

## SCHOOL OF ELECTRICAL SCIENCES

## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Choice Based Credit System (CBCS)

- With amendments as approved from 26<sup>th</sup> ACM to 32<sup>nd</sup> ACM (07.08.2021).
- Applicable for the students admitted from 2018-19.

# **Curriculum and syllabus**

**"TO MAKE EVERY MAN A SUCCESS AND NO MAN A FAILURE"** 

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## HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

#### 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 that promotes learning and world class research.
- To nurture creativity and innovation.
- To instill highest ethical standards and values.
- To pursue activities for the development of the Society.
- To develop national and international collaborations with institutes and industries of eminence.
- To enable graduates to become future leaders and innovators.

#### Value Statement:

Integrity, Innovation, Internationalization.

### DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

#### Vision:

To educate the students in the recent developments of emerging fields in Electrical and Electronics Engineering, to encourage research activities, innovative techniques and to develop managerial abilities so as to make them excel globally with ethical values.

#### Mission:

- To empower students with state-of-art knowledge and technological skills in Electrical and Electronics Engineering.
- To keep pace with changing industrial requirement and to imbibe the students with new technology.
- To mould students for research, innovation and entrepreneurship.
- To inculcate managerial and professional capabilities with ethics and human values.

## B. Tech. ELECTRICAL AND ELECTRONICS ENGINEERING PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

The program is expected to enable the students to

- **PEO1:** Graduates will be capable of modelling, designing and developing innovative solutions for critical Electrical and Electronics Engineering problems using advanced techniques.
- **PEO2:** Graduates will demonstrate professional competence, practical and innovative skills in integrating various electrical and electronics components enabling them to have successful careers in Electrical and Power, Electric Vehicle or allied industry.
- **PEO3:** Graduates will be able to pursue higher studies, involve in research and development activities in interdisciplinary topics by applying recent technological developments in electronics and embedded systems.

#### **PROGRAM OUTCOMES (ALIGNED WITH GRADUATE ATTRIBUTES) (PO)**

1. A knowledge base for engineering: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.

2. **Problem analysis:** An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions

3. **Investigation:** An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data and synthesis of information in order to reach valid conclusions.

4. **Design:** An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.

5. Use of engineering tools: An ability to create, select, apply, adapt, and extend

appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.

6. **Individual and teamwork:** An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.

7. **Communication skills:** An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing,

speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.

8.**Professionalism:** An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.

9. **Impact of engineering on society and the environment:** An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.

10. Ethics and equity: An ability to apply professional ethics, accountability, and equity.

11. Economics and project management: An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.

12. **Life-long learning:** An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge

#### . PROGRAM SPECIFIC OUTCOMES (PSO)

- **PSO1:** Use logical & technical skills to model, simulate, analyze and develop electrical components and systems.
- PSO2: Integrate the knowledge of fundamental electronics, power electronics control system and embedded systems for designing industrial control systems.
- **PSO3:** Contribute for the development of smart power grid, electric vehicle and integrating green energy to meet the increasing demand of the society.

	B.TECH –ELECTRICAL AND ELECTRONICS ENGINEERING											
			(165 CREDIT STRUCTURE)									
			SEMESTER - I									
S. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	Т	Ρ	с	S	тсн			
1	BS	MEB4101/ ELA4101	Engineering Graphics and Computer Aided Design / Professional English and soft skills	1	1	2	3	1	4			
2												
3	BS	PHA4102/ CYA4101	Engineering Physics / Engineering Materials	3	0	0	3	1	3			
4	PC	CSA4101/ GEA4102	Problem solving using C* / Sustainable Engineering Systems	2	0	2*	3/2	1	4/3			
5	PC	EEB4101 / EEB4118	Introduction to Digital Systems / Engineering And Design	3	0	0	3	1	3			
6	BS	EEA4131	Engineering Immersion Lab	0	0	2	0.5	2	2			
7	BS	PHA4131/ CYA4131	Engineering Physics / Materials Chemistry Lab	0	0	2	1	0	2			
		Тс	otal	12	1	10	17.5/ 16.5	7	23/ 22			

\*Project based learning

			SEMESTER - II						
S. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	С	S	тсн
1	BS	MAA4117	Analytical Mathematics	3	0	2	4	1	5
2	BS	PHA4102/ CYA4101	102/ Engineering Physics / 3 0 0 3 1		1	3			
3	BS	MEB4101/ ELA4101	Engineering Graphics And Computer Aided Design / Professional English and soft skills	1	1	2	3	1	4
4	PC	CSA4101/ GEA4102	Problem solving using C* / Sustainable Engineering Systems	2	0	2*	2/3	1	3/4
5	PC	EEB4101/ EEB4118	Introduction to Digital Systems / Engineering And Design	3	0	0	3	1	3

6	PC	EEB4116	Electromagnetic Theory	3	1	0	4	1	4
7	PC	EEB4117	Circuits and Networks	3	1	0	4	1	4
8	PC	EEB4141	Circuits and Networks laboratory	0	0	2	1	1	2
9	BS	EEA4131	Engineering Immersion Lab	0	0	2	0.5	2	2
10	BS	PHA4131/ CYA4131	Engineering Physics / Materials Chemistry Lab	0	0	2	1	1	2
		Tot	tal	18	3	10/ 12	25.5 /26.5	8	32/33

			SEMESTER - III						
S. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	С	S	тсн
1	BS	MAA4201	Partial Differential Equations and Transforms	3	0	2	4	0	5
2	РС	EEB4201	Electrical machines	3	1	0	4	1	4
3	РС	EEB4202	Analog Electronics	3	1	0	4	0	4
4	BS	GEA4216	Professional Ethics and Life Skills	2	0	0	2	0	2
5	DE		Department Elective-I	3	0	0	3	0	3
6	NE		Non Department Elective- I	2	0	0	2	0	2
7	РС	EEB4231	Electrical machines laboratory	0	0	3	1		3
8	РС	EEB4232	Analog Electronics laboratory	0	0	3	1		3
9	РС	EEB4233	Design Project I	0	0	2	1	0	2
		Тс	tal	16	2	10	22	1	28

			SEMESTER - IV						
S. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Р	С	s	тсн

1	PC	MAA4217	Numerical Methods	3	0	2	4	0	5
2	PC	EEB4216	Signals and Systems	3	1	0	4	1	4
3	PC	EEB4217	Control Systems	3	1	0	4	1	4
4	PC	EEB4218	Transmission & Distribution	3	1	0	4	1	4
5	DE		Department Elective-II	3	0	0	3	0	3
6	NE		Non Department Elective–II	2	0	0	2	0	2
7	PC	EEB4241	Electrical Simulation laboratory	0	0	2	1	0	2
8	PC	EEB4242	Control Systems Laboratory	0	0	2	1	0	2
9	РС	EEB4243	Design Project II	0	0	2	1	0	2
		То	tal	17	3	8	24	3	28

SEMESTER - V											
S. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	С	S	тсн		
1	BS	MAA4301	Optimization Techniques	3	1	0	4	0	4		
2	PC	EEB4301	Power Electronics	3	1	0	4	2	4		
3	PC	EEB4302	Microcontroller and Embedded Systems	3	0	2	4	1	5		
4	PC	EEB4303	Measurement and Instrumentation	2	0	2	3	1	4		
5	DE		Department Elective-III	3	0	0	3	0	3		
6	NE		Non Department Elective–III	2 0		0	2	0	2		
7	PC	EEB4331	Power Electronics laboratory	0	0	3	1	0	3		
8	PC	EEB4332	Electrical Machine Design laboratory	0	0	2	1	0	2		
9	PC	EEB4333	Design Project III	0	0	2	1	0	2		
		Tota	I	16	2	11	23	5	29		
			SEMESTER - VI								
S. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE		L	т	Ρ	с	c s		
1	PC	EEB4316	Power System protection and control	3		1	0	4	1		

