadhyayi - Phonetics - Word generation - Computational aspects – Mnemonics - Recursive operations - Rule based operations - Sentence formation -Verbs and prefixes - Role of Sanskrit in natural language processing	CO-3 BTL-2
MODULE 4: Number Systems, Health Wellness and Psychology	(9L)
Number systems in India - Historical evidence - Salient aspects of Indian Mathematics - Bhuta- Samkhya system - Kaṭapayadi system - Measurements for time, distance, and weight - Pingala and the Binary system Ayurveda: approach to health - Sapta-dhatavaḥ: seven-tissues - Role of Agni in health - Tri- dosas - Ayurveda: definition of health - Psychological aspects of health - Disease management elements - Dinacarya: daily regimen for health & wellness - Importance of sleep - Food intake methods and drugs - Approach to lead a healthy life - Indian approach to psychology - The tri guṇa system & holistic picture of the individual - The Nature of Consciousness - Consciousness studies and issues	CO-4 BTL-2
MODULE 5: Town Planning and Architecture, Governance and Public Administration	(9L)
 Perspective of Arthasastra on town planning - Vastu-sastra - The science of architecture - Eight limbs of Vaastu - Town planning -Temples in India: marvelous stone architecture for eternity - Temple architecture in India - Iconography Introduction to raja dharma - Arthasastra: a historical perspective - Elements of a kauțilyan state - The king & the amatya - Janapada & durga - Treasury and the State Economy (Kosa) - Danda 8. Mitra - The Administrative Setup - Relevance of Arthasastra - Public Administration in Epics 	CO-5 BTL-2
REFERENCE BOOKS	
1 "Introduction to Indian Knowledge System: Concepts and Applications", Mahad Vinayak Rajat, Nagendra Pavana R.N., PHI Learning Private Ltd., 2022.	evan B., Bhat
MOOC Source	
1. https://onlinecourses.swayam2.ac.in/imb23_mg55/preview	

MANDATORY COURSES II

COURSE TITLE	TRADITIONA	CREDITS	Non Credit Course		
COURSE CODE	GGE51021	COURSE CATEGORY	L-T-P-S	3-0-0-2	
Version	1.0	Approval Details	LEARNING LEVEL	BTL – 2	
		ASSESSI	MENT SCHEME	·	
First Periodical Assessment	Second Periodical Assessment	Seminar/Assignme nts/Project	Surprise Test / Quiz etc., as approved by the Department Examination Committee "DEC""	Attendanc e	End Semester Exam
15%	15%	10%	5%	5%	50%

		This o	compre	hensiv	e cours	se aims	to pro	vide stı	dents	with a	deep u	ndersta	anding o	of vario	ous
Cou	rse	aspe	cts of h	ealth a	nd wel	l-being	while i	ncorpo	rating	traditio	nal hea	aling sy	stems l	ike	
Descri	ption	Ayur	veda ar	nd Sidd	ha meo	dicine. I	Particip	ants w	ill explo	ore the	import	tance o	f maint	aining	
		physi	physical, mental, emotional, social, and spiritual health for overall well-being.												
		1.	Unde	rstand	the im	portand	ce of m	aintain	ing var	ious as	pects o	of healt	h for ov	erall w	ell-
			Deing. 2 Evolore the unique approach of Avuryeda and its focus on balance and well being												
Cou	rse	2.	 Explore the unique approach of Ayurveda and its focus on balance and well-beil Understand the principles and concents of Siddha modicine 											I-being	5
Obje	ctive	3.	3. Understand the principles and concepts of Siddha medicine.												
-		4.	4. Understand the importance of a balanced diet in maintaining overall health and												
		E	preventing diseases.												
). 1	5. Learn and practice various yogic exercises and postures (Asanas) for physical fitness.												
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		-	growth, repair, and overall health.												
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Prereq	uisites:	INII													
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CO, P	CO, PO AND PSO MAPPING														
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CO-1 CO-2 CO-3	PO-1 1 2 2	PO-2 - 1 2	PO- 3 - -	PO- 4 - -	PO- 5 - -	PO- 6 2 2 2	PO- 7 1 1	PO- 8 - -	PO- 9 1 1	PO- 10 -	PO- 11 1 2	PO- 12 - -	PSO -1	PSO -2	PSO -3
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CO-1 CO-2 CO-3 CO-4 CO-5	PO-1 1 2 2 1 3	PO-2 - 1 2 1 1 1 1	PO- 3	PO- 4 - - 2 3	PO- 5 - - 1 1	PO- 6 2 2 2 2 2 2 2	PO- 7 1 1 1 2 2	PO- 8 - - - - 2 2	PO- 9 1 1 1 1 1	PO- 10 - - - -	PO- 11 1 2 2 2	PO- 12 - - - -	PSO -1	PSO -2	PSO -3
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CO-1 CO-2 CO-3 CO-4 CO-5 MOD Health treatm health health	PO-1 1 2 2 1 3 ULE 1: n: Defin nent. Tr n - Finan - Envir	PO-2 - 1 2 1 Health nition - en type ncial he ronmen	PO- 3 - - - - 1: We and Im Import es of he ealth - I tal hea	PO- 4 - - 2 3 eakly re tance c ealth o Emotio Ith - Oc	PO- 5 - - 1 1 elated, nce of F of main ne has nal hea ccupatio	PO- 6 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PO- 7 1 1 2 2 lerately intain piritual professi	PO- 8 - - 2 2 y relate - Physic health onal hee	PO- 9 1 1 1 1 1 2 d and cal hea - Intell eath. Pr	PO- 10 - - - 3: Stroi ortance lth - N lectual esent h	PO- 11 1 1 2 2 2 2 mgly re lental health sealth s	PO- 12 - - - lated eventic health - Relat tatus -	PSO -1	PSO -2	PSO -3
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CO-1 CO-2 CO-3 CO-4 CO-5 MOD Health treath health health expec (NCDs	PO-1 1 2 2 1 3 ULE 1: n: Defir nent. Tr n - Final - Envir tancy -) the le	PO-2 - 1 2 1 Health nition - en type ncial he ronmen preser eading c	PO- 3 1: We and Im Import es of he ealth - I tal hea ht statu cause o	PO- 4 - - 2 3 eakly re tance c ealth o Emotio Ith - Oc is - mo f death	PO- 5 - - 1 1 2 2 1 2 1 2 2 1 2 2 1 2 2 3 2 3 2 3	PO- 6 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PO- 7 1 1 1 2 2 lerately intain piritual professi dreadfi c diseas	PO- 8 - - 2 2 y relate h - Moi - Physic health onal he ul disea	PO- 9 1 1 1 1 1 2 d and cal hea - Intell eath. Pr ases - r dcer - d	PO- 10 - - - 3: Stron ortance lth - N lectual esent h non-cor iabetes	PO- 11 1 2 2 2 2 mgly rel e on pr lental health sealth s mmunic - chro	PO- 12 - - - - lated eventic health - Relat tatus - cable d nic pul	PSO -1	PSO -2	PSO -3
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	Kumar, D. S. (Ed.). (2020). Ayurveda in the New Millennium: Emerging Roles and Future
1	Challenges. CRC Press.
REFER	ENCE BOOKS
1	Balakrishnan Acharya(2006) Ayurveda its principles and philophies, Hardwar, Divya Prakashan.
2	AtharaleV.B.(1980) basic principles of Ayurveda, Bombay, Pediatric Clinics.
E-BOO	KS / MAGAZINE / ARTICLES
1	Micozzi, M. S. (2014). Fundamentals of complementary and alternative medicine-E-book. Elsevier Health Sciences.
2	Chaudhry, B. (2019). A handbook of common medicinal plants used in Ayurveda. Kojo Press.
ONLIN	E RESOURCES
1.	https://cdn.ayush.gov.in/wp-content/uploads/2021/06/Introduction.pdf
2.	https://www.ism.kerala.gov.in/index.php/downloadss/iec-materials

COURSE TITLE	HISTORY OF SCIENCE AND TECHNOLOGY IN INDIA CREDITS										
COURSE CODE	GGE51022	COURSE MC CATEGORY		L-T-P-S	3-0-0-2						
Version	1.0	Approval 36 TH ACM Details		LEARNING LEVEL	BTL - 2						
ASSESSMENT	SCHEME										
		CIA									
First Periodical Assessment	Second Periodical Assessment Seminar/Assign Ments/Project Surprise Test / Qu as approved by Department Exam Committee "DE		Surprise Test / Quiz etc., as approved by the Department Examination Committee "DEC""	Attendance	ESE						
15%	15%	10%	5%	5%	50%						
Course Description	This course covers the richness of ancient India and their notable contributions in the field of Science and Technology. Details on the living styles of ancient Indians and their application of science and technology in day-to-day life is briefed. Covers the notable contributions of eminent Indian scientists and their contributions to the field of Science and Technology in building a modern India.										
Course Objective	 This course ai the field of Scie This course de of Science and 	 Duilding a modern India. This course aims to educate upon the notable contributions of ancient indian scientists to the field of Science and Technology This course details the contributions made by eminent Indian scientists in the various fields of Science and Technology. 									

Course Outcon	 Upon completion of this course, the students will be able to summarize the notable contributions in ancient India in the field of Science and Technology explain the different techniques adapted by ancient Indians in the field of Irrigation, Water resources and Ship Building appreciate the noteworthy contributions of Indians in the field of Mathematics and Science describe the role of Indians in the field of Biotechnology, Space technology and Nanotechnology report on the prominent scientists of India and present a survey on their noteworthy contributions to the world. 													
CO, PO AND PSO MAPPING														
со	PO-	PO-2 PO-											PSO -1	PSO -2
CO-1	-	-	-	-	-	2	2	2	2	1	-	1	-	-
CO-2	-	-	-	-	-	2	2	2	2	1	-	1	-	-
CO-3	-	-	-	-	-	2	2	2	2	1	-	1	-	-
CO-4	-	-	-	-	-	2	2	2	2	1	-	1	-	-
CO-5	-	-	-	-	-	2	2	2	2	1	-	1	-	-
			1: Wea	akly rela	ated, 2:	Moder	ately re	elated a	nd 3: St	rongly	related			
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20 trac Manag Madhy	ditiona gement aman	ngation al water t to Co dir – Ag	n, wate r conse ombat graman	rvation Drough dir	system nt - Sh	a ship i is of Inc iip buil	lia - 7 V ding -	Vays In Mukti	dian Vil Kalpta	lages A ru – S	dopted arvama	Water Indir –	C(B1	(9L) D-2 TL-2
MODU	LE 3: N	lathem	atics a	nd Scier	nce									(9L)
ldea of numbe Chakra quantu	f Zero, ers, Pin wala n um phy	Aryabh gala, V nethod sics in	ata – Th irahank of Alg <i>Vaishes</i>	ne Decin a, Gopa orithms hika Ato	nal Syst Ila and — Rule omic the	em–Nu Hemaca er Met eory	umerica andra – hods –	ll Notati Binary Helioc	ons and Numbe entric 1	l nume ers - Chl Theory,	rals– Fik handa S Aryabh	oonacci hastra, aatiya ,	CC B1	D-3 "L-2
MODU	LE 4: B	iotechr	nology,	Defenc	e Techr	nology a	nd Nar	notechn	ology					(9L)
Biotechnology, Genome sequencing initiatives by India, DNA technology regulation Bill – Space Technology, GAGANYAN, Seven Mega Missions by ISRO, Nuclear Technology, India's three stage Nuclear Programme, India's Nuclear Policy – Defence Technology, Vikrant, Vikramaditya – Nano Technology, India's Mission on Nano Science and Technology -									-Space three naditya	C(BT	D-4 "L-2			
MODU	LE 5: C	ONTRI	BUTION	IS OF IN	DIANS		NCE AN		INOLOG	iY				(9L)
JC Bos	e, Hom	i J. Bab	a, Vikra	im Sara	bhai, Sa	atyendra	anath B	ose, CV	Raman	, APJ At	odul Kal	am	CO-5	

Suggested A	ctivity:	BTL-3							
To submit a detailed report on Recent contributions by India in the field of Science and									
Technology									
REFERENCE B	OOKS								
1	"Science and Technology UPSC Civil Services Exam State Administrative Exa Agrahari, McGraw Hill Publications, ISBN-10 935532555X, 7th Edition, 2023	ams", Ravi P.							
2	"A Brief History of Science & Technology In India", Dr. P Lathwal, Indu Book Serv ISBN: 9789391377205, First Edition, 2022	ices Pvt Ltd.,							
E Resources	for Reference								
1.	https://www.thebetterindia.com/63119/ancient-india-science-technology								
2.	https://www.ijsdr.org/papers/IJSDR2210086.pdf								
3.	https://www.insightsonindia.com/science-technology/								

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						AS	SESSN	IENT S	CHEME								
		-			-	CI	A										
Fir Perio	rst odical		Secon Periodi	nd ical	Se Assi	eminar, gnmen Project	/ its/	Surpri	se Test etc.,	t / Quiz	Δ	Attendance		Attendance		ESI	Ξ
15	3%		15%		•	10%			5%			5%		50%	6		
	,,,,	The	The students shall develop an intuitive understanding of the political and e											nomic	•		
Cou Descri	irse iption	tho	thoughts of thinkers from various ages to have an explicit insight into the ideas, values and ethics provided by them.														
Course Object	e ive	• T the • T pol	 This course aims to equip the students with value building through analyzing the ideas of the thinkers of various ages This course also equips students with an ability to critically analyse the social, economic and political conditions. 														
Course Outcor	e me	Up 1. 2. 3. 4. 5.	on com Brief Sum Desc Appr impa Deba	npletion on the marize ribe the eciate ict on t ite on c	n of th histor the th e eme the si he pro current	is cour ic back eories rgence gnifica gress c t trend	se, the kgroun emerg of the nce o of the r s of se	e studer d of ec ing from welfar f Gand nation. cularisi	nts will onomi m west e state hian tl m and	be abl c issue tern ec and th hought their e	e to s in Ind onomi- neir sec s and ffects c	lia. c and p curity in Ambeo on build	oolitical f mplication dkar the ding a na	thought. ons. oughts ar ation.	nd the		
CO. PO) AND I		1APPIN	IG													
со	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO-1	PSO-2	PSO-3		
<u> </u>	-1	-2	-3	-4	-5	-6	-/	-ð	-9	-10	-11	-12					
<u> </u>	-	-	-	-	-	-	1	1	-	-	1	-					
CO-2	-	-	-	- 1	-	1	-	-	1	-	2	-					
CO-3	-																
CO-4	2	- 1	1	-	-	2	1	3	2	2	2	1					
	-	-	1: W	/eakly	related	d. 2: M	odera	telv rel	ated a	nd 3: S	trongly	v relate	ed				
MODU	MODULE 1: Historical background of Economic Issues in India 91																
Impact	of col	onial r	ule on	Indian	Econo	my; Da	adabha	ai Naor	oji- Dra	ain The	ory; Po	ost		BTL-1	L,2		
MODU	MODULE 2: Western Economic and Political thought 9L																

Liberalis	DTI 1 2						
product	ion, theory of Surplus value, Class struggle; Gramsci- Theory of Hegemony	D1L-1,2					
MODUL	E 3: Emergence of Welfare State	9L					
Welfare	state- Meaning, Womb to Tomb concept and its current state; Security- Shift						
from tra	BTL-1,2						
and soc	ial security						
MODUL	E 4: Gandhian and Ambedkar Thought	9L					
Gandhi:	BTL-1,2						
MODUL	9L						
Seculari	DTI 1 3						
system.		D11-1,2					
TEXT BO	DOKS						
1.	Subrata Mukherjee, Sushila Ramasamy," A history of Political Thought- Plato to Ma	arx",PHI learning					
	private limited,2nd edition,2011						
2.	Shefali Jha,"Western Political Thought: From the Ancient Greeks to Modern Times	", 2nd Edition by					
	Pearson						
REFERE	FERENCE BOOKS						
1	Indian Political Thinkers: Modern Political Thought, Atlantic Publishers & Dist, 2000						
2	Marx, Karl, 1818-1883. The Communist Manifesto. London; Chicago, Ill. :Pluto Pres	s, 1996.					
3 Nehru, Jawaharlal, 1889-1964. The Discovery of India. Garden City, N.Y. :Anchor Books,							
4	4 Gandhi, Mahatma, 1869-1948. The Collected Works of Mahatma Gandhi. New Delhi :Publications						
Division, Ministry of Information and Broadcasting, Govt. of India,							

			Non Credit								
COURSE TITLE	State, Nation	-Building and Politics in	n India	CREDITS	Course						
COURSE CODE	EGE51024	COURSE CATEGORY	МС	L-T-P-S	3-0-0-2						
Version	1.0	Approval Details	36th ACM	LEARNING LEVEL	BTL – 3						
ASSESSMENT SCHEME											
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	End Semester Exam						
15%	15%	10%	5%	5%	50%						
Course Description	After studying the cou building and the const	irse, the students shou tituents of Indian polition	ld be able to g cs	ain knowledge o	of Nation						
Course Objective	 This course will Indian secularis To brief on the p To understand t 	enlighten the students m and the salient featu principles of federalism he administrative fram	to learn about ires of Secular and its workir ework of India	t the basics of n India. ng In Government	ation building						
Course Outcome	 Summarize the basics of nation building with a special reference to Indian constitution. Identify and relate the components that constitute Indian constitution Appraise the salient features of Indian secularism. Classify the principles of Federalism and its relation to central and state autonomy. Illustrate the Indian central administration system and the hierarchy of operations. 										

Prerec	Prerequisites: Nil														
СО, РС) AND	PSO M	APPIN	3											
	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	PSO	PSO	PSO
co	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-1	-2	-3
CO-1	-	-	1	1	-	3	2	3	2	2	2	-			
CO-2	-	-	-	1	-	2	2	2	2	1	2	-			
CO-3	-	-	-	-	-	2	2	2	2	1	2	-			
CO-4	-	-	-	-	-	2	2	2	2	1	2	-			
CO-5	CO-5 1 1 1 1 - 3 2 3 2 2 2 -														
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: Basic of Nation Building 9 Hours										ours					
Indian government and politics: basics Nation-Building in India: Theoretical, Historical,										CO	-1				
Cultural perspective, National Movements in India										BTL-	1,2				
MODU	JLE 2:	Indian	Consti	tution										9 He	ours
Makin	g of th	e India	n Const	itution	: The Co	onstitu	ent Ass	sembly	- Backg	ground,	Comp	osition,	,	со	-2
Nature Princip	e and i ples of	ts work State P	ing, Ide olicy.	eologica	ll Conte	ents: Pr	eamble	e, funda	amenta	al Right	s and D	irective	5	BTL-	2,3
MODU	JLE 3:	Indian S	Secular	ism										9 H	ours
Disting	tivene	ess of In	dian Se	ecularis	m, Con	stitutic	on as ar	n instru	ment o	f social	chang	e:		CO	-3
Consti	tution	al Amer	ndment	ts.										BTI	3
MODU	JLE 4:	Federal	ism											9 Ho	ours
Fede	ralism	and its	workin	g: Natu	re, the	Areas	of Tens	ion in (Centre-	State r	elation	s, Dem	ands	со	-4
for St	ate Au	utonom	y, Sepa	ratist N	loveme	ents.								BTI	3
MODU	JLE 5:	Centra	l Admiı	nistrati	on									9 H	ours
Execu	utive a	nd Cent	tral Adı	ninistra	ntion: P	resider	nt, Prim	ne Mini	ster, ar	nd cour	cil of m	ninister	s, Unio	CO	-5
Territ	ories:	Admini	stratio	n, Critic	al Appi	reciatic	on.							BTI	3
TEXT	BOOK	S													
 Indian Government and Politics: Basics / Political Ideologies/ Nation Building, Dr. Jayanta Kumar Dash & Dr. Ratnaprava Barik, Geetanjali Publication 2012 															
2	2. A	n Intro nd Poli	ductior tics . Ne	to the w Delh	Consti i: Kalya	tution o Ini Pub	of India lishers,	a. New 1999 (Delhi: N Reprint	/ikas, 1 t).	998. Sil	kri, S.L.	Indian	Goveri	nment
REFF	RENCE	BOOK	5		, -		-,								

1.	R.N Gilchrist, Principles of Political Science, Bombay: Orient Longmans, Seventh Edition, 1952
2.	Andrew Heywood, Political Theory: An Introduction, United Kingdom: Palgrave Mac Milan, 4 th Edition, 2015.
E-BOOKS	/ MAGAZINE / ARTICLES
1.	https://cepr.org/voxeu/columns/nation-building-new-ebook

COURSE TITLE		INDUSTRIAL SAF	ETY	CREDITS	Non Credit Course					
COURSE CODE	GGE51025	COURSE CATEGORY	МС	L-T-P-S	3-0-0-2					
Version	01	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3					
ASSESSMENT SCHEME										
First Periodical Assessment	Second Periodical Assessment	Seminar/Assignm ents/Project	Surprise Test / Quiz etc., as approved by the Department Examination Committee "DEC""	Attendance	ESE					
15%	15%	10%	5%	5%	50%					
Course Description	Upon complet knowledge an safeguarding v professional so well-being of t contribute to a	ion of the Industrial S d skills necessary to fo workers, assets, and th eeking to enhance the heir team, this course a culture of safety exc	afety course, participan oster a safer and healthi ne environment. Wheth ir safety expertise or a ne will empower them to ellence within their orga	ts will be equippe er workplace, the er the students a manager respons make informed d anization.	ed with the ereby re an industry ible for the lecisions and					
Course Objective	The objective necessary to p contribute to covers 1. comprehe industrial 2. course co students colleague 3. delve into the highe	of this course is to e romote a safe and hea the overall success a ensive understanding settings. overs a wide range o to effectively comr es. o the fundamental pri est safety standards	quip students with the althy work environment, nd sustainability of ind of safety protocols, s of safety terminologies nunicate and engage nciples of safety regula	knowledge, skills protect workers ustrial operation standards, and p used in the ind with safety pro tions, ensuring c	s, and mind set and assets, and s. It provides / practices within lustry, enabling ofessionals and ompliance with					
Course Outcome	Upon complet 1. Realize th 2. Enable th 3. Enable st 4. Appreciat 5. Assess th Techniqu	ion of this course, the ne importance and bas the students to learn ab udents to Conduct and the about Workplace Es ne various Hazards es.	students will be able to sic Terminologies of safe out the Important Statu d participate the various oposures and Hazards. and consequences thr	ety. utory Regulations Safety activities ough various Ri	and standards. in the industry. sk Assessment					

CO, PO AND PSO MAPPING															
со	РО- 1	РО- 2	РО- 3	РО- 4	РО- 5	РО- 6	РО- 7	РО- 8	РО- 9	РО- 10	РО- 11	РО- 12	PS O-1	PS O-2	
CO-1	3	3	2	-	-	2	2	-	-	1	1	2			
CO-2	3	3	2	-	-	2	2	-	-	1	1	2			
CO-3	3	3	2	-	-	2	2	-	-	1	1	2			
CO-4	3	3	2	-	-	2	2	-	-	1	1	2			
CO-5 3 3 2 - - 2 2 - - 1 1 2															
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: INTRODUCTION											(9L	.)			
 Need for safety. Safety and productivity. Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents. Theories of accident causation. Safety organization- objectives, types, functions, Role of management, supervisors, workmen, unions, government, and voluntary agencies in safety. Safety policy - Safety Officer-responsibilities, authority. Safety committee-need, types, advantages. Suggested Reading: Importance of Safety, Health and Environment policies at Workplace 										fe on. rs, ety	CO-) BTL-	1 2			
MODULE 2: STANDARDS AND REGULATIONS												(9L)			
Indian Fa occupati Hazard Id Suggeste • Indu Pro	actories onal he dentific ed Read ustrial S mote S	s Act-19 ealth ar cation a dings: Safety 9 afety ir	948- He nd safet and Ris Signs: 1 n the W	ealth- S ty (OH& k Analy Types o /orkpla	afety- I &S) - Oc /sis- co of Signs ice	Hazard ccupati de of p , Regul	ous ma onal Sa ractice ations,	terials fety an IS 156 Standa	and Wo Id Healt 56:200 ards an	elfare- th Audi 6 d Best	ISO 450 t IS144 Practic	001:20 89:199 es to	18 18-	CO-: BTL-	2 3
MODULI	E 3: SA	FETY A	стіліт	IES										(9L)	
 Toolbox Talk- Role of safety Committee- Responsibilities of Safety Officers and Safety Representatives- Safety Training and Safety Incentives- Mock Drills- On-site Emergency Action Plan- Off-site Emergency Action Plan- Safety poster and Display- Human Error Assessment. Monitoring Safety Performance: Frequency rate, severity rate, incidence rate, activity rate. Housekeeping: Responsibility of management and employees. Advantages of good housekeeping. 5 s of housekeeping. Suggested Readings: Roles and Responsibilities of Safety Officers and Safety Representatives 										ty cy or ce, of	CO- BTL-	3 3			
MODULE 4: HAZARDS AND RISKS												(9L)			
 Hazard and risk, Types of hazards- Mechanical Hazard, Electrical Hazard, Noise hazard and Fire Hazard - Particulate matter- musculoskeletal disorder improper sitting poster and lifting Ergonomics RULE & REBA- Unsafe act & Unsafe Condition. Classification of Fire, Types of Fire extinguishers, fire explosion and toxic gas release, Structure of hazard identification and risk assessment. Identification of hazards: Inventory analysis, Fire and explosion hazard rating of process plants Suggested Readings / Activities: Personal Protective Equipment (PPE), Types of PPE and their appropriate use, PPE selection, maintenance, and training, Assessing PPE effectiveness in hazard control 										nd ng re isk of	CO-/ BTL-	4 3			

MODUL	E 5: HAZARD IDENTIFICATION TECHNIQUES	(9L)						
 Job Safety Analysis-Preliminary Hazard Analysis-Failure mode and Effects Analysis- Hazard and Operability- Fault Tree Analysis- Event Tree Analysis Qualitative and Quantitative Risk Assessment- Checklist Analysis- Root cause analysis- What-If Analysis- and Hazard Identification and Risk Assessment Suggested Readings: Guidelines for safe handling, storage, and disposal of hazardous materials in various industries 								
ТЕХТВОС)KS							
1.	R.K. Jain and Prof. Sunil S. Rao, Industrial Safety, Health and Environment management systems, Khanna Publications. 2000.							
2.	L. M. Deshmukh, Industrial Safety Management: Hazard Identification and Risk Co Hill Education, 2005.	ntrol, McGraw-						
REFERENC	CE BOOKS							
1	Frank Lees, 'Lees' Loss Prevention in Process Industries, Butterworth-Heinemann pu 4th Edition, 2012.	blications, UK,						
2	John Ridley, John Channing, Safety at Work, 7 th edition, Routeledge, 2007.							
3	Das Akhil Kumar, Principles of Industrial Safety Management Understanding the Ws of Safety at Work, PHI Learning Pvt Ltd, 2020.							
E Reso	urces for Reference							
1.	https://hsseworld.com/wp-content/uploads/2020/08/Industrial-Safety-Manag	ement.pdf						
MOOC								
1.	https://onlinecourses.nptel.ac.in/noc20_mg43/preview							

MANDATORY COURSES III

COURSE TITLE	PRINC	PLES OF MANAGEMENT		CREDITS	Non Credit Course								
COURSE CODE	GGE51031	COURSE CATEGORY	МС	L-T-P-S	3-0-0-2								
Version	1.0	LEARNING LEVEL	BTL-4										
ASSESSMENT	T SCHEME												
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE								
15%	15%	10%	5%	5%	50%								
Course	To have an in-depth	knowledge in basic con	cepts of manag	gement, and also	o to understand								
Description	about the functions of	of Management and their	r implications i	n an effective m	anner.								
Course Objective	 To make the st To illustrate and To study the diff To understand le To know the dim 	 To make the students to understand the basic concepts of management. To illustrate and evaluate the importance of planning and decision making techniques. To study the different Organizational structures. To understand leadership and the foundation of leadership theories. To know the dimensions of the controlling framework. 											
Course Outcome	 Understand the basic concepts and significance of management in business. Apply and analyze the techniques of planning and apply the Decision-making process in Business organizations. Identify the difference between Centralization and Decentralization and functions of Line and Staff 												

	4. Explain and critically analyse the theories and concepts of leadership and management																	
			5.	Apply	differe	ent con	trolling	ganisat ; techni	ions. ques in	differe	ent situ	ations						
Prer	aui	sites	: Basic	under	standir	ng of bu	siness	and bu	isiness	commi	unicatio	on.						
CO,	CO, PO AND PSO MAPPING																	
		Ρ																
	`	ο	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	PS	PS	PS		
	,	-	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	0-1	0-1 0-2 0			
	1	1																
	·1 2	- 2	-	- 2	-	-	-	-	-	-	-	-	-	- 2	-	-		
CO-	3	-	-	-		-	-	-	-	-	-	-	-	-	-	-		
CO-	4	-	3	-	-	-	-	-	-	-	-	-	-	-	2	-		
CO-	5	-	-	-	3	-	-	-	-	-	-	-	-	2	- 1	-		
		I		1: W	eakly r	elated,	2: Mo	derate	y relat	ed and	3: Stro	ngly re	lated					
МО	DUL	E — 1	L: INTR	ODUCT	ΓΙΟΝ											(9L)		
Defir	nitio	n – I	mport	ance –	Nature	e and S	cope o	f Mana	igemen	t – Pro	ocess o	f Mana	gemen	t -	CO-	1		
Role	and	l fur	nctions	of Ma	anager	s - Lev	els of	Manag	ement	- Mana	agerial	Skills-	Scienti	fic	BTL-	2		
Man	ager	nent	t Contr	ibution	is to Ma	anagen	nent by	differe	ent Scho	ools of	though	it.				(01)		
MODULE – 2: PLANNING AND DECISION MAKING (9L)																		
Nature and purpose of planning - Planning process – Objectives - Management by objective CO-2 (MBO)- Strategic Planning - Decision Making - Decision Making Process. BTI -3										2 -3								
MODULE – 3: ORGANIZING (9L)																		
Structure, Nature, Types of Organizations, Principles of Organizing; Departmentalization; CO-3																		
Delegation; Decentralization of Authority; Span of Control - Line and Staff Functions BTL-4										-4								
MOE	DULE	- 4	: LEAD	DING										. [(9L)		
Intro Man	oduc agei	tion men	i, Cha t: Prine	racteris ciples o	stics o f Leade	t a Le ership.	eader, Styles c	Function of Leade	ons of ers.	a Le	ader;	Leaders	ship a	nd	BTI -	4 4		
MOD	DULE	- 5	CON	TROLLI	NG											(9L)		
Intro	oduc	tion	, Conc	ept of	Contro	olling, F	Purpose	e of Co	ntrollin	ıg; Typ	es of C	ontrol;	Steps	in	CO-	5		
Cont	rolli	ng; ⁻	Techni	ques in	Contro	olling in	ethica	l aspec	ts of m	anagen	nent pr	oblems	5.		BTL-	3		
TEXT	BO	OKS																
1	Ste 202	phe 0.	n P. Rc	bbins,	David A	A. Dece	nzo, Fu	indame	ntals o	f Mana	igemen	t,11 th e	dition,	Pears	on Educ	ation,		
2.	Ha	rold	Koont	z, O'Doi	nnell ar	nd Hein	z Weih	rich, Es	sentials	s of Ma	nagem	ent. Ne	w Delh	i <i>,</i> 11th	edition	, Tata		
REFE	REN		BOOKS	2020.														
1																		
2	L.N	1.Pra	asad, P	rinciple	es and I	Practice	e of Ma	nagem	20, ent	th Edit	ion, Sul	tan Cha	and & S	ions, 2	020.			
	R.N	l Gu	pta,Pri	nciples	of Mai	nageme	ent, 2nd	d Editio	on, Sulta	an Chai	nd Ltd.	2005.						
E BO	OKS																	
1 https://d3bxy9euw4e147.cloudfront.net/oscmsprodcms/media/documents/PrinciplesofManage																		
•	me	nt-U	P.par															
2	http	os://	open.l	ib.umn	.edu/p	rinciple	esmana	gemen	t/									
мос	С																	