2	PC	EEB4317	Solid State Drives	3	0	2	4	1	5
3	PC	EEB4318	Power System Analysis	3	1	0	4	1	4
4	BS	GEA4304	Business Economics	2	0	0	2	1	3
5	DE		Department Elective-IV	3	0	0	3	0	3
6	NE		Non Department Elective–IV	2	0	0	2	0	2
7	PC	EEB4341	Power System Protection laboratory	0	0	2	1	0	2
8	PC	EEB4342	Comprehension	1	0	0	1	0	1
9	PC	EEB4343	Design Project IV	0	0	2	1	0	2
		Tota	Ι	18	2	6	22	4	27

			SEMESTER - VII								
S. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Ρ	с	S	тсн		
1	РС	EEB4401	Electrical Energy Utilization and Conservation	3	1	0	4	1	4		
2	PC	EEB4402	Energy and Environment	3	0	0	3	3	3		
3	РС	EEB4403	Industry Standards and Specifications	2	0	2	3	1	4		
4	РС	EEB4404	Artificial intelligence for Electrical Engineers	3	0	0	3	1	3		
5	NE		Non Department Elective– V	2	0	0	2	0	2		
6	DE		Department Elective-V	3	0	0	3	0	3		
7	РС	EEB4431	Illumination laboratory	0	0	2	1	0	1		
8	РС	EEB4432	Power System Simulation laboratory	0	0	2	1	0	1		
9	РС	EEB4434	Renewable Energy Lab	0	0	2	1	0	2		
10	РС	EEB4433	Design Project V	0	0	2	1	0	2		
	Total         16         1         10         22         6         25										
			SEMESTER - VIII								

S. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	т	Р	С	S	тсн
1	РС	EEB4441	Project & Viva – voce	0	0	16	8	0	16
2	РС	EEB4442	Internship	0	0	0	1	0	0
		Тс	tal	0	0	16	9	0	16
			Total				165		

	LIST OF DEPARTMENTAL ELECTIVES WITH GROUPING - SEMESTER WISE													
SE M	COURSE CATEGO RY	COURSE CODE	NAME OF THE COURSE	L	Т	Р	С	S	тсн					
3	DE	EEC4251	Solar Energy System and Regulation <sup>1</sup>	3	0	0	3	0	3					
3	DE	EEC4252	Electrical Safety	3	0	0	3	0	3					
3	DE	EEC4253	Basic Python Programming <sup>2</sup>	3	0	0	3	0	3					
4	DE	EEC4266	Wind Energy Systems <sup>1</sup>	3	0	0	3	0	3					
4	DE	EEC4267	High Voltage Engineering	3	0	0	3	0	3					
4	DE	EEC4268	Power Plant Engineering	3	0	0	3	0	3					
4	DE	EEC4269	Internet of Things <sup>2</sup>	3	0	0	3	0	3					
5	DE	EEC4351	Alternative Sources of Energy	3	0	0	3	0	3					
5	DE	EEC4352	Power Quality	3	0	0	3	0	3					
5	DE	EEC4353	Advanced Control Theory	3	0	0	3	0	3					
5	DE	EEC4354	Renewable Power Generation Technologies <sup>1</sup>	3	0	0	3	0	3					
5	DE	EEC4355	Embedded IoT <sup>2</sup>	3	0	0	3	0	3					
6	DE	EEC4366	Energy Conversion and Storage Technologies <sup>1</sup>	3	0	0	3	0	3					
6	DE	EEC4367	Electrical System Design	3	0	0	3	0	3					
6	DE	EEC4368	Special Electrical Machines	3	0	0	3	0	3					
6	DE	EEC4370	Industrial Internet Of Things <sup>2</sup>	3	0	0	3	0	3					
6	DE	EEC4371	IoT Application development using Mobile phone <sup>2</sup>	3	0	0	3	0	3					
7	DE	EEC4451	Power Electronics for Renewable Energy Systems <sup>1</sup>	3	0	0	3	0	3					
7	DE	EEC4452	Power System and Smart grid	3	0	0	3	0	3					
7	DE	EEC4453	Industrial Automation	3	0	0	3	0	3					
7	DE	EEC4454	Distributed Generation And Micro- Grids <sup>1</sup>	3	0	0	3	0	3					
7	DE	EEC4455	Smart Grid Technologies & IOT <sup>2</sup>	3	0	0	3	0	3					
7	DE	EEC4456	Embedded system for Electric and Hybrid Vehicles <sup>2</sup>	3	0	0	3	0	3					