COU TIT	IRSE 'LE			HUMA	N RESO	DURCE		CRE	DITS	1	Non Cro Cours	edit Se			
COU CO	IRSE DE		GGE51	.032		COU CATE	URSE GORY		М	с	L	-T-P-S		3-0-0	-2
Vers	sion		1.0)	A	Approva	al Deta	ils	36th /	АСМ	LEA	ARNING LEVEL	6	BTL-/	4
ASSESS	SMENT	SCHEN	/IE												
Fir Perio Assess	rst odical sment	Sec	ond Pe Assessr	riodica nent	il	Sem Assign Pro	inar/ ments, oject	/	Surpris / Q	e Test uiz	Atto	endano	e	ESE	
15	%		15%	6		1	0%		5%	6		5%		50%	
Cou Descri	irse iption	To tr	To train the students on management of Human Resources by exposing them to theories and practices on HR management												
Cou Obje	irse ctive	 To understand and appreciate the importance and functions of the human resources. To distinguish between Recruitment and Selection. To study the training practices and performance appraisal. To develop an understanding about basics of compensation management. To identify and appreciate the significance of the ethical issues in HR 										ces.			
Cou Outc	irse ome	1. 2. 3. 4. 5.	Conce Enviro Applyi Deterr enviro Creati quality Apply labour	eptualizen nment. ng the nine th nment: ng and /. ing eth i laws, r	Recruit Recruit e effec s to ass selecti ical pri relatior	basic co ment a tivenes tess the ing, and nciples as and s	oncept and Tra ss with contri d apply and co security	of Hun ining m which bution approj mmit t	nan Res nethods goals ai s of Ma priate t	ource l s. re defir nagers echniq	Philoso ned and ues, in ethics	phy to d achie compe and re	changi ved in t nsatior sponsil	ng team n and bilities	in
Prereq	uisites														
СО, РО	AND F	SO MA	APPING	i											
со	PO -1	PO- 2	РО- 3	РО- 4	РО- 5	РО- 6	РО- 7	РО- 8	РО- 9	PO -10	PO- 11	PO- 12	PSO -1	PSO -2	
CO-1	2	-	2	-	-	2	-	-	-	-	-	1			
CO-2	2	2	-	1	1	2	1	2	-	-	2	2			
CO-3	2	1	2	2	-	2	1	3	-	-	2	3			
CO-4	2	1	-	2	1	2	1	3	-	-	2	3			
CO-5	2	2	2 - 2 - 2 1 3 - 2 3												

1: Weakly related, 2: Moderately related and 3: Strongly related								
MO	DULE – 1: HUMAN RESOURCE FUNCTION	(9L)						
Hum Man Orga Man	nan Resource Philosophy- Changing environments of HRM-Strategic Human Resource nagement-Using HRM to attain competitive advantage-managing migrated workforce- anization of HR departments- Line and staff functions-Role of Managers. Personnel nagement, HRM, HCM-Differences.	CO-1 BTL-2						
MO	DULE – 2: RECRUITMENT & PLACEMENT	(9L)						
Man inve Recr Pror Emp sam Desi inter	n Power Planning and Forecasting-Job analysis: Methods-IT and computerized skill entory-Job Description-Writing job Specification-HR and the responsive organization. ruitment: Recruitment Sources-Internal and External-Building employee commitment: motion from within-Sources, Developing and Using application forms-E-Recruitment. oloyee Testing & Selection: Selection process, basic testing concepts, types of test, work ples & simulation, selection techniques, interview, common interviewing mistakes, igning & conducting the effective interview, small business applications, computer aided rview.	CO-2 BTL-3						
MO	DULE – 3: TRAINING & DEVELOPMENT	(9L)						
Orie Train Man build Prog solu Pote pror	entation & Training: Orienting the employees, the training process, need analysis, ning techniques, special purpose training, Training via the internet. Developing nagers Management Development-on-the-job Development techniques using HR to d a responsive organization. Key factor for success, Management Development grams-Objectives and Methods. Performance Appraisal: Methods-problems and tions- MBO approach- The appraisal interviews- Performance appraisal in practice, ential appraisal system. Managing Careers: Career planning and development- Managing motions and transfer. Succession Planning: Family Businesses.	CO-3 BTL-4						
MO	DULE – 4: COMPENSATION & MANAGING QUALITY	(9L)						
Esta in cc eval for c India bene emp	blishing Pay Plans: Basics of compensation-factors determining pay rate-Current trends ompensation-Job evaluation-pricing managerial and professional jobs-Computerized job uation. Pay for Performance and Financial Incentives: Money and motivation-incentives operations employees and executives-organization wide incentive plans- Practices in an Organizations. Benefits and Services: Statutory benefits-non-statutory (voluntary) efits-Insurance benefits-retirement benefits and other welfare measures to build ployee commitment.	CO-4 BTL-4						
MOI	DULE – 5: LABOUR RELATIONS AND EMPLOYEE SECURITY	(9L)						
Labo adm Acco Attri	our Relations and Employee Security: Industrial Relation-Collective bargaining; Discipline ninistration; Labour Welfare; Whistle Blowers; Performance Management, HR punting, Auditing HR functions, Challenges of HRM function, Absenteeism- Causes of ition. Human Resource Audit. Contemporary HR Concepts.	CO-5 BTL-3						
ТЕХТ ВООКЅ								
1	1 Gary Dessler, "Human Resource Management", 16 th edition, Prentice-Hall of India.2020							
2.	David A. DeCenzo, Stephen P. Robbins , David A. DeCenzo, Stephen P. Robbins, Personr Resource Management,3 rd edition, Pearson.2022.	nel/Human						
REFE	ERENCE BOOKS							

1	John Bernardin H & Joyee E.A Russel, Human Resource Management- An
	experimental approach, 6 th edition, McGraw-Hill International Edition.,2012.
2	Aswathappa, Human Resource Management, 9 th edition, Tata McGraw Hill, New Delhi, 2021
E BC	DOKS
1	https://www.ascdegreecollege.ac.in/wp-content/uploads/2020/12/Human-Resource-
•	Management-by-Pravin-Durai.pdf
2	https://www.yyu.edu.tr/images/files/Turizmde_Insan_Kaynaklari_Gelisimi_Doc_DrZekeriya_N
	AS(1).pdf
MO	oc
1.	https://www.coursera.org/specializations/human-resource-management

COURSE TITLE	GF	REEN TECHNOLOGY		CREDITS	Non Credit Course
COURSE CODE	GGE51033	COURSE CATEGORY	МС	L-T-P-S	3-0-0-2
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3
ASSESSMENT S	СНЕМЕ				
First Periodical Assessment	Second Periodical Assessme nt	Seminar/Assign ments/Project	Surprise Test / Quiz etc., as approvedby the Department Examination Committee "DEC""	Attendance	ESE
15%	15%	10%	5%	5%	50%
Course Descriptio n	This course ai development strategies for students with how chemical hazard to hur	ms to equip the stud including different µ changing this concep an ability to underst I production could be nan health and envir	ents with a basic underst perspectives, consequent of towards a sustainable of tand the principles of Gre achieved without posing onment.	anding of concep ces of societal re lirection. This cou en Technology ar	t of sustainable source use and urse also equips nd demonstrate
	1. To guide t	he students in under	standing the concepts of	green technolog	y and its need.
Course Objective	 To ensure To enable To enable differentir To guide t 	that the students un the students to expl- the student's ability ndustries he students in the ap	nderstand the term green ore the Green industrial p to describe Cleaner Proc oplication of green chemis	oxidation and na processes. duction measures	anotechnology. s applicable to red technologies.
Course	Upon comple 1. examine t 2. evaluate t 3. gain know	tion of this course, th he principles of gree he approach on gree /ledge on Green indu	ne students will be able to n chemistry and engineer in technology towards the strial processes	o ing e new discovery a	and innovation

analyze the concept of sustainable development and its importance
 analyze and select the different principles of green chemistry and susta

5. analyze and select the different principles of green chemistry and sustainable development for various applications															
			develo	opmen	t for val	nousap	plicatio	ons.							
				G											
со,	PO- 1	PO -2	PO - 3	РО- 4	РО -5	РО- 6	РО- 7	РО- 8	РО- 9	PO - 10	PO -11	PO - 12	PSO -1	PSO- 2	
CO- 1	2	2	3	1	1	1	2	3	1	2	1	3	1	1	
CO- 2	-	-	3	2	2	1	2	3	1	2	1	2	1	1	
CO- 3	-	-	3	2	2	1	2	3	1	2	1	2	3	2	
CO- 4	-	-	3	2	2	1	2	3	1	2	1	1	1	1	
CO- 5 - 3 2 2 1 2 3 1 2 1 1 3 2 1: Weakly related, 2: Moderately related and 3: Strongly															
1: Weakly related, 2: Moderately related and 3: Strongly related															
related MODULE 1: INTRODUCTION TO GREEN TECHNOLOGY (9L)															
Principles of green technology, concepts of green chemistry and process intensification. BTL-3															
NICD		UNLLIN	311111		VD CAI	ALISIS	•								(56)
Greer reacti liquid	n oxidat ons, Sy s.	tion an nthesis	d photo s of Gre	ochemi en Rea	cal read gents, (ctions, Green s	Microw solvent	vave an s, Gree	d Ultra n nano	sound techno	assiste logy ar	d Id Ionic	CO BTI	-2 3	
MOD	ULE 3:	GREEN	INDUS	TRIAL I	PROCES	SES									(9L)
Pollut pestic	ion sta ides ar	tistics f nd wast	rom va ewater	rious ir treatn	ndustrie nent. A	es like greene	polyme er appro	r, textil bach to	e, phai wards a	rmaceu all thes	tical, d e indus	yes, stries.	CO BTI	3 -3	
MOD	ULE 4:	GREEN	CHEM	STRY 8	& SUST	AINAB	LE CHE	MICAL	PROCE	SSES					(9L)
Resou impac	urces/T ct ofgre	ools fo en che	r Green mistry,	Altern Develo	atives, opment	Green of Spe	laws co cializeo	omplian d Synth	ice, Exa etic Teo	amples chnique	and es.		CO BTI	-4 L-3	
MOD	ULE 5:	CHALLE	ENGES /	AND PF	RACTIC	AL IMP	LEMEN	ΙΤΑΤΙΟΙ	N						(9L)
Respo techn andsu	onsibilit ologies Istainal	ies and Imple: Die dev	l poten menta elopme	tials of tion of ent with	compa the pra n Case s	nies fo ctical a studies	r actior pplicat	n. Greer ions of	n Produ Green	uctivity emergi	and er ing tecl	nerging hnologie	s CO BTI	5 L-3	
BOOK	S														
	1 2	Bisho Anas 1998	p P. L. tas P.T 8.	McGrav . and W	w-Hill, F /arner .	Pollutic I.C, Gre	on Preve en Che	ention: emistry:	Funda Theor	mental y and P	s and P ractice	Practice, e, Oxford	Bostor Unive	n <u>, 2000</u> rsity P). ress,
3	3	Marc	el Dekk	er, Intr	oductio	on to G	reen Cl	hemistr	y, A.S.	Publish	ier, Ne	wyork, 2	001.		
	1	Moda Revie	ak P., V ws,	isvanat	han C.	and Pa	rasnis I	M, Clea	ner Pro	oductio	n Audi	t Enviror	nment	al Syst	em
	5	Asian Clark Black	Institut J.H. ar well	te of Te nd Ma	chnolo cquarri	gy, Bar e D.J,	ngkok, : Handb	1995. ook of	Greer	n Chen	nistry	and Tec	hnolo	gy, Wi	ley-
		Publis	hers, 2	002											
REFER	ENCE B	OOKS													

	Ahluwalia, Green Chemistry: Environmentally Benign Reactions, V.K. Ane Books India, New
1	Delhi,
	India, 2006.
	Sawyer C.N, McCarty P.L and Parkin G.F, Chemistry for Environmental Engineering and Science,
2	5th
	ed. McGraw-Hill Professional, 2003.
2	Lancaster M, Green Chemistry: An Introductory Text, Royal Society of Chemistry, Cambridge,
5	2002.
E Resources	o for Reference
1.	https://link.springer.com/article/10.1007/s11356-022-20024-4
2.	https://iopscience.iop.org/article/10.1088/1755-1315/94/1/012115/pdf
2	https://iaeme.com/MasterAdmin/Journal_uploads/IJMET/VOLUME_9_ISSUE_3/IJMET_09_
5.	03_113.pdf
MOOC	
1.	https://onlinecourses.swayam2.ac.in/aic21_ge16/preview

COURS	SE E			IND	USTRI	AL MAI	NAGEN	IENT			CREI	DITS		Non Cro Cours	edit se	
COUR CODI	SE E	G	GGE510)34	C C	OURSE	RY		M	с	Ŀ	-T-P-S		3-0-0	-2	
Versio	on	1	.0		A	pprova	l Detai	ls	37 th ACM			RNING	6	BTL-4		
ASSESS	MENT	SCHEME														
First Periodi Assessm	t ical nent	Seco As	nd Per ssessm	iodical ent		Seminar/ Assignments/ Project Surprise Test / Quiz					Atte	endanc	e	ESE		
15%	, 5		15%			10)%		5%	6		5%		50%	6	
Cours Descript	se tion	This	This course provide brief introduction about the management principles and their functions.													
Course Objectiv	e	1. T 2. T 3. T 4. ⁻ 5. T	 To provide brief introduction about the management principles and their functions. To study the concepts of product design, product layout and PPC functions. To know the material requirement planning and store keeping procedure. To explain the basic principles of TQM. To understand the social responsibilities of engineer and ways to protect our environment. 													
Course Outcome	e	1. fi 2. l n 3. L a 4. / ii 5. l	Interp amiliar mplen nodes Inders ndyze Analyze n quali ncorpo	ret giv rize with nent pr and PP tand th import e the no ty cont prate th	en or n differ oduct C funct ne ma cance c eed of rol. ne socia	ganizat rent lea design ions. terial u of inver Total C al respo	tion st idershi , and require ntory co Quality ponsibilit	ructur p style explair ment ontrol. manag	e, and s. plannir ement enginee	ent typ ent typ and ap er and v	ire m pes of store precia ways to	ajor m plant keepi te the u	nanage layout, ng pro usage o ct our o	ment , produ ocedure of TQM environ	skills, action e and tools ament	
Prerequi	sites:	Knowle	dge of	English	Comn	nunicat	tion									
CO, PO	AND P	SO MA	PPING													
~	PO	PO	PO	PO	PO	PO	PO	РО	PO	PO	PO	РО	PS	PS		
	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	0-1	0-2		
CO-1	1	-	3	-	-	-	-	-	-	-	-	-	1	-		
CO-2	2	-	-	2	1	-	-	-	-	-	-	-	1	-		

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mana	management- Business Organisation -Types- Proprietorship-Partnership- Joint stock-													:k-		
Соор	erat	ive So	ociety-A	Advant	ages a	nd dis	advant	ages -	Orgar	nisatior	n-Defin	ition-	types	of	CO- 1	1
orgar	organisation –Line-Functional-Line & staff-advantages and disadvantages- Leadership - Types –Quality of good leader -Motivation - Maslow's Theory of Motivation -Hierarchy of													-	BTL-	2
Types	Types –Quality of good leader -Motivation - Maslow's Theory of Motivation -Hierarchy of needs- Communication - Process of Communication – Barriers for effective communication													of		
need	needs- Communication - Process of Communication – Barriers for effective communication.													n.		
MOD	MODULE – 2: PRODUCTION MANAGEMENT														(9L)
Project planning - Market survey- Project capacity-selection of site for project- Plant layout-												ut-				
Types of Plant layout- Product design-Material requirement-Production-definition-Job, Batch & Mass production with their advantages and disadvantages-Productivity-definition													b,	CO-	2	
Batch & Mass production with their advantages and disadvantages-Productivity-definition factors to improve productivity- Production planning and Control (PPC)-definition-Functions													on	BTL-	3	
of PP	factors to improve productivity- Production planning and Control (PPC)-definition-Functions of PPC- planning, routing, scheduling, dispatching and Inspection													ns		
of PPC- planning, routing, scheduling, dispatching and Inspection. MODULE – 3: MATERIALS MANAGEMENT														(9L)	
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Material management - functions- different methods of purchasing - classification of stores - Functions of store keeper. Inventory Management- Definition - functions of Inventory													ry	0	2	
Control- Advantages of Inventory Control Enterprise resource planning - concept, features													es	СО- рті	<u>л</u>	
and applications - Material Requirement Planning (MRP)-concept, applications -Just in Time													ne	DIL	4	
(JIT)-concept and benefits-Supply chain management-concept and benefits.																
MODULE – 4: TOTAL QUALITY MANAGEMENT														(9L)	
Qual	lity-	Conce	pt-Qua incinio	s of to	ntroi- L	Jetiniti ality m	on - Fa	actors a mont-	ATTECTIC	ig quai / Circle	ity- Dii s-dofi	terent	types Functio	or		
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CO-3	2	1	-	-	-	2	-	-	-	-	-	-	-	1	
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1: Weakly related, 2: Moderately related and 3: Strongly related															
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challenges and opportunities facing FinTech companies- future of FinTech BTL-2 MODULE - 2: FIN TECH AND FINANCIAL MARKETS (91) Primary markets and Secondary market an overview-FinTech and payments, FinTech and lending-FinTech and investments-FinTech and insurance- regulatory landscape for FinTech in financial markets CO-2 MODULE - 3: FIN TECH AND CYBERSECURITY (91) Cybersecurity threats to FinTech-Cybersecurity best practices for FinTech companies-role of government in regulating FinTech cybersecurity. CO-3 Branchless Banking: MODULE - 4: BRANCHLESS BANKING (91) Branchless Banking: Monule - 4: BRANCHLESS BANKING (91) Branchless Banking: Mobile Banking, Card technologies, Internet Banking, Ancillary Services: Interbank Transfer - Electronic Clearing Services (ECS), Electronic Funds BTL - 4 BTL - 4 Safe Deposit Lockers; FOREX service; DEMAT and Custodial service. (91) BTL - 4 MODULE - 5: TECHNOLOGY DISRUPTIONS ENABLING FINTECH INNOVATION (91) 4 G and 5 G networks fueling Fin Tech opportunities, transforming customer experience using Mobile Application and smart phones, embedded sensors and social media, cloud computing, web 2.0/3.0/4.0/apid web design, Java Script, Technologies, IoT, Big Data analytics and Al and Block chain. BTL - 3 TEXT BOOKS 1 Susanne Chishti, Janos Barberis, The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries, John Wile	Introduction to FinTech, history of FinTech-key trends driving the growth of FinTech,											
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analytics and AI and Block chain. TEXT BOOKS 1 Susanne Chishti, Janos Barberis, The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries, John Wiley & Sons. 2016 2. Parag Y Arjunwadkar, Fintech: The Technology Driving Disruption in the financial service industry CRC press. REFERENCE BOOKS 1 Jonathan Aronson and Peter F. Cowhey, Digital DNA: Disruption and the Challenges for Global Governance, OUP USA, 2017 2 Rajesh, R., & Sivagnana Siddhi T., "Banking Theory Law & Practice", Tata Mc Graw Hill.2009. E BOOKS 1. https://www.amazon.in/Fintech-Founders-Inspiring-Entrepreneurs-Changing- ebook/dp/B08295NZ2T?asin=B08295NZ2T&revisionId=e61ddfa1&format=1&depth=1 2. https://www.ebooknetworking.net/ebooks/banking-theory-and-law-practice-by- gurusamy.html	compu	ting, web 2.0/3.0/4.0, rapid web design, Java Script, Technologies, IoT, Big Data	BTL-3									
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Jonathan Aronson and Peter F. Cowhey, Digital DNA: Disruption and the Challenges for Global Governance, OUP USA, 2017 Rajesh, R., & Sivagnana Siddhi T., "Banking Theory Law & Practice", Tata Mc Graw Hill.2009. E BOOKS 1. https://www.amazon.in/Fintech-Founders-Inspiring-Entrepreneurs-Changing- ebook/dp/B08295NZ2T?asin=B08295NZ2T&revisionId=e61ddfa1&format=1&depth=1 2. https://www.ebooknetworking.net/ebooks/banking-theory-and-law-practice-by- gurusamy.html	REFERE	NCE BOOKS										
2 Rajesh, R., & Sivagnana Siddhi T., "Banking Theory Law & Practice", Tata Mc Graw Hill.2009. E BOOKS https://www.amazon.in/Fintech-Founders-Inspiring-Entrepreneurs-Changing-ebook/dp/B08295NZ2T?asin=B08295NZ2T&revisionId=e61ddfa1&format=1&depth=1 2. https://www.ebooknetworking.net/ebooks/banking-theory-and-law-practice-by-gurusamy.html MOOC	1	Jonathan Aronson and Peter F. Cowhey, Digital DNA: Disruption and the Challenges Governance, OUP USA, 2017	for Global									
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MANDATORY COURSE-IV

COL	JRSE	PROFESSIONAL SKILL AND ETHICS								CREDITS Non Cr					t
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Vei	rsion		1.0	A	Approval Details			41ACN Dt. 13 J 24	1 ul	LEARN	VEL	В	TL – 3		
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First Periodical Assessment 15%		Se Per Asse	econd iodical essment	F Ass	Practical	l its (Observa reco approv Depa Exam Commit	ation / I ords as ed by th rtment ination tee "DE	ab ne	Attenda	nce	Theo	ry	Practi al	ic
1	5%	1	L5%		10%		!	5%		5%		25%	6	25%	•
Co Desci Co Obje	urse ription urse ective	The to pr cours comr inter need 1 2 3 4 5	The Grooming and Mock Interview Training course is a focused 10-hour program designed to prepare the students for successful campus placements and professional careers. This course covers essential aspects of personal grooming, professional etiquette, effective communication, resume building, and interview preparation. Through practical exercises, interactive sessions, and real-world scenarios, students will gain the skills and confidence needed to excel in job interviews and professional environments. 1. To enhance personal grooming and professional etiquette. 2. To improve verbal and non-verbal communication skills. 3. To create customised resumes and cover letters as per job role. 4. To prepare students for various types of interviews.												
Co Out	urse come	 Upon completion of this course, the students will be able to Exhibit appropriate personal grooming and professional attire suitable for various business environments. Communicate effectively and confidently in verbal and non-verbal interactions, ensuring clarity, articulation, and appropriate tone. Formulate well-structured, targeted resumes and cover letter that highlight relevant skills, achievements, and experiences. Prepare for different types of interviews (HR and Technical), knowing what each assesses. Engage confidently in mock interviews, receiving and incorporating feedback to improve performance 										us ng Is, s. ve			
Prerec	QUISITES:	Plus Tv	NO Engl	ish-Inte	ermedia	te Level									
CO/ PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO1	PO 11	PO:	L PS	O PSC	22
CO1	-	-	-	-	-	-	_	2	1	2	-	3	1		2
CO2	-	-	-	-	-	-	-	2	2	2	-	3	1	-	1
CO3	-	-	-	-	-	-	-	2	2	2 2 - 3		2	1		
CO4	-	-	-	-	-	-	-	-	1	2	2	3	1	1	

CO5	-	-	-	-	-	-	-	-	2	2	2	3	1	1
			1: We	akly rel	ated, 2	Moder	ately re	elated a	nd 3: St	trongly	related			
Mod	lule 1 : B	USINES	SS ETHI	CS AND	ETIQU	ETTE								(9P)
Impo Perso profe Etiqu	rtance o mal hygie ssional b ettes	f perso ene ano ehavio	onal gro d groom or-Busin	oming-l ning tips ess etiq	Dressing - Make Juettes:	g for su up and a Do's an	ccess: E accesso id don't	Business ries for s-Practi	formal a profe ce for p	and bussional	isiness look- In onal dre	casual a troduct essing, [attire- ion to Dining	CO-1 BTL- 2
Module 2 : TAILORING AND CUSTOMIZING RESUME TO MEET JOB ROLE INCLUDING COVER LETTER													(9P)	
Key components of a professional resume- Tailoring your resume for different job profiles- Use of Action verbs in Resume-Resume do's and don'ts- Reviewing and refining student resumes as per job description- Customizing cover letters for specific roles, Preparation of Checklist and Portfolio, Researching for the company and gaining details of the job description													CO- 2 BTL- 3	
Module 3: VERBAL AND NON-VERBAL PRESENTATION IN THE INTERVIEW													(9P)	
Effect profe langu interv	Effective speaking skills-Articulation and clarity-Tone and pitch control- Introducing oneself in a professional setting- Making first impression- Non-Verbal Communication: Importance of body language-Eye contact, facial expressions, and gestures- Posture and handshake- Magics of smile in interview-Role-playing exercises to enhance non-verbal cues- Time management in interviews												CO- 3 BTL- 3	
Mod	ule 4: IN	FERVIE	W PREF	PARATIO	ON TEC	HNIQUE	S							(9P)
Overv interv behav pairs,	view of view asso vioural q Removi	differe esses- uestior ng Fear	nt type Discussi ns (Situa r, nervo	es of in ing frec ation, Ta usness	terview quently ask, Act and an>	s: HR a asked i ion, Res kiety usi	and Tec ntervie sult)- Pr ng relax	chnical-l w quest actice f kation n	Underst tions- S or answ nethod	anding TAR me vering co and bre	what of ethod fo ommon eathing	each ty or answ questio techniq	pe of /ering ons in ues	CO-4 BTL- 3
Mod	ule 5 : M	OCK IN	ITERVIE	WS AS	PER JOI	BROLE	AND FE	EDBAC	((9P)
Simulated one-on-one interviews as per job description with feedback-Role-playing in different interview scenarios (HR, Technical)- Time management in responses-Feedback to Each Student regarding merits and scopes for improvement, Advanced strategies for handling difficult interview questions, Negotiation skills and salary discussions, Interaction with Alumni Ambassadors-Full length Panel Interview Follow-Up Emails and Letters- Maintaining Professional Connections and networking												CO-5 BTL- 3		
ТЕХТ ВООК														
1	Collins, Your Int	Allan (erview	2016). H /ers & L	HR Inter AND TH	rview Se IE JOB Y	ecrets: H <u>OU W</u> A	low To NT! US	Ace Υοι <u>Α: Suc</u> ce	ur Next ess in hr	Human '.	Resour	ces Inte	rview,	Dazzle

HONORS COURSES OFFERED BY DEPARTMENT OF AUTOMOBILE ENGINEERING

LIST OF COURSES UNDER THE HONORS IN MOTORSPORT ENGINEERING:

	SEMESTER - V												
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Р	С	s	тсн				
1.	HN	EAT51900	Race Car Anatomy	3	0	0	3	1	3				
			SEMESTER - VI										
2.	HN	EAT51901	Motorsport Vehicle System Design	3	0	0	3	1	3				
	SEMESTER - VII												

3.	HN	EAT51902	Aerodynamics for Race Cars	3	0	0	3	1	3
4.	HN	EAT51903	Racetrack and Data Management	3	0	0	3	1	3
					12				

COURSES UNDER THE HONORS IN MOTORSPORT ENGINEERING:

<u>Syllabus</u>

V SEMESTER:

COUR TITLE	SE E		RACE CAR ANATOMY										3		
COUR CODI	SE E	EA1	51900	C	COURSE	CATE	iory	ŀ	IN	1	L-T-P-S		3-0-0)-1	
Versio	on		1.0		Appro	val Det	ails	36th	ACM	LE	ARNIN LEVEL	G	BTL-3		
ASSESSI	MENT	SCHEM	E												
First Periodi Assessm	: cal nent	Se Per Asse	cond iodical ssment	:	Ser Assig Pı	minar/ nments roject	5/	Sur Test	prise / Quiz	Att	endan	ce	ESE		
15%	,	-	15%			10%		5	5%		5%		50%	6	
Cours Descript	Course This course gives historical development of motorsport and competition vehicle evolution.														
Course Objectiv	 To discuss on historical development of motorsport and competition vehicle evolution. To identify the systems and components of a racing car To illustrate sporting and technical regulations and techniques used in racing car design and manufacture To examine the interaction between various design parameters of a racing car 														
Course Outcom	es	 Upon completion of this course, the students will be able to Discuss on historical development of motorsport and competition vehicle evolution. Identify the systems and components of a racing car Illustrate sporting and technical regulations and techniques used in racing car design and manufacture Examine the interaction between various design parameters of a racing car Demonstrate key features of various software packages related to Motorsports. 													
Prerequ	isites	Nil													
CO, PO	AND F	SO MA	PPING					•				-	T		
со	PO 1	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO 10	PO-	PO-	PSO-	PSO-	
<u> </u>	-1 1	2 1)	4 2	5	0	/	0 1	9	-10	11	12	1	2	
CO-1 CO-2	2	1	2	1	- 1	2	-	-	2	1	- 1	2	2	 1	
CO-3	1	2	1	2	-	-	-	1	-	1	-	1	1	2	
CO-4	2	1	1	2	-	2	1	-	2	2	1	2	2	1	
CO-5	1	1	1	2	1	-	-	1	-	1	-	1	1	2	
	_		- 1: Wea	- klv rela		Moder	atelv re	elated a	nd 3: St	trongly	/ relate				
MODULE	E 1: HI	STORY C	OF MOT	ORSPO	RT AND	COMPE	TITION	VEHICL	E DEVEI	OPME	NT		(9L)		
The hist Motorsp events s Suggest	tory o oort er tuden t ed Re	f motor Igineerin ts can ta ading: S	rsport e ng -Mo ake par Secrecy	nginee torspor t to dev in Mot	ring-Re t techn velop th orsport	view o ology e eir skill engine	f moto volutio s. ering	rsport e n reviev	enginee v - A bri	ring-P ief loo	ioneers k at all 1	of the	CO- BTL	1 -2	
MODUL	E 2: C	OMPON	IENTS C	OF A RA	CING C	AR							(9L)		

Chassis types - Suspension systems - Springs and dampers - Steering systems - Brakin	g
systems – Engines - Fuel systems - Exhaust systems - Transmission systems - Coolin	g CO-2
systems - Effects of aerodynamics - Data logging, sensors, and engine management.	BTL-2
Suggested Reading: Aero kits used in race cars	
MODULE 3: SPORTING AND TECHNICAL REGULATIONS	(9L)
All about the most important book for a motorsport engineer – the rule book - About the world governing bodies of the sport - Why the rule book keeps changing - How t interpret the rule book- Rules for car races - Rules for bikes races. Motorsport Engineer Race Driver / Rider - Test Driver / Rider - Design engineer - Rac technician -Aerodynamics Engineer - Race official / steward.	- ^O CO-3 e BTL-3
MODULE 4: DESIGN OF COMPETITION VEHICLES	(9L)
Identify important design objectives for a successful racing car - Compute loads on a car during operating conditions like Acceleration, Braking, Cornering. Design objectives of racing car structure - Different types of structures like: space-frame, monoque an stressed skin - Loads on the chassis structure - Analysis techniques for the frame - Passiv safety structures Suggested Reading : Study how these loads influence the aerodynamic forces acting o the car.	r a d CO-4 BTL-2
MODULE 5: INTRODUCTION TO SOFTWARE PACKAGES RELATED TO MOTORSPORT EN	GINEERING (9L)
ANSYS, OptimumLap, Chassis Sim, Data logger, ADAMS, Matlab & Race Technolog	у со-5
Analysis software.	BTL-4
Suggested Reading: Race track data reading in excel.	
TEXT BOOKS	
1. Milliken and Milliken, "Race Car Vehicle Dynamics", Premier Series books, 2015.	
2. Terry Jackson, "Anatomy of Speed: Inside the World's Great Race Cars".	
REFERENCE BOOKS	
1. Forbes Aird, Race Car Chassis: Design and Construction [Powerpro]	
2. Carroll Smith, Engineer to Win: The Essential Guide to Racing Car Materials Technology Winners Which Don't Break.	blogy or How to Build

VI SEMESTER:

COURSE	MOTORSP	ORT VEHICLE SYSTE	M DESIGN	CREDITS	3							
IIILE												
COURSE	FAT51901	COURSE	HN	I_T_P_S	3-0-0-1							
CODE		CATEGORY		211.5	5001							
Version	1.0	Approval Details	33 rd ACM	LEARNING LEVEL	BTL-3							
ASSESSMENT SCHEME												
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE							
15%	15%	10%	5%	5%	50%							
Course Description	This course provide	This course provides motorsport vehicle design procedure and calculation.										