ENGINEERING	GRAPHICS	S AND COM	/IPUTER A	IDED	DESIGN	CRED	DITS	3				
MEB4101	COURS	SE CATEGO	RY BS		L-T-P-S			1-1-2	2-1			
Approval Deta	ils 24 A	CM 30 <sup>th</sup> ۱	May 2018	LE	EARNING	i LEVEL		BTL-3	3			
IEME												
Second Periodical Assessment	Assign	ments/	-		Attend	ance		ESE				
			5%		5%			50%				
		ducas tha		al da		a compi	itor		locian			
tools and funda basic concepts emphasis on th	imentals of involved i e principle	f free hand n technica s and basi	d sketchin al drawing	g. It p g skills	orepares s and co	the stud	lents grap	to leai hics. I	rn the t also			
<ol> <li>To understand the basics of Engineering graphics and plane curvatures of AutoCAD tool</li> <li>To visualize the free hand sketch and orthographic projections and to solve si problems</li> <li>To comprehend the various geometrical models and its developments</li> <li>To understand the transformation of 2D drafting to 3D models using CAD tools</li> <li>To generate associated views of 3D models and related geometric dimension and tolerencing.</li> <li>Upon completion of this course, the students will be able to</li> </ol>												
<ol> <li>Use the Autechniques.</li> <li>Apply the a and solids.</li> <li>Visualize sol</li> <li>Recognize a</li> <li>Generate the AutoCAD as</li> </ol>	toCAD com cquired kn id objects a nd use 3D i ne various	nmands to owledge t and apply model con	generate o solve sir AutoCAD o imands in	simp nple p comm Auto(	le drawi problems ands to g CAD tool	involvir generate to gener	ng str the i rate s	raight p models solid ob	olanes 			
MAPPING												
				PO	PO			PSO	PSO			
	• • •		-	- 10	-	-	<u>-</u>	-	3			
2 -	3 -		-	-	-	-	1	-	-			
			-	-	-			-	-			
:	3 -		-	-	1	-	1	-	-			
3			-	-	-	1	1	-	-			
d, 2: Moderately	related an	d 3: Stron	ly related									
CS OF ENGINEER	ING GRAPH	IICS AND I	LANE CU	RVES				(6L+6P	=12)			
Dimensioning - Scales. Drafting methods - introduction to Computer Aided Drafting – Computer Hardware – Workstation – Printer and Plotter – Introduction to software for Computer Aided Design and Drafting – Exposure to Solid Modelling software – Geometrical Construction- Coordinate Systems/Basic Entities – 3D printer. Practical component: AutoCAD – Solid modelling tool - Basics. Suggested Readings:												
	MEB4101         Approval Deta         HEME         Second         Periodical         Assessment         15%         This course broken tools and fundate basic concepts emphasis on the aspects of composition of the aspects of composition of the aspects of compresent to understate of the aspects of compresent to the aspects of compresent to understate of the aspects of the aspec	MEB4101       COURS         Approval Details       24 A         HEME       Second       Seminal         Periodical       Assign         Assessment       Project         15%       10%         This course broadly introditions and fundamentals of basic concepts involved it emphasis on the principle aspects of component designations on the principle aspects of component designations.         1. To understand the base AutoCAD tool       2.         2. To visualize the free has problems       3.         3. To comprehend the vality.       4.         4. To understand the transity.       5.         5. To generate associated and tolerencing.       0.         Upon completion of this considered and solids.       3.         3. Visualize solid objects as AutoCAD as well.       4.         1. Use the AutoCAD completion of this considered and solids.       5.         3. Visualize solid objects as AutoCAD as well.       6         5. Generate the various AutoCAD as well.       6         6 1       1         7 3	MEB4101       COURSE CATEGO         Approval Details       24 ACM 30 <sup>th</sup> N         HEME       Second       Seminar/         Periodical       Assignments/       Assignments/         Assessment       Project       15%         15%       10%       This course broadly introduces the tools and fundamentals of free hand basic concepts involved in technica emphasis on the principles and basi aspects of component designing.       1. To understand the basics of En AutoCAD tool         2. To visualize the free hand sketch problems       3. To comprehend the various geom         4. To understand the transformation       5. To generate associated views of and tolerencing.         Upon completion of this course, the       1. Use the AutoCAD commands to techniques.         2. Apply the acquired knowledge to and solids.       3. Visualize solid objects and apply 4         3. Visualize solid objects and apply 4       4. Recognize and use 3D model com         5. Generate the various views of ta AutoCAD as well.       4.         MAPPING       90       90       90         90       PO       PO       PO       9         3       -       -       -       -         4. To understand the transformation       5. Generate associated views of and tolerencing.       -       -         1. Use the AutoCAD as well.       -<	MEB4101         COURSE CATEGORY         BS           Approval Details         24 ACM 30 <sup>th</sup> May 2018           HEME         Second         Seminar/ Assignments/ Project         Surpris Test / C           15%         10%         5%           This course broadly introduces the mechanic tools and fundamentals of free hand sketchin basic concepts involved in technical drawing emphasis on the principles and basic underst aspects of component designing.           1. To understand the basics of Engineering AutoCAD tool         Interpret associated views of 3D mode and tolerencing.           Upon completion of this course, the students of and tolerencing.         Upon completion of this course, the students of and solids.           3. Visualize solid objects and apply AutoCAD of and solids.         Surprise and solids.           3. Visualize solid objects and apply AutoCAD of and solids.         Surprise and use 3D model commands in 5. Generate the various views of the geom AutoCAD as well.           I         MAPPING           PO         PO         PO         PO           3         -         -         -         -           4         5         6         7         8         9           3. Visualize solid objects and apply AutoCAD of and solids.         -         -         -         -           3         0         -         -         -         <	MEB4101         COURSE CATEGORY         BS           Approval Details         24 ACM 30 <sup>th</sup> May 2018         LI           HEME         Second         Seminar/ Assignments/ Project         Surprise Test / Quiz           15%         10%         5%           This course broadly introduces the mechanical det tools and fundamentals of free hand sketching. It p basic concepts involved in technical drawing skill emphasis on the principles and basic understanding aspects of component designing.           1. To understand the basics of Engineering graf AutoCAD tool         100           2. To visualize the free hand sketch and orthograph problems         To comprehend the various geometrical models           3. To comprehend the various geometrical models and and tolerencing.         Upon completion of this course, the students will be 1. Use the AutoCAD commands to generate simple techniques.           2. Apply the acquired knowledge to solve simple p and solids.         3. Visualize solid objects and apply AutoCAD commands to advolds.           3. Visualize solid objects and apply AutoCAD commands to AutoCAD as well.         -           HMAPPING         -         -         -           2         3         -         -         -           3         -         -         -         -         -           4         5         6         7         8         9         10	MEB4101         COURSE CATEGORY         BS         L-T-P-S           Approval Details         24 ACM 30 <sup>th</sup> May 2018         LEARNING           HEME         Second         Seminar/ Assignments/ Project         Surprise Test / Quiz         Attend           Assessment         Project         5%         5%         5%           This course broadly introduces the mechanical design usin tools and fundamentals of free hand sketching. It prepares basic concepts involved in technical drawing skills and cc emphasis on the principles and basic understanding of proj aspects of component designing.         10         10         10         10           1. To understand the basics of Engineering graphics and AutoCAD tool         2.         To visualize the free hand sketch and orthographic projec problems         3. To comprehend the various geometrical models and related and tolerencing.         30 m odels and related and tolerencing.           Upon completion of this course, the students will be able to 1. Use the AutoCAD commands to generate simple drawit techniques.         3. Nisualize solid objects and apply AutoCAD commands to ge 4. Recognize and use 3D model commands in AutoCAD tool           3. Visualize solid objects and apply AutoCAD commands to generate the various views of the geometrical solid m AutoCAD as well.         11           -         -         -         -         -           4         5         6         7         8         9         10         11 <td>MEB4101         COURSE CATEGORY         BS         L-T-P-S           Approval Details         24 ACM 30<sup>th</sup> May 2018         LEARNING LEVEL           HEME         Second         Assignments/ Assignments/ Project         Surprise Test / Quiz         Attendance           15%         10%         5%         5%           This course broadly introduces the mechanical design using computools and fundamentals of free hand sketching. It prepares the stude basic concepts involved in technical drawing skills and computer involved in technical drawing skills and computer involved to technical drawing skills and computer aspects of component designing.         1. To understand the basics of Engineering graphics and plane AutoCAD tool           2. To visualize the free hand sketch and orthographic projections ar problems         3. To comprehend the various geometrical models and its developm           4. To understand the transformation of 2D drafting to 3D models us         5. To generate associated views of 3D models and related geome and tolerencing.           Upon completion of this course, the students will be able to         1. Use the AutoCAD commands to generate simple drawings and techniques.           2. Apply the acquired knowledge to solve simple problems involvir and solids.         3. Visualize solid objects and apply AutoCAD commands to generate           4. Recognize and use 3D model commands in AutoCAD tool to generate         4. S 6         7         9         10         11         1         1         1         1</td> <td>MEB4101         COURSE CATEGORY         BS         L-T-P-S           Approval Details         24 ACM 30<sup>th</sup> May 2018         LEARNING LEVEL           HEME         Second         Seminar/ Assignments/ Project         Surprise Test / Quiz         Attendance           15%         10%         5%         5%         5%           This course broadly introduces the mechanical design using computer it tools and fundamentals of free hand sketching. It prepares the students basic concepts involved in technical drawing skills and computer grap emphasis on the principles and basic understanding of projections and vaspects of component designing.         1. To understand the basics of Engineering graphics and plane curv AutoCAD tool           2. To visualize the free hand sketch and orthographic projections and to problems         3. To comprehend the various geometrical models and its developments           4. To understand the transformation of 2D drafting to 3D models using C         5.           5. To generate associated views of 3D models and related geometric cand tolerencing.         9.           Upon completion of this course, the students will be able to         1.           1. Use the AutoCAD commands to generate simple drawings and pract techniques.         2.           2. Apply the acquired knowledge to solve simple problems involving strand solids.         3. Visualize solid objects and apply AutoCAD commands to generate the test.           4. Recognize and use 3D model commands in AutoCAD tool to generate set.         1<td>MEB4101         COURSE CATEGORY         BS         L-T-P-S         1-1-2           Approval Details         24 ACM 30<sup>th</sup> May 2018         LEARNING LEVEL         BTL           HEME         Second         Seminar/ Assignments/ Project         Surprise Test / Quiz         Attendance         ESE           15%         10%         5%         5%         5%         50%           This course broadly introduces the mechanical design using computer aided of tools and fundamentals of free hand sketching. It prepares the students to lear basic concepts involved in technical drawing skills and computer graphics. I emphasis on the principles and basic understanding of projections and visualiz aspects of component designing.         Ino understand the basics of Engineering graphics and plane curvatures AutoCAD tool           2. To visualize the free hand sketch and orthographic projections and to solve s problems         To comprehend the various geometrical models and its developments           3. To comprehend the various geometrical models and related geometric dimens and tolerencing.         Upon completion of this course, the students will be able to           1. Use the AutoCAD commands to generate simple drawings and practice dr techniques.         Ino to generate the warious views of the geometrical solid model manually and AutoCAD as well.           2. Apply the acquired knowledge to solve simple problems involving straight p and solids.         Ino to the solue 3D model commands in AutoCAD tool to generate solid ob 5. Generate the various views of the geometrical solid model manually and AutoC</td></td>	MEB4101         COURSE CATEGORY         BS         L-T-P-S           Approval Details         24 ACM 30 <sup>th</sup> May 2018         LEARNING LEVEL           HEME         Second         Assignments/ Assignments/ Project         Surprise Test / Quiz         Attendance           15%         10%         5%         5%           This course broadly introduces the mechanical design using computools and fundamentals of free hand sketching. It prepares the stude basic concepts involved in technical drawing skills and computer involved in technical drawing skills and computer involved to technical drawing skills and computer aspects of component designing.         1. To understand the basics of Engineering graphics and plane AutoCAD tool           2. To visualize the free hand sketch and orthographic projections ar problems         3. To comprehend the various geometrical models and its developm           4. To understand the transformation of 2D drafting to 3D models us         5. To generate associated views of 3D models and related geome and tolerencing.           Upon completion of this course, the students will be able to         1. Use the AutoCAD commands to generate simple drawings and techniques.           2. Apply the acquired knowledge to solve simple problems involvir and solids.         3. Visualize solid objects and apply AutoCAD commands to generate           4. Recognize and use 3D model commands in AutoCAD tool to generate         4. S 6         7         9         10         11         1         1         1         1	MEB4101         COURSE CATEGORY         BS         L-T-P-S           Approval Details         24 ACM 30 <sup>th</sup> May 2018         LEARNING LEVEL           HEME         Second         Seminar/ Assignments/ Project         Surprise Test / Quiz         Attendance           15%         10%         5%         5%         5%           This course broadly introduces the mechanical design using computer it tools and fundamentals of free hand sketching. It prepares the students basic concepts involved in technical drawing skills and computer grap emphasis on the principles and basic understanding of projections and vaspects of component designing.         1. To understand the basics of Engineering graphics and plane curv AutoCAD tool           2. To visualize the free hand sketch and orthographic projections and to problems         3. To comprehend the various geometrical models and its developments           4. To understand the transformation of 2D drafting to 3D models using C         5.           5. To generate associated views of 3D models and related geometric cand tolerencing.         9.           Upon completion of this course, the students will be able to         1.           1. Use the AutoCAD commands to generate simple drawings and pract techniques.         2.           2. Apply the acquired knowledge to solve simple problems involving strand solids.         3. Visualize solid objects and apply AutoCAD commands to generate the test.           4. Recognize and use 3D model commands in AutoCAD tool to generate set.         1 <td>MEB4101         COURSE CATEGORY         BS         L-T-P-S         1-1-2           Approval Details         24 ACM 30<sup>th</sup> May 2018         LEARNING LEVEL         BTL           HEME         Second         Seminar/ Assignments/ Project         Surprise Test / Quiz         Attendance         ESE           15%         10%         5%         5%         5%         50%           This course broadly introduces the mechanical design using computer aided of tools and fundamentals of free hand sketching. It prepares the students to lear basic concepts involved in technical drawing skills and computer graphics. I emphasis on the principles and basic understanding of projections and visualiz aspects of component designing.         Ino understand the basics of Engineering graphics and plane curvatures AutoCAD tool           2. To visualize the free hand sketch and orthographic projections and to solve s problems         To comprehend the various geometrical models and its developments           3. To comprehend the various geometrical models and related geometric dimens and tolerencing.         Upon completion of this course, the students will be able to           1. Use the AutoCAD commands to generate simple drawings and practice dr techniques.         Ino to generate the warious views of the geometrical solid model manually and AutoCAD as well.           2. Apply the acquired knowledge to solve simple problems involving straight p and solids.         Ino to the solue 3D model commands in AutoCAD tool to generate solid ob 5. Generate the various views of the geometrical solid model manually and AutoC</td>	MEB4101         COURSE CATEGORY         BS         L-T-P-S         1-1-2           Approval Details         24 ACM 30 <sup>th</sup> May 2018         LEARNING LEVEL         BTL           HEME         Second         Seminar/ Assignments/ Project         Surprise Test / Quiz         Attendance         ESE           15%         10%         5%         5%         5%         50%           This course broadly introduces the mechanical design using computer aided of tools and fundamentals of free hand sketching. It prepares the students to lear basic concepts involved in technical drawing skills and computer graphics. I emphasis on the principles and basic understanding of projections and visualiz aspects of component designing.         Ino understand the basics of Engineering graphics and plane curvatures AutoCAD tool           2. To visualize the free hand sketch and orthographic projections and to solve s problems         To comprehend the various geometrical models and its developments           3. To comprehend the various geometrical models and related geometric dimens and tolerencing.         Upon completion of this course, the students will be able to           1. Use the AutoCAD commands to generate simple drawings and practice dr techniques.         Ino to generate the warious views of the geometrical solid model manually and AutoCAD as well.           2. Apply the acquired knowledge to solve simple problems involving straight p and solids.         Ino to the solue 3D model commands in AutoCAD tool to generate solid ob 5. Generate the various views of the geometrical solid model manually and AutoC			