1. To discuss engine performance and engine simulation techniques2. To test the physical processes at work during the preparation of the fuel & air is3. To evaluate the matching of engine, transmission and induced vibration for m applications4. To demonstrate the race dynamics and control systems.5. To examine hybridization and electrification of motorsport powertrains									& air mix for moto	kture orsport				
Course Outcom	es	U 1. Di 2. Te 3. Ev ap 4. Do 5. An	pon co iscuss e est the p valuate oplicationemonst nalyse h	mpletic ngine p ohysica the ma ons rate the nybridiz	on of thi perform I proces atching e race c ation a	is cours ance ar sses at of eng lynamic nd elec	e, the s nd engin work du tine, tra cs and c trificatio	tudent ne simu uring th ansmiss ontrol s on of m	s will be ilation t e prepa ion and systems notorsp	e able t echnic aration d indu s. ort pov	to jues of the ced vib wertrain	fuel & a ration าs	air mixtu for moto	re orsport
Prerequisites: Nil														
CO, PO	CO, PO AND PSO MAPPING													
со	PO -1	PO- 2	PO-	РО- 4	PO- 5	PO-	PO- 7	PO-	PO- 9	PO -10	PO- 11	PO- 12	PSO- 1	PSO- 2
CO-1	2	1	1	2	-	1	-	1	-	10	-	1	1	2
CO-2	2	2	2	1	1	2	1	-	2	1	1	2	2	1
CO-3	1	2	1	2	-	-	-	1	-	1	-	1	1	2
CO-4	2	1	1	2	-	2	1	-	2	2	1	2	2	1
CO-5	1	1	1	2	1	-	-	1	-	1	-	1	1	2
			1: Wea	kly rela	ted, 2:	Moder	ately re	lated a	nd 3: S	trongly	y relate	d		
MODUL	.E 1: Eľ	NGINE P	OWER	AND CH	ARACTI		5							(9L)
Gasolino cycles an thermo- Practice	e engir nd the fluid ir 2: TSi a	ne perfo limits t nplicati nd GDI	ormanc to ideal ons. in moto	e chara behav orsports	cteristio ior - Ma	cs: perf	ormanc ng pow	e indice er outp	es - Ide out usin	alized 1 g high	hermo engine	dynami speeds	c s: C B	20-1 TL-2
MODUL	E 2: A	IR FUEL	AND C	OMBUS	STION									(9L)
Maximizing the air/fuel charge in every cylinder: intake system design, supercharging & turbo- charging - Fuel systems, combustion control and engine management systems - Mechanical design of high performance two and four stroke petrol and diesel motorsport engines. <i>Practice:</i> Ramjet injection and pilot injection in motorsports engines									al C B	CO-2 TL-2				
MODUL	.E 3: TI	RANSM	ISSION	AND IN	IDUCED	VIBRA	TION						÷	(9L)
The matching of engine, transmission and vehicle - The design of high-performance vehicle transmission systems - Limit behavior and design aspects - differentials and brake balancing - Simulation tools and model building - Vibration behavior of car and wheels; springs; dampers; track roughness. Practice: The use of electro-hydraulic shaker rigs for setup.									e - C S; B	CO-3 TL-3				
Practice: The use of electro-hydraulic snaker rigs for setup. MODULE 4: RACE DYNAMICS AND CONTROL										(9L)				

Minimum time optimization - Tyre shear force development, measurement and characterization - Suspension geometry description and analysis – important properties - Steady turning equilibrium states; suspension/chassis interactions; roll angles, load transfers, jacking - Yaw/sideslip handling dynamics; steady turn responses, understeer and oversteer. <i>Practice:</i> Analysis of stability and controllability of vehicles MODULE 5: HYBRID AND ELECTRIC DRIVELINE									
мс	DDULE 5: HYBRID AND ELECTRIC DRIVELINE	(9L)							
Lay trac adv Con driv Pro	rout of an electric vehicle, performance of electric vehicles – traction motor characteristics, etive effort, transmission requirements, vehicle performance, energy consumption, antage and limitations, specifications, system components, electronic control system - incepts of hybrid electric drive train, types, architecture of series and parallel hybrid electric re train, merits and demerits.	CO-5 BTL-4							
TEX	T BOOKS								
1.	Donald L Anglin and William H Crouse, Automotive mechanics, McGraw Hill Education; 10	th Edition.							
2	Herald Naunheimer, Bernd Bertsche, Joachim Ryborz and Wolfgang Novak, Automotive tr	ansmissions:							
۷.	Fundamentals, selection, Design and application, Springer science & Business media.								
REF	ERENCE BOOKS								
1.	Julian Happian, An Introduction to Modern Vehicle Design, Publisher: SAE International, 2	014.							
2.	John Fenton, Handbook of Vehicle Design Analysis, Published by Society of Automotive E 2016	ngineers Inc,							
PRA	CTICE:								
	 Simulate the vehicle performance characteristics of the designed vehicle using 0 Software. Compare the old Vs new design as per the results obtained from Optimum Lap software report. 	OptimumLap e and submit							

VII SEMESTER:

COURSE TITLE	AERODY	NAMICS FOR RA	CE CARS	CREDITS	3
COURSE CODE	EAT51902	COURSE CATEGORY	HN	L-T-P-S	3-0-0-1
Version	1.0	Approval Details	33 rd ACM	LEARNING LEVEL	BTL-3
ASSESSMENT	SCHEME				
First Periodical	Second Periodical	Seminar/ Assignments	Surprise Test / Quiz	Attendance	ESE
Assessment	Assessment	/ Project			-
15%	15%	10%	5%	5%	50%
Course	This course provid	les race car aeroo	lynamics practice ar	id its limitations, and	some
Description	appreciation of like	ely new developr	nents.		
Course Objectives	 To examine ve To develop cu To apply engine constraints us To discuss on initiative and To demonstration demonstration 	ehicle aerodynam rrent Race Car Ad neering technique ing CFD different roles personal respons ate advanced lev	nics and wind tunnel erodynamics practic es taking account of within an engineeri ibility, which may be vel knowledge and ponents.	technology e a range of commercia ng team and the abi e as a team member o understanding of a	I and industrial lity to exercise r leader. wide range of

				Upon c	omplet	ion of th	is cours	e, the s	tudent	s will be	e able i	to			
			1.	Examin	e vehic	le aerod	ynamics	and w	ind tun	nel tecl	nnolog	У			
			2.	Develo	o currei	nt Race	Car Aero	odynam	ics pra	ctice		<i>c</i>	-		
Coι	urse		3.	Apply e	enginee	ring tec	hniques	taking	accour	nt of a	range	of com	imercia	I and ind	dustrial
Out	com	es		constra	ints usi	ng CFD									
			4.	Discuss	on diff	erent ro	les with	n an en	gineeri	ng tean	n and t	he abili	ty to ex	ercise in	itiative
			-	and per	rsonal r	esponsi	ollity, wi	nich ma	ly be as	a team	n mem	ber or I	eader.	مر مامانین	
			5.	Demon	strate	advance	and com	n know	leage	and ur	idersta	anding	ora	wide ra	nge or
Dror	COGUI	icitoc	Nil	enginee		aterials		ропеп	ιs.						
	PO	AND I													
	,	P	50 111								Р				
C	CO O- PO PO PO PO- PO- PO PO PO O- PO										PO	PSO	PSO		
		1	-2	-3	-4	5	6	-7	-8	-9	10	-11	-12	-1	-2
CO	-1	2	1	1	2	-	1	-	1	-	1	-	1	1	2
CO	-2	2	2	2	1	1	2	1	-	2	1	1	2	2	1
CO	-3	1 2 1 2 1 - 1 -									1	1	2		
CO	-4	2	1	1	2	-	2	1	-	2	2	1	2	2	1
CO-5 1 1 2 1 - 1 - 1 -										1	1	2			
	1: Weakly related, 2: Moderately related and 3: Strongly related														
MC	DUL	E 1:	VE	HICLE A	ERODY	NAMICS		_					. 1		(9L)
Veh	icle	resista	ances a	and typ	es - Va	rious ty	pes of	forces	and mo	oments	- Vari	ous bo	dy		_
opti	miza	tion t	echniq	ues for	minim	um drag	- Princi	ple of v	wind tu	nnel te	chnolo	ogy - Flo	w	CO-	1
visu	visualization techniques. BTL-3														
Prac	MODULE 2: RACE CAR AERODYNAMICS AND RECENT DEVELOPMENTS (91)														
Raci			ACE CA	R AERU		VIICS AN			the fun	damon	talaar	odunan	nic		(9L)
basic flow concepts and governing equations - A review of the fundamental aerodynamic characteristics of streamlined and bluff bodies - The application of aerodynamic design									an	CO-2					
nrin	cinle	es to m	notorsr	ort win	igs and	diffuser	s		cation	or acre	aynan	ne desi	5''	BTI	-3
Sua	aest	ed Rei	adina:	Mechar	nisms fo	or contro	olling ae	rodvna	mic lift	and dra	ag gen	eration		5.1	•
MO	DUL	E 3: Al	PPLICA	TION O	F CFD I	N RACE	CARS				00-				(9L)
Intro	oduc	tion t	o CFD -	Fluid d	ynamic	s - gove	rning eq	uations	- Grid	genera	tion, te	echniqu	ies		
and	арр	licatio	n - Solı	ution sti	, rategies	5	0			0				CO-	3
Prac	ctice	: Num	erical r	nodellir	ng of flu	uid flow	around	vehicle	body					BIL	-4
МО	DUL	E 4: Al	ERODY	NAMIC	PERFO	RMANC	E ENHA	NCEME	NTS						(9L)
An	intro	ductio	on to a	aerodyn	namic is	ssues re	lated to	o coolir	ng and	ventila	tion fl	ows -	An		
intro	oduc	tion to	o whee	laerod	ynamic	s - An ov	verview	of open	-wheel	, sports	s car ar	nd touri	ng	<u></u>	4
car a	aero	dynan	nics.											BTL-	+ 2
Pra	ctice	e: Exp	erimen	tal met	thods f	or moto	orsport	aerody	namics	and u	se of	a movi	ng		-
grou	und v	wind t	unnel f	or race	car.										(01)
MO	DUL	E 5: AI	ERODY		MATE			PONEN	ITS		£ 1 N 4	- +	t. [(9L)
Wat	erial	s torn	ns, per	forman	ce and	selectio	n - Com	iposites	applic	ation o	nd ond	otorsp	ort		
toch	ustry Doigu		igii casi	e studie	25 - COI	uros	structur	es desi	gii, alia	ilyses a		liiiizati	011	CO-	5
Sug	nnqu nest	ed Re	ndina.	Moder	n Manu	ures. Ifacturin	g techn	nlogy a	nd ioini	ing teck	nique	s- maki	nσ	BTL-	2
GRP	GRPF sheets														
TEX	TEXT BOOKS														
1.	W.I	H. Huc	ho. 'Ae	erodvna	mics of	F Road V	ehicles'.	Butter	worth a	and Co.	. 2014				
2.	Jos	eph Ka	atz, Rac	ce Car A	erodyn	iamics, E	Butterwo	orth an	d Co., 2	015.	,				
REF	EREN	NCE BO	DOKS		,	,			,						
1.	E.L.	Hough	iton &	P.L.Carp	oenter,	"Aerody	/namics	for Eng	ineerin	g stude	ents", E	Butterw	orth H	einman a	and
	Со.,	2013													
2.	Mill	iken a	nd Mill	liken, "F	Race Ca	r Vehicle	e Dynam	nics", B	utterwo	orth and	d Co., 2	2015.			

COURS	E TITLE		Race Track and Data Management CREDITS								3			
COURS	E CODE		EAT519	903	CO CAT	OURSE FEGORY		н	N		L-T-P	-S	3-0-0	0-1
Ver	sion		1.0		Ap D	oproval Jetails		33 rd /	ACM		LEARN LEVI	ING EL	BTL	-3
ASSESS	MENT S	CHEME												
First Po	riodical		Secor	d	Se	minar/		Surnris						
Δςςρς	ment		Periodi	cal	Assig	gnments	/ т	est / Ou		Α	ttendand	e	ES	E
1.0000		A	ssessm	ient	Р	roject		, .						
15	5%		15%			10%		5%			5%		50	%
Cou	irse	Thi	s cours	e gives e	evolutio	on of mo	torspo	orts, trac	ck des	ign an	d its spec	ialties, 1	rack dat	a
Descri	ption	and	analyz	e the pe	erforma	ince pea	ks							
		1.	To dise	cuss the	evolut	ion of m	otorsp	orts						
Course		2.	To dev	elop th	e track	design a	nd its :	specialt	ies					
Course		3.	To des	ign the	racetra	ick in rea	ii time	ام م م م			- lea			
Objectiv	es	4.		elop tra		a and an acc focin	alyze t	ne perio	ormar	nce pe	JKS ad distinu	wich th	- motor	nort
		5.	10 dss	nmont	and the	ges lacil	ig the i	its dove		ant	iu uistinį	guisii tii		sport
Linen completion of this course, the students will be able to														
Upon completion of this course, the students will be able to														
		2	Dovola	s the ev		sign and	its sno	.s scialtios						
Course 2. Develop the track design and its specialties														
Outcom	es	٦. ۵	 Develop track data and analyze the performance peaks 											
		5. Assess the challenges facing the motorsport sector and distinguish t									uish the	motors	snort	
environment and the influences on its development														
Prerequisites: Nil														
								1						PS
со	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO	- P(D PO-	PO-	PS	0-
	1	2	3	4	5	6	7	8	9	-1	11	12	0-1	2
CO-1	2	1	1	2	-	1	-	1	-	1	-	1	1	2
CO-2	2	2	2	1	1	2	1	-	1	2	1	2	2	1
CO-3	1	2	1	2	-	1	-	1	-	1	-	1	1	2
CO-4	2	1	1	2	-	2	1	-	2	2	1	2	2	1
CO-5	1	1	1	2	1	-	1	1	-	1	-	1	1	2
		1	: Weak	ly relate	ed, 2: N	loderate	ely rela	ted and	d 3: St	trongly	related			
MODULI	E 1: INTF	RODUC	FION TO	мото	RSPORT	٢S							(91	_)
History o	of motor	rsport a	and con	npetitio	n vehic	le devel	opmer	nt - Com	petiti	ion vel	nicle cate	gories	60	4
-Sporting	g and te	chnical	regulat	tions - D	esign c	of compe	tition	vehicles	5.				CO-	1 2
Practice	: Variou	s comp	oetition	conduc	ted for	car and	bikes a	around	the w	orld.			DIL	.5
MODUL	2: INSI	DE RAC	CING TE	CHNOL	OGY								(9L)
Understa	anding r	ace car	[.] – Und	erstand	ing race	etrack –	Apex l	ine – Ra	acing	line –	Fast lane	– Tip-	0	2
Toe – Do	wnshift	– Strai	ght line	e - Dragg	ging – T	hrottle -	- Pitlan	ie.					BTI	_2
Practice	: Discus	sions o	f racing	techni	cal topi	cs.								
MODUL	E 3: TRA	CK DA		ИRT									(9L)
Understa	anding t	he MN	1RT Rad	e Track	– Simu	ulator Tr	aining	- POLC) GTI (car dri	ving trair	ning in	0	2
MMRT.													BTI	-3
Practice: Discussion about the MMRT design and its specialties														
MODUL	E 4: TRA	CK DA	ra log	GER									(9L)	
Identifyi	ng the I	Raw tra	ack Dat	a – Ana	alyzing	the Data	a in Ex	cel – P	eak p	erforn	nance gra	aphs –	<u> </u>	4
Tuning w	ith data	loggei	r – Trac	k simula	ation –	Lap time	logge	r -RPM	vs Pov	wer gr	aph logge	er.	BTI	-3
Practice:	Analyze	e the tr	ack dat	a set w	ith MA	LAB.								-
MODULI	5: BUS	INESS	IN MOT	ORSPO	RTS								(9L)	_
The bus	iness er	vironn	nent in	genera	l - The	busines	s conte	ext for i	motor	rsport	organiza	tions -	CO-5	
Managin	g motor	sport b	ousines	ses strat	tegically	y - Creati	ing and	l sustair	ning co	ompet	itive adva	intage	BTL	-2

in motorsport - Commercial aspects of motorsport management - Managing technical knowledge and expertise in motorsport - Technology transfer and opportunities for										
KIIOWIEug	se and expertise in motorsport - recimology transier and opportunities for									
diversifica	ation.									
Practice: Project management and motorsport										
TEXT BOO	TEXT BOOKS									
1.	Ayrton Senna, "Ayrton Senna's Principles of Race Driving"									
2	Buddy Fey, Data Power: Using Racecar Data Acquisition: A Practical Guide to: Selection and Setup									
Ζ.	2. Data Interpretation Trackside Operation.									
REFEREN	CE BOOKS									
1.	Winning: A Race Drivers Handbook by George A. Anderson									
2.	Drive to Win: The Essential Guide to Race Driving by Carroll Smith									
3.	Competition Car Data Logging: A Practical Handbook by Simon McBeath									
PRACTICE	IS TARGETS									
Track Da	y in MMRT on the race weekend.									
•	 Perform race preparation document for the saloon and open wheel category races 									
• /	 Assess the race weekend strategies executed by the Teams for MMRT Track 									

Assess the face weekend strategies executed by the reams for MiNRT frack
 Submit the consolidated report for the track day including observations of the different racing teams.

LIST OF COURSES UNDER THE HONOURS IN AUTOTRONICS:

	SEMESTER - V												
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Р	С	s	тсн				
1.	HN	EAT51904	Perception System for Autonomous Car	3	0	0	3	0	3				
	SEMESTER - VI												
2.	HN	EAT51905	Intelligent Transport system and V2V technology	3	0	0	3	0	3				
			SEMESTER - VII										
3.	HN	EAT51906	Pose Estimation for Autonomous Car	3	0	0	3	0	3				
4.	HN	EAT51907	State Estimation and Vehicle control for Autonomous Car	3	0	0	3	0	3				
	Total Credits						12						

V SEMESTER:

COURSE TITLE	PERCEPTION S	STEM FOR AUTONOI	CREDITS	3								
COURSE CODE	EAT51904	COURSE CATEGORY	HN	L-T-P-S	3-0-0-1							
Version	1.0	Approval Details	LEARNING LEVEL	BTL-3								
ASSESSMENT SC	ASSESSMENT SCHEME											
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE							
15%	15%	10%	5%	5%	50%							

Cou Descrij	rse otion	This course provides various Sensor technologies and techniques used in autonomous car.										ıs car.		
Course Objectiv	Course1. To discuss the concept of autonomous car and its architecture2. To demonstrate the concept of an environment perception system3. To apply the positioning system4. To develop state estimation and localization5. To design the concept of Sensor Fusion and system integration techniques										25			
Course Outcom	es	1. [2. [3. 4 4. [5. [Upon completion of this course, the students will be able to Discuss the concept of autonomous car and its architecture Demonstrate the concept of an environment perception system Apply the positioning system Develop state estimation and localization Design the concept of Sensor Fusion and system integration techniques 											
Prerequi	Prerequisites:													
CO, PO AND PSO MAPPING														
0	РО	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO	PO-	PO-	PS	PS
	-1	2	3	4	5	6	7	8	9	-10	11	12	0-1	0-2
CO-1	3	2	1	3	-	-	-	1	-	1	1	1	1	2
CO-2	2	3	2	2	1	-	2	-	-	2	1	2	2	1
CO-3	1	2	1	2	-	-	-	1	-	1	1	1	1	2
CO-4	2	2	1	2	-	2	1	-	2	2	1	2	2	1
CO-5	2	2 1 1 2 1 - 1 1 1 1											1	2
MODULE 1: Introduction to Autonomous Cars and its Architecture											(9L)			
 Taxonomy of Driving -Requirements for Perception -Driving Decisions and Actions -Sensors and Computing Hardware -Hardware Configuration Design -Software Architecture - Environment Representation -Safety Frameworks for Self-Driving. Case Studies on Google car – Uber car Practice on MATLAB Automated Driving Tool Box – Introduction 									C(B1	CO-1 BTL-3				
Position	and ori	entatio	n Estin	nation .	. I IDAR	Sensor		Senso	r Mode	ls and	Point (louds -		(91)
Pose Esti Data -Ca <i>Practice</i>	Position and orientation Estimation - LIDAR Sensor -LIDAR Sensor Models and Point Clouds - Pose Estimation from LIDAR Data -RADAR Sensor - Sensor Models - Pose Estimation from RADAR Data -Camera and computer vision - Pose Estimation methods. Practice on MATLAB Automated Driving Tool Box using LIDAR/ RADAR/ Camera Sensor									C B	0-2 TL-3			
MODULE	3: Posi	tion Est	timatio	n Syste	ms and	ladvan	ced me	chatro	nics sys	tems			(9L)
GNSS/INS Sensing for Pose (position and orientation) Estimation -Ultrasonic Sensor -IR Sensor - IMUs -Night Vision Technology – advanced mechatronics system -Intelligent mechatronics - intelligent computation -ECU Architecture - Sensor hardware architecture. Practice on MATLAB Automated Driving Tool Box – Design techniques									C B	0-3 TL-3				
MODULE	4: State	e Estim	ation, l	ocaliza	tion an	d Vehi	cle cont	rol					-	(9L)
State Est and Deci and cont <i>Practice</i>	imation ision Ma rol on MAT	and Op king - ` TLAB Au	otimizin Vehicle <i>utomate</i>	ng - The contro ed Drivi	Challer I and A	nges of ctuation <i>I Box –</i>	State Es n - Long Vehicle	stimatio gitudina <i>control</i>	on -Path al & Late <i>l logic</i>	n Plann eral Ve	ing, Aut hicle M	onomy odeling	C(B1	О-4 ГL-3
MODULE	5: Sens	ors Fus	sion and	d Integi	ration o	of Senso	or Data						•	(9L)
Fusion Methods in Perception Systems -Fusion Methods in Positioning Systems -Multi sensor Fusion for State Estimation -Sensor Calibration- use of sensor fusion data - Integration of Sensor Data to On-Board Control Systems - Integration Techniques. Practice on MATLAB Automated Driving Tool Box – Testing techniques									C BT	О-5 ГL-3				
TEXT BO	OKS													
1.	Jacob F	raden,	Handbo	ook of N	/lodern	Sensor	s- Sprin	ger, 2n	d Editic	n, 201	0.			
2.	Simon I	M. Sze	Wiley, S	Semico	nducto	r Senso	rs, Inter	science	e, 3 edit	ion, 20	12.			
REFEREN	CE													
1.	Google	car –w	aymo -	Uber ca	ar – Toy	ota car	s – Volv	o cars						

VI SEMESTER:

COURSE	TITLE	INTELLIGENT TRANSPORT SYSTEM AND V2V TECHNOLOGY CREDITS												3					
COURSE	CODE	E	AT519	05	с	COURS ATEGO	SE RY		HN		L-T-	-P-S	3-(0-0-1					
Versi	on		1.0		Approval Details 36th ACM LEARNING LEVEL							B	BTL-3						
ASSESSN	ASSESSMENT SCHEME																		
Firs	t		Second	ł		Semina	r/	Sur	arico Ta	oct /									
Period	ical	Р	eriodic	al	As	signme	nts/	Jul		517	Atten	dance	E	SE					
Assessn	nent	As	sessme	ent		Projec	t		Quiz										
15%	6		15%			10%			5%		5	%	50%						
Cour	se	This o	course	provide	es know	ledge o	on intell	igent tr	ranspor	t syste	m and v	ehicle t	o vehic	le					
Descrip	tion	techn	ology																
		1. I	o discu	ss on Ir	ntellige	nt Iran	sportat	ion Syst	tems (I	(5)									
Cour	se	2. I 2 T	o demo		e teleco	ommun	Ications	5 IN 115											
Object	ives	5. I ⊿ т	3. To design ITS functional areas																
		4. 1 5 T	o deve	lon Veh	user II	-Vohicle	u seivii (\/2\/)	les Commi	inicatio	nc									
		5. 1	Inon co	mnleti	on of th		$(V \ge V)$	studen	ts will h	nis e ahle	to								
		1 F)iscuss	on Inte	lligent ⁻	Transno	ortation	Systen	ns (ITS)		.0								
Cour	se	2. C	Demons	strate te	elecom	munica	tions in	ITS											
Outcor	nes	3. C	Design I	TS func	tional a	areas													
		4. Describe ITS user needs and services																	
	5. Develop Vehicle-to-Vehicle (V2V) Communications																		
Prerequis	ites: Ni																		
CO, PO A	ND PS	O MAPE	PING				_			-									
0)	РО	PO-	PO-	PO-	PO	PO-	PO-	PO-	PO-	РО	PO-	PO-	PS	PS					
	-1	2	3	4	-5	6	7	8	9	-10	11	12	0-1	0-2					
CO-1	2	2	1	3	-	1	-	1	-	1	1	1	1	2					
CO-2	2	3	2	2	1	-	1	1	-	2	1	2	2	1					
CO-3	1	2	1	2	-	-	-	1	-	1	1	1	1	2					
CO-4	2	2	1	2	-	2	1	2	2	2	1	2	2	1					
0-5	Z	1		2	1	-	-	1	-			L	1	Z					
MODULE	1 . Intr	1: oductic	weaki	y relate	a, 2: 1V	nortat	ion Suc	ited an	a 3: Str	ongiyi	related			(01)					
MODULE	: 1: intr	oductic	n to in	teinger	it frans	sportat	ion sys	tems (i	15)					(9L)					
Introduc	tion to	Intellige	ent Trai	nsporta	tion Sy	stems (ITS) – D	efinitio	on of ITS	S and I	dentifica	ation of							
ITS Obje	ctives,	Historio	cal Bac	kgroun	d, Ben	efits o	f ITS -	ITS D	ata col	lection	techni	ques –	C	0-1					
Detector	s, Autor	natic Ve	ehicle L	ocation	(AVL),	Autom	atic Veł	nicle Ide	entificat	tion (A	VI), Geo	graphic	B	[L-2					
Informati	ion Syst	ems (G	IS), vide	eo data	collect	ion.													
MODULE	2: Tele	commu	nicatio	ns in IT	S								1	(9L)					
Telecom	munica	tions in	ITS – Ir	nporta	nce of t	elecom	munica	itions ir	the IT:	S syste	m, Infor	mation	с	0-2					
Managen	nent, Ir	affic Ma	anagen	ient Ce	nters (I	MC). V	ehicle –	- Road s	ide con	nmunic	ation –	Vehicle	B	TL-2					
Positionii		em.		•										(01)					
	5: 115 1	unction		sod Tr	offic M	anagor	nont S	(ctomc	/ A TN AC) Adv	ncod T	ravolor	1	(9L)					
Informati	ion Svet	11 Cas — 10 cmc (1	HUVall	nmer	rial Vel	nicle Or	nent 3	ns (CV/C	Civir∧y ≂vh∆ ((, Auvo Inced \	/ehicle/	Control	r	0-3					
Systems		λ) čino.	anced	Public	Tran	isnortat	tion S	ustems	, Αυνα (Δρτα	S) Ad	lvanced	Rural	B	0-3 TI_3					
Transpor	tation S	vstems	(ARTS)		, indi	500100		, , , , , , , , , , , , , , , , , , , ,	0.015	,, ,,	u	narar							
MODULE	4: ITS L	Jser Ne	eds and	d Servio	ces									(9L)					
ITS User	Need	s and	Service	es – T	ravel a	and Tra	affic m	anagen	nent, F	ublic	Transpo	ortation							
Managen	nent, El	ectroni	c Paym	ent, Co	ommer	cial Veh	nicle Op	eration	ns, Eme	rgency	Manag	ement,	C	0-4					
Advanced	d Vehic	le safet	y syste	ems, Inf	formati	on Ma	nageme	ent. Au	Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management, Automated Highway Systems										

Vehicle	Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World –									
Overview of ITS implementations in developed countries, ITS in developing countries.										
MODULE 5: Vehicle-to-Vehicle (V2V) Communications										
Dedicated short range communications (DSRC) –V2V vs V2I vs V2X vs V2N vs V2P -Importance										
of ongoing 5G development –GPS receivers and V2V –Laser Illuminated Detection and Ranging										
(LiDAR) –Inertial navigation systems –Characteristics of a wireless mesh network –V2V and										
Cybersecurity.										
TEXT BOOKS										
1.	Kan Paul Chen, John Miles, ITS Handbook: Recommendations for World Road Associatio	n (PIARC)								
2.	Sussman, J. M., Perspective on ITS, Artech House Publishers, 2015.									
3.	Dimitrakopoulos, George: Current Technologies in Vehicular Communication, Springer, 2017.									
REFERE	REFERENCE									
1.	National ITS Architecture Documentation, US Department of Transportation, 2017.									