Basics of drafting and dimensioning	
MODULE 2: VISUALIZATION, ORTHOGRAPHIC PROJECTIONS AND FREE HAND SKETCHING (6L+	-6P=12)
Visualization concepts and Free Hand sketching: Visualization principles — Representation of Three Dimensional objects — Pictorial Projection methods - Layout of views- Free hand sketching of multiple views from pictorial views of objects. Drafting of simple Geometric Objects/Editing General principles of presentation of technical drawings as per BIS - Introduction to Orthographic projections - Naming views as per BIS - First angle projection method. Conversion to orthographic views from given pictorial views of objects, including dimensioning — Drafting of Orthographic views from Pictorial views. Practical component: 2D drafting, Orthographic projections Suggested Readings: AutoCAD tool – Commands for sketching , Projections	CO-2 BTL-2
	·6P=12)
Principles of isometric projection and solid modelling. Isometric drawing – IsoPlanes and 3D Modelling commands. Projections of Principal Views from 3-D Models. Solid Modeling – Types of modelling - Wire frame model, Surface Model and Solid Model – Introduction to graphic software for solid modelling. Development of Surfaces Practical component: 3D modelling and surface development Suggested Readings: Surface modelling and solid modelling	CO-3 BTL-3
	-6P=12)
Preparation of solid models of machine components like slide block, solid bearing block, bushed bearing, gland, wall bracket, guide bracket, shaft bracket, jig plate, shaft support (open type), vertical shaft support etc using appropriate modelling software. 2D views and sectional view, computer aided drafting and dimensioning. Generate 2D drawing from the 3D models – generate and develop the lateral surfaces of the objects. Presentation Techniques of Engineering Drawings – Title Blocks – Printing/Plotting the 2D/3D drawing using printer and printing solid object using 3D printer. Practical component: 2D to 3D transformation, plotting of drawings Suggested Readings: 3D modelling – view generations and commands	CO-4 BTL-2
MODULE 5: SIMPLE DESIGN PROJECTS - COMPUTER AIDED DESIGN(6L+6)	5P=12)
Creation of engineering models and their presentation in standard 2D form, 3D Wire-Frame and shaded solids, meshed topologies for engineering analysis, tool-path generation for component manufacture, geometric dimensioning and tolerencing. Use of solid-modelling software for creating associative models at the components and assembly levels in their respective branch of engineering like building floor plans that include: windows, doors, fixtures such as WC, Sink, shower, slide block, etc. Applying color coding according to drawing practice. <b>Practical component:</b> <b>3D solid meshed topology, geometrical dimensioning, simple components</b> <b>Suggested Readings:</b> AutoCAD dimensioning, accombly of colid components	CO-5 BTL-3
AutoCAD dimensioning, assembly of solid components	
TEXT BOOKS         1.       Jeyapoovan, T. (2016). Engineering Drawing and Graphics Using AutoCAD, 7 <sup>th</sup> Edition         Publishing House Pvt Ltd., New Delhi.	n, Vikas