VII SEMESTER

COUI TITI	rse Le	POSE ESTIMATION FOR AUTONOMOUS CAR									CREDIT	rs		3
COU COI	RSE DE	E	AT519	06	C.	COURS ATEGO	E RY		HN		L-T	-P-S	3-	0-0-1
Vers	ion		1.0		Арр	roval D	etails	36	th ACN	1	LEAR LE	NING VEL	В	TL-3
ASSESSMENT SCHEME														
Fir: Period Assess	st dical ment	Second Periodical Assessment			Ass	Semina Signme Project	r/ nts/ t	Surp	Surprise Test / Quiz			dance		ESE
15	%		15%			10%			5%		5	%	5	50%
Cou Descrij	rse ption	This course provides knowledge on Position and orientation Estimation, Pose Estimation from LIDAR Data, RADAR Data, GNSS/INS and Camera and computer vision												
Cou Object	Course1. To develop the concept of Position and orientation EstimationCourse2. To utilize the Pose Estimation from LIDAR DataObjectives3. To construct the Pose Estimation from RADAR Data4. To develop Pose Estimation from GNSS/INS5. To demonstrate the estimation of Granese and estimation													
Cou Outco	5. To demonstrate the concept of Camera and computer vision Upon completion of this course, the students will be able to 1. Develop the concept of Position and orientation Estimation 2. Utilize the Pose Estimation from LIDAR Data 3. Construct the Pose Estimation from RADAR Data 4. Develop Pose Estimation from GNSS/INS 5. Demonstrate the concept of Camera and computer vision													
Prerequ	uisites:	Nil												
СО, РО	AND I	PSO MA	APPING											
со	PO -1	РО- 2	РО- 3	РО- 4	РО- 5	РО- 6	РО- 7	PO- 8	РО- 9	PO -10	PO- 11	PO- 12	PSO- 1	PSO- 2
CO-1	2	2	1	3	-	1	-	1	-	1	1	1	1	2
CO-2	2	3	2	2	1	-	1	1	-	2	1	2	2	1

CO-3	1	2	1	2	-	-	-	1	-	1	1	1	1	2
CO-4	2	2	1	2	-	2	1	2	2	2	1	2	2	1
CO-5	2	1	1	2	1	-	-	1	-	1	1	1	1	2
	1: Weakly related, 2: Moderately related and 3: Strongly related													
MODULE 1: Position and orientation Estimation												(91	.)	
Introduction to Position and orientation Estimation – Methodology – Compute Jacobian													' c	0-1
method – compute M Matrix method – Gauss Newton method – angle from quaternion –													- B	0 - TL-2
Gradient descent – kalman Filter - error-state extended Kalman filter.														
MODULE 2: LIDAR Sensor Models and Point Clouds													(9L)
LIDARS	Sensor	-Pose (positior	n and or	ientati	on) Esti	mation	from LI	DAR Da	ta - Po	int Clou	ıds – 3D)	
d 2D P	noint	ouus - i (ICP) ali	gorithm	anu ior 1 - nroh	lem of	motion	ioueis distor	tion can	affect	ning li I IDAR	scans a			:0-2
from a	movin	g vehicl	e.										B	TL-3
Practice - Design perception system using LIDAR Sensor in MATLAB Automated Driving Tool Box													(
MODULE 3: Pose Estimation from RADAR Data														(9L)
RADAR Sensor - Sensor Models - Pose Estimation from RADAR Data – localization – path												1		
planning – decision making												, 0	:0-3	
Practice - Design perception system using RADAR Sensor in MATLAB Automated Driving Tool													/ В	TL-3
Box														(01)
MODULE 4: IMU for Pose Estimation											. 1	(9L)		
IIVIU- S	ensor	Nodels	5 - Pose	Estima	ition fro		J - CO	ordinate		ration	- Tuna	amenta		~ 1
equalic			lavigati	ion - gy	roscop	e anu a	acceler	Smeter	neasur	ement	model	s in the		0-4 TL 2
Practic	. 01 11av 2 e - Des	ian neri	rention	system	usina I	MI I Ser	nsor in l	ΜΔΤΙΔΒ	Autom	ated D)rivina T	Tool Box	, В	1L-3
MODUL	E 5: Ca	amera a	and con	nputer	vision -	Pose E	stimati	ion met	hods		inving i	001 004	·	(9L)
Comput	ter V	ision. E	stimatio	on. Ra	andom	Same	ole Co	onsensus	s (Rar	isac).	Geom	etrv ·		. ,
pinhole	camei	ra mode	el - int	rinsic a	nd exti	rinsic co	amera o	calibratio	on - tra	acking,	and s	emantio		
segmen	itation	for driv	able su	irface <i>e</i>	stimati	on								0-5 TL 2
Practic	e - Desi	ign perc	ception	system	using (Camera	Sensor	r in MAT	LAB Au	tomat	ed Driv	ing Too	/ В	1L-3
Box		5 .	•		5							5		
TEXT BO	DOKS													
1.	<u>Paul</u>	F. McM	anamo	<u>n,</u> LiDA	R Techi	nologie	s and S	ystems,	SPIE Pu	blicati	ons, 20	19		
2.	2. <u>Changzhan Gu</u> , Short-Range Micro-Motion Sensing with Radar Technology, IET, 2019.													
3.	 Himanshu Prakash Jain, Anbumani Subramanian "Real-Time Upper-Body Human Pose Estimation Using a Depth Camera" Research Article. 											mation		
REFERE	NCE B	OOKS												
1.	Christian Wöhler "3D Computer Vision: Efficient Methods and Applications X. media publishing1.2012.											lishing,		
2.	 Peter J.G. Teunissen, Oliver Montenbruck, Springer Handbook of Global Navigation Satell Systems, 2017. 											atellite		
COURSE	TITLE	TLE STATE ESTIMATION AND VEHICLE CONTROL FOR AUTONOMOUS CAR											3	
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COURSE	CODE	E	AT5190)7	C CA		<i>(</i>	н	J		L-T-P-S	5	3-0	-0-1
Versi	on		1.0		A	pproval Details		36th /	АСМ	LEAI	RNING	ING LEVEL BTL-3		L-3
ASSESSN	IENT SO	CHEME												
Firs Period Assessn	t ical nent	Seco As	nd Peri sessme	odical ent	Se Assi F	eminar/ gnment Project	s/	Surpriso / Qu	e Test Iiz	A	ttendar	nce	E	SE
15%	6		15%			10%		5%	6		5%		50)%
Cour Descrip	se tion	This Plann Latera	This course provides knowledge on concept of State Estimation and Optimizing, Path Planning, Autonomy and Decision Making, Vehicle control and Actuation, Longitudinal & Lateral Vehicle Modeling.											
Cour Object	se ives	 To apply the concept of State Estimation and Optimizing To design the concept of Path Planning To develop the concept of Autonomy and Decision Making To demonstrate the concept of Vehicle control and Actuation To construct the concept of Longitudinal & Lateral Vehicle Modeling 												
Course Upon completion of this course, the students will be able to 0utcomes 1. Apply the concept of State Estimation and Optimizing 0utcomes 3. Develop the concept of Autonomy and Decision Making 4. Demonstrate the concept of Vehicle control and Actuation 5. Construct the concept of Longitudinal & Lateral Vehicle Modeling														
Prerequisites: Nil														
CO, PO A	CO, PO AND PSO MAPPING													
со	РО -1	РО- 2	РО- 3	РО- 4	РО- 5	РО- 6	РО- 7	РО- 8	РО- 9	РО -10	PO- 11	РО- 12	PS 0-1	PS O-
<u> </u>	2	2	1	1	_	1		1	_	1	1	1	1	2
CO-2	2	1	2	2	1	-	1	1	-	2	1	2	2	1
CO-3	1	2	1	2	-	-	-	1	-	1	1	1	1	2
CO-4	2	2	1	2	-	2	1	2	2	2	1	2	2	1
CO-5	2	1	1	2	1	-	-	1	-	1	1	1	1	2
		1:	Weakly	y relate	d, 2: M	loderat	ely rela	ated and	d 3: Stro	ongly re	elated			
MODULE	E 1: Sta	te Estin	nation a	and Opt	timizing	3							(9L)	
Introduct Estimatio Sensing - <i>Practice -</i>	ion to S n - Line An Aute <i>CARLA</i>	itate Est ar and I onomou <i>simula</i>	timation Nonline us Vehio tor – Int	n and O ar Kalm cle Stat <i>troduct</i>	ptimizin nan Filto e Estim <i>ion</i>	ng – me ers - GN ator - C	thodol SS/INS ARLA s	ogy - me Sensing imulato	ethod o g for Po r.	f least s se Estir	squares nation -	- State - LIDAR	CC BT)-1 L-3
MODULE	2: Path	Planni	ng Tecł	nniques	;								(9L)
Introduction Path Planning – Methodology - discrete path planning and algorithms - Prediction - behavior of moving objects - behavior planning in a self-driving car - build candidate trajectories CO-2 for the vehicle to follow. BTL-3 Practice- Design path planning system using MATLAB Automated Driving Toolbox BTL-3)-2 'L-3				
MODULE	3: Auto	onomy	and De	cision N	/laking									(9L)
Reinforce diagnosis Packages Practice -	ment le , Marko and Ca Writing	earning, ov decis tkin Wc g ROS N	, conflic ion pro orkspace odes – i	t learni cesses es. introdu	ng and and hic ce Carla	HMM le Iden Ma	arning arkov r	; - motio nodels (n planr (HMM	ning and Introdu	d model ction to	-based ROS -	СС)-3 'L-3
MODULE	4: Vehi	icle con	trol and	d Actua	tion									(9L)

Introduction to Vehicle control and Actuation – methods – introduction to PID Control implement a PID control logic in Matlab to maneuver the vehicle around the track <i>Practice- Design vehicle control system using MATLAB Automated Driving Tool Box</i> MODULE 5: Longitudinal & Lateral Vehicle Modeling and control									
Longitu and pat	Idinal and lateral dynamic models for a vehicle and create controllers that regulate speed th tracking performance using Matlab.	CO-5 BTL-3							
TEXT BO	DOKS								
1.	Amditis A., Lytrivis P., Portouli E., Sensing and Actuation in Intelligent Vehicles, Handbook of Intelligent Vehicles. Springer, 2012.								
2.	Kalman, H Infinity, Dan Simon, Optimal State Estimation, Repro book, 2016.								
3.	Umar Zakir Abdul Hamid, Volkan Sezer "Path Planning for Autonomous Vehicle" Hard co 2019.	ver-Import,							
REFERE	NCES								
1.	Soudbakhsh D., Eskandarian A. Vehicle Lateral and Steering Control. In: Eskandaria Handbook of Intelligent Vehicles. Springer, 2012.	an A. (eds)							
2.	https://carla.readthedocs.io/en/latest/start_introduction								

LIST OF COURSES UNDER THE HONORS IN ELECTRIC VEHICLES AND E- MOBILITY:

	SEMESTER - V												
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	С	s	тсн				
1.	HN	EAT51908	Hybrid Vehicles	3	0	0	3	1	3				
			SEMESTER - VI										
2.	HN	EAT51909	Battery Technology and Management	3	0	0	3	1	3				
			SEMESTER - VII										
3.	HN	EAT51910	Advanced Propulsion System for Electric Drive Vehicles	3	0	0	3	1	3				
4.	HN	EAT51911	Energy Storage Devices and Systems	3	0	0	3	1	3				
			Total Credits				12						

V SEMESTER:

COURSE TITLE	Н	YBRID VEHICLES		CREDITS	3						
COURSE CODE	EAT51908	COURSE CATEGORY	HN	L-T-P-S	3-0-0-1						
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3						
ASSESSMENT SCHEME											
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE						
15%	15%	10%	5%	5%	50%						
Course Description	This course provides knowledge on hybrid vehicles and its components										

1. To develop requirements of hybrid vehicles															
	Course	•	2. Т	o demo	onstrate	e the va	arious t	ypes of	Induct	ion mo	tors				
	loctiv		3. т	o discu	ss the o	lifferer	it types	of mot	ors and	d contro	ollers				
00	Jectiv	es	4. Т	o analy	ze the	signific	ance of	electri	c vehic	le desig	n consi	ideratio	n		
			5. т	o demo	onstrate	e differ	ent typ	es of H	/brid ve	ehicles					
			ι	Jpon co	mpletio	on of th	nis cour	se, the	studen	ts will l	oe able	to			
			1. C	Develop	require	ements	of hyb	rid vehi	cles						
0	Course	e	2. C	Demons	trate th	ne vario	ous type	es of ind	duction	motor	S				
Ou	utcom	es	3. C	Discuss 1	the diff	erent t	ypes of	motors	and co	ontrolle	ers				
			4. A	Analyse	the sig	nificand	ce of ele	ectric v	ehicle c	lesign o	onside	ration			
			5. C	Demons	trate d	fferent	types	of Hybr	id vehi	cles					
Prere	Prerequisites: Nil														
CO, F	CO, PO AND PSO MAPPING														
	•	РО	PO	PO	РО	РО	PO	PO	РО	PO	PO	PO	PO	PS	PS
	5	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	0-1	0-2
CO-1		2	1	2	2	1	2	1	-	2	2	1	2	2	1
CO-2		1	2	1	2	-	-	-	1	-	1	-	1	1	2
CO-3	5	2	1	1	1	-	2	1	-	2	2	1	2	2	1
CO-4	Ļ	1	1	1	2	1	-	-	1	-	1	-	1	1	2
CO-5	CO-5 1 1 1 - - - 1 - 1 1 1												2		
	1: Weakly related, 2: Moderately related and 3: Strongly related														
MODULE 1- REQUIREMENT FOR HYBRID VEHICLES (9L)															
Need	Need of E-mobility - E-Mobility Policy - Performance comparation of conventional, electric and CO-1														
hybrid vehicles- Layout of E -vehicle- Specification of electric and hybrid vehicles – Case study BTL-2															
MODULE 2 – CONFIGURATION OF HYBRID VEHICLES (9L)															
Types	of	Hybrids	s - Ser	ries, Pa	rallel,	Split –	Parall	el, Seri	es - P	Parallel	- Adv	antages	s and		ר-2
Disad	vanta	ges. Po	ower s	plit dev	vice - E	inergy	Flow –	- Energ	y Man	ageme	nt Syst	em - D	esign	BT	 L-2
consid	derati	on													(
MOD	OULE 3	S – DRI	VES AN	D CON	TROL						-				(9L)
Introc	ductio	n to c	irives-	Princip	les- Cla	issificat	tion- C	onstruc	tion- F	ower,	Torque	e and s	speed	С	D-3
curve	S- POV	wer rec	quirem	ents and	d calcu	ation-	Iorque	Produ	ction, E	quivale	ent Circ	uit- Typ	des of	BT	'L-3
opera	ition –	- Contr		noas	DC .										(01)
					KS loosifie		Constan	· atian	\A/auluiu	an Ch		istics ((9L)
contr		holors	- Princ	ipies - C	Idssilic	ation –	Constru	uction -	VVOLKI	ng – Ch	aracter	istics - s	speed	DT	/-4 1 2
MOD					ESIGN	CONICII								DI	(01)
Aero	dynar	nic - P		rocistan		ansmis	sion of	ficiency	/ - Voh	uiclo m	acc. Ele	octric v	ahicla		(9L)
chass	is and	d Body	design	n consi	deratio	ns- He	ating a	nd coo	ling sv	stems-	Contro	llers- F	Power		0-5
steeri	chassis and Body design considerations- Heating and cooling systems- Controllers- Power BTL-3														
TEXT BOOKS															
1.	James	s Larmi	nie and	d John L	owrv. "	Electri	: Vehicl	e Techi	nology	" John '	Wilev 8	Sons.2	2013		
2.	Igbal	Husain	, "Elect	ric and	Hybrid	Vehicle	es-Desi	gn Fund	lament	als", Cl	RC Pres	s,2013			
3.	Mehr	dadEhs	ani, "N	/lodern	Electric	, Hybri	d Electi	ric and	Fuel Ce	ll Vehic	cles", Cl	RC Pres	s,2015		
REFER	RENCE	BOOK	Ś								,				
	Ron	HodKi	nson,	"light	Weigh	t Eleo	ctric/	Hybrid	Vehic	le De	sign",	Butter	worth	Heine	mann
1.	Public	cation,2	2015.		-										
2.	Lino 🤆	Guzzella	a, "Veh	icle Pro	pulsion	Syster	n" Sprir	nger Pu	blicatic	ons,201	5.				