REFERE	INCE BOOKS
1.	Warren J. Luzadder and Jon. M. Duff. (2016). Fundamentals of Engineering Drawing, Prentice
1.	Hall of India Pvt. Ltd., Eleventh Edition.
2.	Jensen, J.D. Helsel, D.R. Short. (2012). Engineering Drawing and Design, McGraw-Hill, Sixth
۷.	Edition.
E BOOH	<s< th=""></s<>
1.	http://keralatechnologicaluniversity.blogspot.in/2015/06/engineering-graphics-j-benjamin-
1.	pentex-freeebook-pdf-download.html
2.	http://keralatechnologicaluniversity.blogspot.in/2015/06/engineering-graphics-p-i-
Ζ.	varghese.html
MOOC	
1.	http://nptel.ac.in/courses/112103019/
2.	http://nptel.ac.in/courses/105104148/

COURSE	TITLE	PROFESSIO	ONAL ENGLISH AND SOF	T SKILLS	CREDITS	3					
COURSE	CODE	ELA4101	COURSE CATEGORY	HS	L-T-P-S	1-1-2-1					
Version	1.0	Approval Details	24 ACM30 <sup>th</sup> May 2018		LEARNING LEVEL	BTL-3					
ASSESSME	NT SCHE	EME .									
First Periodical Assessment		Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Te Quiz	est / Attendance	ESE					
15%		15%	10%	5%	5%	50%					
Cours Descript		This course has been designed to meet students' current and future language and communication needs. It attempts to develop their proficiency in the four language skills and knowledge of grammar and vocabulary. This course teaches students how to communicate accurately, appropriately and fluently in professional and social situations.									
Course Obj	ective	listening skills b 2. To provide an en- for daily conver 3. To equip the stu- scientific and te 4. To enhance the checklists, proc 5. To equip the lea	confidence by which the by an enhanced acquisition nvironment to Speak in E rsation, presentation, ground idents to Read, comprehe echnological texts. writing skills of the study ess-description, letter-warners in analysing and ap mind-mapping, audiovis	on of the Eng English at the oup discussio end and answ ents via train riting and rep oplying creati	ish language. formal and informal lev n and debate. wer questions based on ing in instructions, reco port writing. ive thinking skills and pa	vels and use it literary, mmendations, articipate in					
Course Out	come	<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 accuracy and syntax structures.</li> <li>Integrate various components of English Language and determining it through reading and listening.</li> <li>Analyze and transcode data, construct different types of written essays, read complex passages and summarize ideas, create personal profiles in the form of a resume.</li> </ul>									

4. Organize and articulate ideas, concepts, and perceptions in a comprehensive manner in									
written business correspondence, and speaking in formal and informal situations.									
5. Infer details about presentation skills and implementing it in various professional									

situations.

Prerequisites: Plus Two English-Intermediate Level

MODULE 1: FUNCTIONAL GRAMMAR AND VOCABULARY

#### CO, PO AND PSO MAPPING

со	PO 1	PO	PO	PO	PO	PO	PO	PO	РО	PO	PO	PO	PSO	PSO	PSO
CO	PU 1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1	-	-	-	-	-	-	-	-	-	3	-	-	1	-	-
CO-2	-	-	-	-	-	-	-	2	2	3	-	-	1	-	-
CO-3	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO-4	-	-	-	-	-	-	2	-	-	3	2	-	1	-	-
CO-5	-	-	-	-	-	-	-	-	2	3	2	3	-	-	-
			1 · W	eakly r	elated	2: Mo	derate	lv relat	ed and	3: Stro	ongly re	lated			

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

(6L+3P=9)	

Introduction to communication skills –Self Introduction - Basic grammar (tenses, subject verb agreement) - Basic vocabulary (prefixes , suffixes, roots, phrasal verbs and idioms)- Topic sentences , paragraph writing <b>Practical Component:</b> Short conversations-Situational Communication-Dialogue Writing - Writing short paragraph based on environment protection, societal issues, health, cultural contexts etc., identifying topic sentences, linking pairs of sentences. <b>MODULE 2 – LISTENING AND SPEAKING SKILLS</b> (6L+:	CO-1 BTL-2 8P=9)
Academic listening (listening to lectures different topics, audio excerpts and answering question) - General listening (conversations, speeches: formal and informal) - Giving instructions and suggestions- Active and Passive Voice <b>Practical Component:</b> Listen and repeat, Listening to audio excerpts- Listening to native speakers - TED Talks, short prepared speeches, Table topics – Speaking in different situations- MCQ's - Cloze exercises- Complete the Dialogue	CO-2 BTL-3
MODULE – 3 : FUNCTIONAL READING AND WRITING (6L-	3P=9)
Reading comprehension (academic texts and general texts)-Reading and Interpreting visual data, charts, tables and graphs Report writing- accident, industrial, survey, general reports –Direct and Indirect speech         Practical Component:         Identify the errors in sentences, grammar exercise, reading passage for identifying the contextual meaning, interpreting charts, tables and graphs, choose the right meaning of the word given         Assignment on suggested reading activity – Book review         MODULE – 4 : BUSINESS CORRESPONDENCE	CO-4 BTL-2 3P=9)
Memo-Notice - Agenda – Minutes of the Meeting-Action Taken report- Report Writing- Connectives -	CO-3

Cause a	and effect	BTL-3							
Practic	al Component:								
Drafting agenda, notice, memo, minutes of the meeting- ATR- Cause and effect exercises - Presentation									
	anguage lab (Technical or Non-technical topic)								
	ted Reading:								
	cademic Writing 1, New Insights into IELTS, CUP								
MODU	LE 5 – PRESENTATION SKILLS AND INTERVIEW SKILLS (6L+6	6L=12)							
	tation Skills - Reading and Interpreting Advertisements—Job Application- Covering Letter -								
	lum Vitae –E-mail - Project proposal –Interview skills (HR questions) – Group Discussion	CO-5							
	al Component:	BTL-2							
	tation in the language lab (Technical or Non-technical topic)	DIL-2							
	Discussion (Tutorial Classes)								
TEXT B	OOKS								
1.	Dr. Bikram K. Das et al. (2009), An Introduction to Professional English and Soft Skills (wi	th audio							
	CD), Cambridge University Press.								
2	Dolly John (2014), English for Life and the Workplace Through LSRW&T skills,	Pearson							
-	Publications								
REFERE	In CE BOOKS								
1.	Sabina Pillai and Agna Fernandez (2018), Soft Skills & Employability Skills, Cambridge Uni	versity.							
2.	Steve Hart et al (2016), Embark, English for Undergraduates, Cambridge University Press	•							
4.	Jeff Butterfield, (2010), Soft Skills for Everyone, Cengage Learning,								
5.	Aruna Koneru (2015), Professional Speaking Skills, Oxford Publications.								
E BOO	KS								
1	https://www.britishcouncil.in/english/courses-business								
2	http://www.bbc.co.uk/learningenglish/english/features/pronunciation								
4	http://www.cambridgeenglish.org/learning-english/free-resources/write-and-improve/								
моос									
1	https://www.mooc-list.com/tags/english								
2	https://www.mooc-list.com/course/adventures-writing-stanford-online								
3	http://www.cambridgeenglish.org/learning-english/free-resources/mooc/								

COURSE	TITLE	CREDITS	4			
COURS	E CODE	MAA 4101	COURSE CATEGORY	BS	L-T-P-S	3-0-2-1
Version	1.0	Approval Details	24th ACM - 30.5.	2018	LEARNING LEVEL	BTL-3

ASSESS	MENT	SCHE	ME												
First Pe	eriodica			cond			emina	-	Su	urprise		• • • •			
Asses	sment			odical ssmen <sup>-</sup>	.		gnmei Project	-	Tes	t / Qui	z	Atte	ndance		ESE
1'	5%			.5%	L	ſ	10%			5%			5%		50%
	urse	Т			stude	nt und		d the	basic c		ts of r			calcul	
	Durse To make the student understand the basic concepts of matrices and calculus cription MATLAB														
	•	1.	То К	now h	ow to	perfor	m som	e simp	le ope	rations	s on m	natrices	5		
		2.				•								n and	partial
Course			<ol><li>To understand effectively the basic concepts of differentiation and parti differentiation and their applications.</li></ol>												
Objecti	ve	3.	Тор	erforn	n inte	gration	and	other	operat	ions fo	or cert	tain ty	pes of	functi	ons and
			carry	y out tl	he cor	nputat	ion flu	ently.							
		4.	То с	lassify	ordina	ary diff	erenti	al equa	itions.						
			Upo	n com	oletio	n of thi	s cour	se, the	stude	nts will	be ab	ole to			
		1.	calcu	ulate th	ne inv	erse of	the m	atrix u	sing Ca	ayley H	amilto	on the	orem ar	nd dia	gonalize
				matrix					0	. ,					-
Course		2			tho d	orivativ	hnc av	higher	doriv	atives	ייס ב זר	ven fur	nction o	vnlici	tly using
Outcom	ne	2.						ingrier	uenvo		Jagi	ven iui		лрпсп	liy using
						ormula	-								
						and vo		-		-					
		4.	class	ify the	e diffe	rential	equati	ons an	d solv	e them	•				
Prereq	uisites:														
CO, PO	AND P	SO M	APPIN	G											
со	РО 1	PO 2	РО 3	РО 4	PO 5	РО 6	РО 7	PO 8	РО 9	РО 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	2	2	-	-	-	-	• -	-	-	-	- 12	3	1	<b>3</b>
CO-2	3	3	2	-	-	-	-	-	-	-	-	-	3	1	1
CO-3	3	3	2	2	-	-	-	-	-	-	-	-	3	1	1
CO-4	3	3	-	-	2	2	2	-	-	-	-	-	3	1	1
		:	1: Wea	akly re	lated,	2: Mo	derate	ly rela	ted an	d 3: St	rongly	/ relate	ed		·
MODU	LE 1:M	ATRIC	CES 🛛								(1	13L+2F	P=15)		
Charact															
theorem	•		•								sing (	Cayley	Hamil	ton	CO-1
theorem							milari	ty trans	sforma	tion					BTL-
Suggest								•	J •			11	тт. ч		1,2,3,4
Lab1:	-			-	vecto	rs, vei	rincat	ion an	a inve	erse us	ing C	ayley	namili	ion	
theoren MODU		/			11110						(	13L+2I	0-151		
Method						s _ Dre	duct (	and Ou	otiont	milas	•			tric	
function								_							
Taylor'											100		- entituti	~	CO-2
Sugges															BTL-
Lab2:		-					na of :	functio	ons of	two va	riable	es			1,2,3,4
	·														
					_										
MODU						-					•	13L+2F			
Integrat															CO-3
Integration using partial fraction – Bernoulli's formula. Applications of Integral Calculus: BT									BTL-						

Area	a, Surface an	d Volume.	1,2,3				
Suggested Reading: Basicsof Integrations							
	<b>A A</b>	ions of Integral Calculus: Area, Surface area and Volume.					
		DINARY DIFFERENTIAL EQUATIONS (13L+2P=15)					
Second order differential equations with constant coefficients - Particular integrals -							
$e^{ax}$ ,	Sinax, Cosax	$x, x^{m}$ e <sup>ax</sup> Cos bx, e <sup>ax</sup> Sin bx. Solutions of homogeneous differential equations	CO-4				
with	variable coe	efficients – Variation of parameters	BTL-				
		ing: Basics of Differential Equations.	1,2,3				
Lab	4: Solution	of Second order differential equations.					
TEXT	BOOKS						
1.	Grewal B 2014	S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd	l Edition,				
2.		and Manish Goyal, "A Text book of Engineering Mathematics", Eighth Editions Pvt Ltd., 2011.	on, Laxmi				
3.	Chandrase 2010	karan A, "A Text book of Engineering Mathematics I", Dhanam Publications,	Chennai,				
REFE	RENCE BOO	VKS					
1.	Srimantha	Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 201	5.				
2.	Weir, M.D	and Joel Hass, Thomas' Calculus, 12th Edition, Pearson India, 2016.					
3.	Advanced	Engineering Mathematics With Matlab, Third Edition, 2011 by CRC Press.					
E BO	OKS						
1.         http://nptel.ac.in/courses/111105035/ https://www.edx.org//introduction-engineering-mathematics-utarlingtonx-endingenering-mathematics-mathematics-utarlingtonx-endinge							
MOC	C						
	1.	https://www.mooc-list.com/tags/engineering-mathematics					

COURSE	TITLE	EN (Comm	CREDITS	3					
COURSE	CODE	PHA4102	С	OURSE CATEGO	ORY	BS	L-T-P-S	3-0-0-0	
Version	1.0	Approval Detai	ils	24th ACM	- 30.5.2	2018	LEARNING LEVEL	BTL-3	
ASSESSM	ENT SCH	EME							
First Periodical Assessment		Second Periodical Assessment		Seminar/ signments/ Project	-	ise Test Quiz	Attendance	ESE	
15%	, b	15%		10%	ļ	5%	5%	50%	
Cours Descrip	-	This course will facilitate students to understand the concepts of properties of matter, heat, acoustics, ultrasonics, quantum physics, semiconducting materials and photonics to solve engineering problems							
Image: Course Objective       1. To impart knowledge on types of stress, elastic moduli, heat conduction determination of thermal conductivity.         Course Objective       2. To provide a strong foundation on the concepts and applications of acous and ultrasonics.         3. To illustrate theoretically and experimentally the particle nature of light wave nature of particle.									