VI SEMESTER:

COURSE TITLE	BATTERY T	ECHNOLOGY AND MANA	CREDITS	3	
COURSE CODE	EAT51909	COURSE CATEGORY	HN	L-T-P-S	3-0-0-1
Version	1.0	Approval Details	36 th ACM	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME														
Fir	st		Second			Somina	r/		Surprise					
Perio	dical	Pe	eriodica	al	Assign	ments/	'Proiec	t Te	ost / Ou	iz	Atten	dance		ESE
Assess	ment	As	sessme	nt	7351B11	inento,	Tiojee							
15	%		15%			10%			5%		5%	6		50%
Cou Descri	rse ption	This	course	provi	des kno	wledge	on batt	ery teo	hnolog	y and i	ts mana	igemen	t	
Cou Objec	irse tives	1. 2. 3. 4. 5.	To disc To dev To desi To exa To den	uss on elop co ign on mine c nonstra	electro oncepts recent t n advar ate abou	chemic on maj echnolo cemen ut batte	al energ or batte ogy cha t in bat rries for	gy stora ery che nges ir tery teo Autom	age mistries batter chnolog notives.	s and to y ;y	esting			
Cou Outco	irse omes	 Upon completion of this course, the students will be able to Discuss on electrochemical energy storage Develop concepts on major battery chemistries and testing Design on recent technology changes in battery Examine on advancement in battery technology Demonstrate about batteries for Automotives. 												
Prerequ	isites: N	Vil												
СО, РО	AND PS	50 MA	PPING											
со	PO 1	204	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS 0.1	PS
<u> </u>	-1 2	- <u>Z</u> 1	- 3	-4	- 5	-0 2	-/ 1	-8	-9 2	-10	-11	-12	0-1	1
CO-1 CO-2	2	2	1	2	-	1	-	1	-	1	-	1	1	2
CO-3	2	1	2	1	-	2	1	-	2	2	1	2	2	1
CO-4	1	2	1	2	1	-	-	1	-	1	-	1	1	2
CO-5	1	1	1	1	-	-	-	1	-	1	1	1	1	2
1: Weakly related. 2: Moderately related and 3: Strongly related											<u> </u>			
MODU	LE 1-II	NTROD	UCTIO	N TO E	LECTRO	CHEMI	CAL EN	ERGY S	TORAG	E			(9L)
Introdu	iction to	batte	ry tech	nologi	es Elect	romotiv	/e force	e- Reve	rsible c	ells- Re	elation	betwee	en 🖌	
electrica	al energ	gy and o	energy	conte	nt of a c	ell-Free	energy	/ chang	ges and	electro	omotive	force	in 🖌 🔓	20-1
cell- Cu	rrent ch	allenge	es in En	ergy s	torage T	echnol	ogies.							····
MODUL	E 2 - M/	AJOR B	ATTER	Y CHEI	MISTRIE	S DEVE	LOPME	NT AN	D TESTI	NG			(9L)
Battery ohmic Discharg applicat	 perform load cu ge curve tion. 	mance rve- E es Terr	evalua ffect o ninal vo	tion- f f opei oltage:	Primary Tating to S- Platea	battery empera au volta	- Servi ture o ge –Lea	ce time n servi ad acid	e- Volta ce life. Batter	ige dat Secor ies – C	a- Serv Idary b onstruc	ice life atterie tion an	- s- id E	CO-2 3TL-2
MODUL	.E 3 – RE	CENT '	TECHN	ologi	ES -1								(9	ЭL)
Recent	develo	pment	of elec	trode	materia	ls in lit	hium-ic	n batt	eries- R	ecent	develop	oment o	of	CO-3
solid ele	ectrolyt	es and	their a	applica	tion to	solid st	ate bat	teries-	Polyme	r solid	electro	lytes fo	or F	3TL-3
MODIII	F 4 – RF	CENT	TECHN		FS - 2									91)
Thin F	ilm soli	id stat	e Batt	eries	Eundai	nentals	Cons	tructio	n and	annli	ration	– Supe	er (<u></u>
Capacit	ors: Fun	idamer	ntal. Co	nstruc	tion and	applic	ation.	ci accio	n, ana	appin		Sup	E	STL-3
MODULE 5 - BATTERIES FOR AUTOMOTIVES – EUTURE PROSPECTS (9L)									(9L)					
Degrees of vehicle electrification – Battery size vs. application -USABC and DOE targets for										<u> </u>				
vehicular energy storage systems – Analysis and Simulation of batteries - Equivalent circuit and BTL-2														
life modelling – Environmental concerns in battery production – recycling of batteries														
TEXT BC	OKS													
1. T.I Sp	Minami, ringer P	, M.Ta Publicat	tsumisa tion, 20	ago, N 12.	1.Wakih	ara, C.	Iwaku	ra,S. K	ohijiya,	Solid	state i	onics f	or bat	teries,
2. Sa	ndeep [Dhame	ja, Elec	tric Ve	hicle Ba	ttery Sy	vstems,	Newne	ess pub	ication	, 2011.			
REFERE	NCE BO	OKS												
1 Bard	, Allen	J., and	Larry I	R. Faul	kner. El	ectroch	emical	Metho	ds: Fur	damer	ntals an	d Appl	ication	s. 2nd
ed., '	Wiley–`	VCH, V	erlag, G	mbH,	2011.									

2 Masataka Wakihara and Osamu Yamamoto, Lithium-ion Batteries Fundamental and Performance, Wiley–VCH, Verlag GmbH, 2012.

VII SEMESTER:

	TTLE	ADVANCED PROPULSION SYSTEM FOR ELECTRIC DRIVE												2	
COOKSEI					VEH	ICLES				Chi				5	
COURS	SE	F/	VT5191	0	(COURSI	E		ни		I.T.P	-5	3-	0-0-1	
CODE		L/	113131	•	C/	ATEGO	RY					5			
Versio	on		1.0		Appr	oval De	etails	36t	h ACM	LE/	ARNING	В	TL-3		
ASSESSM	ENT SO	CHEME													
First Second Periodical Seminar/															
Periodi	cal	Secon	d Perio	odical	Ass	ignmer	nts/	Su	rprise		Attenda	ance		ESE	
Assessment		Ass	sessme	nt		_ Project		Test	/ Quiz						
15% 15% 10% 5% 5%									5%		5	50%			
Cours Descript	e ion	This c	This course provides knowledge on various motors and its applications.												
		1. To discuss on the fundamentals of permanent magnet brushless DC motors.													
Cours	2. To develop concepts of permanent synchronous magnet motors														
Objectiv	ves	3. To demonstrate concepts of switched reluctance motors													
Objectiv		4. To	o deteri	mine th	e conce	epts of	stepper	motor	s and it	s appli	cations				
	5. To demonstrate the basic concepts of other special machines														
Cours Outcom	e 1es	U 1. Di 2. Do 3. Do 4. Do 5. Do	pon cor iscuss o evelop emonst etermir emonst	mpletio in funda concep trate co ne the c trate th	n of thi amenta ts of pe ncepts concept e basic	s cours Is of pe rmane of swite s of ste concep	e, the s ermanei nt syncl ched re pper m its of ot	tudents nt magi nronou luctanc otors a her spe	s will be net brus s magne e moto nd its a ecial ma	e able t shless [et moto rs pplicat chines	o DC moto ors ions	ors.			
Prerequisi	ites: Ni	il													
CO, PO A	ND PS	О МАРР	ING												
<u> </u>	РО	РО	РО	РО	РО	РО	PO-	РО	РО	РО	РО	РО	PS	PSO	
	-1	-2	-3	-4	-5	-6	7	-8	-9	-10	-11	-12	0-1	-2	
CO-1	2	1	2	1	1	2	1	-	2	2	1	2	2	1	
CO-2	1	2	1	2	-	-	-	1	-	1	-	1	1	2	
CO-3	2	1	1	1	-	2	1	-	2	1	1	2	2	1	
CO-4	1	1	1	2	1	-	-	1	-	1	-	1	1	2	
CO-5	1	1	1	1	-	-	-	1	-	1	-	1	1	2	
		1:	Weakly	y relate	ed, 2: M	oderat	ely rela	ted an	d 3: Str	ongly r	elated				
MODULE	1- PEI	RMANE		GNET B	RUSHLI	ESS DC	мото	RS						(9L)	

Fundamentals of Permanent Magnets-Types-Principle of operation-Magnetic circuit analys EMF and Torque Equations-Characteristics and control	is- CO-1 BTL-2
MODULE 2- PERMANENT MAGNET SYNCHRONOUS MOTORS	(9L)
Principle of operation –EMF and Torque equations -Phasor diagram -Power controllers –Torq speed characteristics –Digital controllers –Constructional features, operating principle a characteristics of synchronous reluctance motor.	ue CO-2 nd BTL-2
MODULE 3 - SWITCHED RELUCTANCE MOTORS	(9L)
Constructional features –Principle of operation-Torque prediction–Characteristics Pow controllers –Control of SRM drive-Sensor less operation of SRM –Applications.	er CO-3 BTL-3
MODULE 4 – STEPPER MOTORS	(9L)
Constructional features –Principle of operation –Types –Torque predictions –Linear and No linear analysis –Characteristics –Drive circuits –Closed loop control –Applications.	m- CO-4 BTL-2
MODULE 5 - OTHER SPECIAL MACHINES	(9L)
Principle of operation and characteristics of Hysteresis motor –AC series motors –Linear mot –Applications.	or CO-5 BTL-2
TEXT BOOKS	-
1. T.J.E. Miller, 'Brushless magnet and Reluctance motor drives', Claredon press, London, 2	010.
2. R. Krishnan, 'Switched Reluctance motor drives', CRC press, 2012.	
REFERENCE BOOKS	
1. R.Krishnan, 'Electric motor drives', Prentice hall of India,2012.	
2. D.P.Kothari and I.J.Nagrath, ' Electric machines', Tata Mc Graw hill publishing company, N Edition, 2014.	lew Delhi, Third

COURSE TITLE	ENERGY STO	DRAGE DEVICES AND S	SYSTEMS	CREDITS	3						
COURSE CODE	EAT51911	COURSE HN CATEGORY		L-T-P-S	3-0-0-1						
Version	1.0	LEARNING LEVEL	BTL-3								
ASSESSMENT SCHEME											
First Periodical Assessment	Second Periodical Assessment	SecondSeminar/PeriodicalAssignments/Surprise TestAssessmentProject/ Quiz		Attendance	ESE						
15%	15%	10%	5%	5%	50%						
Course Description	This course gives knowledge on energy storage devices and systems										

1. To discuss on electrical energy storage technologies														
Cour	se	2.	To illust	rate th	e needs	s for ele	ectrical	energy	storage	9				
Object	ives	3.	To exan	nine the	e featur	es of ei	nergy s	torage	system	S				
		4.	lo deve	lop ele	ctroche	emical e	energy s	torage	system	IS				
		5.	To dem	onstrat	e energ	gy stora	ge syst	ems						
			Upon co	ompleti	on of th	nis cour	se, the	studen	ts will t	be able	to			
-		1.	Discuss	on elec	ctrical e	nergy s	torage	techno	logies					
Cour	se	2.	Illustrate the needs for electrical energy storage											
Outco	mes	3.	. Examine the features of energy storage systems											
		4. Develop electrochemical energy storage systems												
		5.	Demon	strate e	energy s	torage	system	S						
Prerequis	ites:													
CO, PO A	ND PS	Ο ΜΑΡΓ	PING											
	РО	PO-	РО	PO-	PO-	РО	PO-	PO-	РО	РО	PO-	РО	PS	PS
0	-1	2	-3	4	5	-6	7	8	-9	-10	11	-12	0-1	0-2
CO-1	2	1	2	2	1	2	1	-	2	2	1	2	2	1
CO-2	1	2	1	2	-	-	-	1	-	1	-	1	1	2
CO-3	2	1	1	1	-	2	1	-	2	2	1	2	2	1
CO-4	1	1	1	2	1	-	-	1	-	1	-	1	1	2
CO-5	O-5 1 1 1 1 1 - 1 - 1										1	2		
		1:	Weakly	y relate	d, 2: M	oderat	ely rela	ted and	d 3: Str	ongly r	elated			
MODULE 1- ELECTRICAL ENERGY STORAGE TECHNOLOGIES										(9L)				
Characte demand p	ristics o periods,	of Electi Need f	ricity, El or cont	ectricit inuous	y, and t and flex	the role kible su	s of EE	5, High ng dista	genera ince be	tion co tween (st durin generat	g peak- ion and	C(B1	0-1 TL-2
consump	tion, Co	ongestic	on in po	wer gri	ds, Trai	nsmissi	on by c	able.						
MODULE	2- NEE	DS FOR	ELECTR	RICAL E	NERGY	STORA	GE							(9L)
	- 1922	oo r on				STORA	01							(32)
Emerging	needs	for FFS	more	renew:	ahle en	erov le	ss fassi	l fuel 🤇	Smart (Grid use	s The	roles of		
electrical	enerov	storag	e techn	ologies	. The re	oles fro	m the v	iewnoi	nt of a	utility	The rol	es from	C	0-2
the view	point of	consur	ners. Th	ne roles	from t	he view	/point c	of gener	rators c	of renev	vable e	nergy.	B	TL-2
•···•			,					8000						
MODULE	3 - FEA	TURES	OF ENE	RGY ST	ORAGE	SYSTE	MS							(9L)
Classifica	ition of	F EES s	systems	, Mech	nanical	storage	e syster	ns, Pu	mped	hydro	storage	(PHS),		
Compress	sed air	energy	storage	e (CAES), Flywł	neel ene	ergy sto	orage (F	ES), Ele	ectroch	emical	storage	C	0-3
systems,	Secon	dary b	atteries	s, Flow	/ batte	ries, Ch	iemical	energ	y stor	age, H	ydroge	n (H2),	В	TL-3
Synthetic	natura	l gas (S	NG).											
MODULE	4 - ELI	CTROC	HEMIC	AL ENE	RGY ST	ORAGE	SYSTE	MS						(9L)
Batteries	: Prima	ry, Sec	ondary	batteri	es; diffe	erence	betwee	n prim	ary and	d secon	dary ba	itteries,	C	0-4
chemistri	es of p	primary	batter	ies suc	h as Zi	inc-Carl	oon, Al	kaline.	Advan	tages,	disadva	ntages,	B	с 4 ГL-2
limitation	is and a	pplicat	ion eac	h above	e menti	oned ba	atteries	•						-
	_													1
MODULE	5 - ENI	RGY S	FORAGI	E SYSTE	MS									(9L)

Secondary batteries such as Lead acid, Nickel Cadmium, Metal hydrides, lithium ion, lithium phosphate and high temperature batteries- sodium-sulphur. Advantages, disadvantages, limitations and application each above mentioned batteries.										
TEXT BC	DOKS									
1.	"James M. Eyer, Joseph J. Iannucci and Garth P. Corey ", "Energy Storage Benefits and Market									
	Analysis", Sandia National Laboratories, 2014.									
REFERE	NCE BOOKS									
1.	"Jim Eyer, Garth Corey", Energy Storage for the Electricity Grid: Benefits and Marke	et Potential								
	Assessment Guide, Report, Sandia National Laboratories, Feb 2010.									
2.	O'Hayre, SW Cha, W Colella and FB Prinz, "Fuel Cell Fundamentals", Wiley, 2005									
3.	Xianguo Li, "Principles of Fuel Cells", Taylor and Francis, 2005									