<ul> <li>4. To distinguish the materials based on band theory and make the students understand the basic functions of electronic devices</li> <li>5. To make the students understand the production of lasers and propagation of light through an optical fiber.</li> <li>Upon completion of this course, the students will be able to</li> <li>6. distinguish the types of stress and relate the concept of elastic moduli with the properties of materials and also explain the concept of heat conduction and thermal conductivity.</li> <li>7. explain the concept of reverberation time and outline the generation and applications of ultrasonics.</li> <li>8. explain the black body radiation, Compton Effect and also solve the Schrodinger's wave equations.</li> <li>9. classify the materials based on band gap and also illustrate the functioning of discrete devices.</li> <li>10. outline the principle, working and application of lasers and optical fibers.</li> </ul> Prerequisites: XII standard Physics CO, PO AND PSO MAPPING CO 1 2 2 3 2																	
5. To make the students understand the production of lasers and propagation of light through an optical fiber.         Upon completion of this course, the students will be able to         6. distinguish the types of stress and relate the concept of elastic moduli with the properties of materials and also explain the concept of heat conduction and thermal conductivity.         7. explain the concept of reverberation time and outline the generation and applications of ultrasonics.         8. explain the black body radiation, Compton Effect and also solve the Schrodinger's wave equations.         9. classify the materials based on band gap and also illustrate the functioning of discrete devices.         10. outline the principle, working and application of lasers and optical fibers.         Prerequisites: XII standard Physics         CO, PO AND PSO MAPPINO         CO       1       2       3         2       -       -       -       -       3       1       -         CO-1       3       2       -       -       -       3       1       -       -         CO-2       3       2       -       -       -       3       1       -       -         CO-1       3       2       -       -       -       3       1       -       -         CO-2       3       2       -       -				4.	To d	disting	uish t	he ma	aterial	s base	d on	band	theor	y and	make	the stu	Idents
light through an optical fiber.         Upon completion of this course, the students will be able to         6. distinguish the types of stress and relate the concept of elastic moduli with the properties of materials and also explain the concept of heat conduction and thermal conductivity.       7. explain the concept of reverberation time and outline the generation and applications of ultrasonics.         8. explain the black body radiation, Compton Effect and also solve the Schrodinger's wave equations.       9. classify the materials based on band gap and also illustrate the functioning of discrete devices.         10. outline the principle, working and application of lasers and optical fibers.       Prerequisites: XII standard Physics         CO- PO ND BOD MAPPING       CO-1       3       2       -       -       3       1       -       -         CO-2       3       2       -       3       -       -       -       3       1       -       -         CO-3       2       -       -       3       -       -       -       -       3       2       -					unde	erstan	d the b	basic fu	unctio	ns of e	lectro	nic dev	vices				
Upon completion of this course, the students will be able to         6. distinguish the types of stress and relate the concept of elastic moduli with the properties of materials and also explain the concept of heat conduction and thermal conductivity.         Course         Outcome       9. explain the concept of reverberation time and outline the generation and applications of ultrasonics.         8. explain the black body radiation, Compton Effect and also solve the Schrodinger's wave equations.       9. classify the materials based on band gap and also illustrate the functioning of discrete devices.         10. outline the principle, working and application of lasers and optical fibers.         Prerequisites: XII standard Physics         CO         CO       PO				5.	To r	nake t	he stu	Idents	under	stand	the p	roduct	ion of	lasers	and pr	opagat	ion of
6. distinguish the types of stress and relate the concept of elastic moduli with the properties of materials and also explain the concept of heat conduction and thermal conductivity.     7. explain the concept of reverberation time and outline the generation and applications of ultrasonics.     8. explain the black body radiation, Compton Effect and also solve the Schrodinger's wave equations.     9. classify the materials based on band gap and also illustrate the functioning of discrete devices.     10. outline the principle, working and application of lasers and optical fibers.  Prerequisites: XII standard Physics  CO, PO AND PS MAPPING  CO 1 3 2					light	throu	gh an	optica	l fiber.								
Course Outcome       properties of materials and also explain the concept of heat conduction and thermal conductivity.         7.       explain the concept of reverberation time and outline the generation and applications of ultrasonics.         8.       explain the black body radiation, Compton Effect and also solve the Schrodinger's wave equations.         9.       classify the materials based on band gap and also illustrate the functioning of discrete devices.         10.       outline the principle, working and application of lasers and optical fibers.         Prerequisites: XII standard Physics         CO, PO AND PSO MAPPING         CO       1       2       3       4       5       6       7       8       9       10       11       12       1       2       3         CO-1       3       2       -       -       -       -       3       1       -       -         CO-2       3       2       -       3       -       -       -       3       1       -       -         CO-3       3       2       -       -       -       -       3       2       -       -         ICO-4       3       2       -       -       -       -       3       2       -       -       -					Upo	on com	pletio	n of th	is cou	rse, the	e stud	ents w	ill be a	ble to			
Course Outcome       ithermal conductivity.         7. explain the concept of reverberation time and outline the generation and applications of ultrasonics.         8. explain the black body radiation, Compton Effect and also solve the Schrodinger's wave equations.         9. classify the materials based on band gap and also illustrate the functioning of discrete devices.         10. outline the principle, working and application of lasers and optical fibers.         Prerequisites: XII standard Physics         CO       PO				6.	disti	nguish	the t	ypes o	f stres	s and	relate	the co	oncept	of ela	istic mo	duli wit	th the
Course Outcome       7. explain the concept of reverberation time and outline the generation and applications of ultrasonics.         8. explain the black body radiation, Compton Effect and also solve the Schrodinger's wave equations.       9. classify the materials based on band gap and also illustrate the functioning of discrete devices.         10. outline the principle, working and application of lasers and optical fibers.         Prerequisites: XII standard Physics         CO.1       3       2       -       -       -       -       -       3       1       -       -         CO.2       3       2       -       -       3       1       -       -       -         CO-1       3       2       -       -       3       - </td <td></td> <td></td> <td></td> <td></td> <td>prop</td> <td>perties</td> <td>of m</td> <td>aterial</td> <td>s and</td> <td>also e</td> <td>xplain</td> <td>the c</td> <td>concep</td> <td>ot of h</td> <td>neat cor</td> <td>nductio</td> <td>n and</td>					prop	perties	of m	aterial	s and	also e	xplain	the c	concep	ot of h	neat cor	nductio	n and
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law a exper Schrö	body radiation- Planck's theory (derivation) – Deduction of Wien's displacement nd Rayleigh – Jean's law from Planck's theory - Compton effect – Theory and imental verification ödinger's wave equation – Time independent and time dependent equations – cal significance of wave function – Particle in a one dimensional box - Extension to 3	CO-3 BTL-3
-	nsion (no derivation)	
	JLE 4 –SEMICONDUCTING MATERIALS	(9L)
Extrin semic PN j Const	theory of solids - Classification of metals, semiconductors & insulators – Intrinsic & sic Semiconductors (Qualitative Treatment) – Direct & Indirect band gap – onductor Hall Effect – Determination of Hall Coefficient. unction diode – Construction, working & VI characteristics, Zener diode - ruction, working & VI characteristics – Zener diode as voltage regulator – Transistors struction & working – CE & CB Configuration characteristics curves.	CO-4 BTL-3
MOD	ULE 5 – PHOTONICS AND FIBRE OPTICS	(9L)
popul laser propa optica	iple of lasers - Stimulated absorption - Spontaneous emission, stimulated emission - ation inversion - pumping action - active medium - laser characteristics – Nd-Yag -CO <sub>2</sub> laser - Semiconductor laser - applications - optical fiber - principle and gation of light in optical fibers - Numerical aperture and acceptance angle - types of al fibers - single and multimode, step index and graded index fibers - fiber optic nunication system.	CO-5 BTL-3
	BOOKS	
1.	P.Mani (2011), Engineering Physics Vol.I and II, Dhanam Publications, Chennai.	
2.	Gaur R.K. and Gupta S.L. (2010), <i>Engineering Physics</i> , Dhanpat Rai Publications ( Delhi, 8 <sup>th</sup> Edition.	P) Ltd., New
REFE	RENCE BOOKS	
3.	P.Charles, Poople and Frank J. Owens (2017), Introduction to Nanotechnology, Wiley	
4.	Arthur Beiser, (2017), Concepts of Modern Physics, Tata Mc Graw – Hill Publications,	7 <sup>th</sup> Edition.
5.	Neeraj Mehta (2011), Applied Physics for engineers, Prentice Hall India Learning Pvt.	Ltd.
MOO		
1.	http://nptel.ac.in/courses/115106061/	
2.	http://nptel.ac.in/courses/117101054/12	

COURSE TITLE ENGINEERING MATERIALS (Common to ALL Branches of Engineering) CREDITS														_	
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1. To make the students understand the basics of crystal structure and p													phase	rule.	
2. To provide an exposure on the fundamentals of powder meta													-		
applications of inorganic materials and composites.															
3 To give a strong foundation on the basic concents of nanomaterials the g													the ge	neral	
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		5.	•						•		is of	the ch	emical	compos	sition.
<ol> <li>To provide a knowledge on the theoretical basis of the chemical composition, properties and applications of lubricants, adhesives and explosives.</li> </ol>														,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
	properties and applications of lubricants, adhesives and explosives. Upon completion of this course, the students will be able to														
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		4.	I	dentif	y the	mater	ials wl	nich ca	an be	emplo	yed a	as orga	anic cor	ductor	s and
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CO-4	3	1	1	1	-	-	1	-	-	-	-	2	2	-	-
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Basic cry – X-ray d	liffract	ion ar	nd crys	tal str	ucture									CO-1	
Basic cry – X-ray d Basic ter	liffract rmino	ion ar logy -	nd crys Deriv	tal str ation	ucture of Gib	bs Ph	ase ru	le-Pha	ise dia	agrams	: One	e comp	onent	CO-1 BTL-3	
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Steel – Composition, types, heat-treatment, Abrasives – Classification - Refractories – Classification, Properties, Applications. Glasses – F	Properties Uses
- Refractories – Classification, Properties, Applications. Glasses – F	, 110perties, 03es
	roperties, Types,
Specialty glasses. Composites - Introduction - Definition - Constituent	s – Classification - CO-2
Fiber-reinforced Composites – Types and Applications.	BTL-3
Powder Metallurgy – Preparation of metal/alloy– Advantages and limi	tations.
MODULE 3: NANOMATERIALSAND MOLECULAR SIEVES	
	•
Introduction – Synthesis of Nanomaterials - Bottom-up and Top-do Methods of preparation – Sol-gel process, Gas-phase condensation,	
Deposition. Properties – Optical, Electrical, Magnetic, Chemical proper	-
only).Characterization – FE-SEM, TEM (Principle and Applications only).	•
<b>Zeolite Molecular sieves</b> – composition, structure, classification - a	
exchange, adsorption, separation, laundry, catalysis.	
MODULE 4: MATERIALS FOR ELECTRONIC APPLICATONS	(9L
Liquid Crystals- Introduction – Characteristics – Classification- Therm	
Polymorphism in Thermotropic Liquid Crystals – Molecular arrange	
stsres of Liquid Crystals, Lyotropic Liquid Crystals- Applications.	
Conducting and Super conducting Organic electronic materials - Applic	ations. CO-4
	es- Conducting <b>BTL-2</b>
Polymers:Classification, Intrinsic Conducting Polymers,Extrinsic Cond	0
Applications - Biodegradable Polymers, examples and applications.	
MODULE 5: LUBRICANTS, ADHESIVES AND EXPLOSIVES	(9L
Lubricants – Mechanism of Lubrication, Classification and Prope	rties, Semi Solid
Lubricants, Solid Lubricants, MoS <sub>2</sub> and Graphite - Adhesives – Develop	
strength, Physical and Chemical factors influencing adhesive action	Classification of CO-5
Adhesives – Epoxy Resin (Preparation, Properties and Application	ns). Explosives – <b>BTL-2</b>
Requisites, Classification, Precautions during storage – Rocket propella	ints – Requisites -
Classification.	
TEXT BOOKS	
1. P.S. Raghavan (2018), <i>Engineering Materials</i> , Dhanam Publication	ons
2. P.C. Jain and Monicka Jain (2012), <i>Engineering Chemistry</i> , Dhan Delhi	pat Raj Publication (P) Ltd, Ne
REFERENCE BOOKS	
Puri, Sharma and Pathania (2020), Principles of Physical Ch	emistry Vishal Publishing C
1. Jalandar.	children, visital i ublishing c
E BOOKS	
http://www.erforum.net/2016/01/engineering-chemistry-by-ja	n-and-jain-pdf-free-
1. ebook.html	 
MOOC	
1. https://www.edx.org/course/materials-science-engineering-mis	isx-mse1x

COURS	Ε ΤΙΤΙ	.E		P	ROBL	EM SO	LVING	USING	i C			CREDI	٢S		3
COURS	E COD	DE	CSA	4101				TEGO		РС	:		-T-P-S		2-0-2-1
Versio n	1.	0	Approv	al Det	ails	23	B ACM	, 06.02	.2021		LE	ARNIN	G LEVEI	L	BTL-3
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Course DescriptionTo 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 Objectiv	'e		<ul> <li>1.To acquire the basic knowledge in computer hardware, programming languages and Problem-solving techniques.</li> <li>2.To learn the fundamentals of C programming.</li> <li>3.To gain knowledge in Functions, arrays and strings in C programming.</li> <li>4.To understand the pointers, Structures and Union in C programming</li> <li>5.To gain Knowledge on Embedded Programming</li> </ul>												
Course Outcom	e		<ol> <li>Dem to sc</li> <li>Designation</li> <li>Designation</li> </ol>	ribe th onstra live the gn and gn and	ie basi te pro e giver Imple Imple	cs of d blem s n probl ement (	igital c solving em. C prog C prog	comput techn ram us ram us	er and iques ing Co ing Po	d prog using ntrol inters	gramm flowc Statei s and l	hing lan hart, al ments a File ope	guages. gorithm Ind Fund Trations.	ı/pseu ctions.	do code
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MODUL (6L+6P=		NTR	ODUCTIO	ON TO	CYBE	R SECU	RITY								

Introduction – Fundamentals of digital computers - Programming languages -Programming	l
Paradigms – Types of Programming Languages – Language Translators – Problem Solving	l
Techniques: Algorithm – Flow Chart - Pseudo code.	

#### **Practical Component:**

Drawing Flowcharts using E- Chart & Writing pseudo code for the following problems

(i) Greatest of three numbers

(ii) Sum of N numbers

(iii) Computation of nCr

CO-1

BTL-2

MODULE 2: SECURIT	VATTACKS PRINCI		AGEMENT		(61-	+6P=12)
Evolution of C -Why				vpes in C – Op	· · ·	.01 – 12)
and Expressions – In						
Statements.				·		
Practical Component	:					
(i) Program to illustra	te arithmetic and l	ogical operators				
(ii) Program to read a	and print data of dif	ferent types				CO-2
(iii) Program to calcul	late area and volum	ne of various geo	ometrical shapes	5		BTL-3
(iv) Program to comp	ute biggest of three	e numbers				
(v) Program to print r	nultiplication table					
(vi) Program to conve	ert days to years, m	onths and days				
(vii) Program to find s	sum of the digits of	an integer				
MODULE 3:	SECURITY	PLANS,	POLICIES	AND	PROC	EDURES
(6L+6P=12)		Strings and	standard funct	ione Dro pr		
Functions – Storage Statements.	e class – Arrays	- strings and	standard Tunci	lons - Pre-pro	ocessor	
Practical Component	••					
(i) Program to compu		acci series and s	im of a number	s using recursio	n	
(ii) Program to comp				-		
(iii) Program to sort t	-	•		ay		CO-3
(iv) Program to searc	-		i di y			BTL-3
(v) Program to do wo	-	inche in an an array				
(vi) Program to insert		ing				
(vii) Program to conc	•	0				
(viii) Program using p	•	•				
MODULE 4:	OVERVIEW		CURITY CO	OUNTERMEAS	URE	TOOLS
(6L+6P=12)						
Pointers – Dynamic N	/lemory allocation -	- Structure and	Union – Files.			
Practical Component	::					
(i) Program to comp	ute sum of intege	rs stored in a 1	-D array using	pointers and d	ynamic	
memory allocation						CO-4
(ii) Program to read a		a student/payro	oll database usir	ng structures		BTL-3
(iii) Program to simul						
(iv) Program to illustr	•					
(v) Program to illustra						
MODULE 5: TESTING						6P=12)
Structure of embedd	ed C program - Da	ta Types - Opera	ators - Statemer	nts - Functions	- Keil C	CO-5
Compiler.						BTL-2
Practical component						
Simple programs usir	ig embedded C					
TEXT BOOKS						

1.	Jeyapoovan T (2015), Fundamentals of Computing and Programming in C, Vikas Publishing house.
2.	Mark Siegesmund (2014), Embedded C Programming, first edition, Elsevier publications.
REFER	ENCE BOOKS
1.	Ashok Kamthane (2017), Computer Programming, Pearson Education, 7 <sup>th</sup> Edition, Inc.
2.	Yashavant Kanetkar (2016), Let us C, 15th edition, BPP publication.
	S.Sathyalakshmi, S.Dinakar (2013), Computer Programming Practicals – Computer Lab Manual,
<u>3.</u>	Dhanam Publication, First Edition.
E BOOI	<s< th=""></s<>
1.	https://en.wikibooks.org/wiki/C_Programming
моос	
<u>1.</u>	https://onlinecourses.nptel.ac.in/noc18-cs10/preview
<u>2.</u>	http://nptel.ac.in/courses/106105085/2
<u>3.</u>	https://www.udemy.com/c-programming-for-beginners/
<u>4.</u>	https://www.coursera.org/specializations/c-programming

COUR	SE TITLE		LE ENGINEERING S L BRANCHES OF EI	-		CREDITS	2				
COUR	SE CODE	GEA4102	COURSE CATEGORY		PC	L-T-P-S	2-0-2- 1				
Versio n	1.0	Approval Details	23 ACM, 06.02.	2021	LE	ARNING LEVEL	BTL-3				
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First Periodical Assessment		Second Periodical Assessment	Seminar/ Assignments/ Project	-	prise / Quiz	Attendance	ESE				
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Course I	Description	Sustainable Engineering will be an essential sub-discipline in engineering in the future. The course is designed for those students with a basic background in science and maths who wish to develop the interdisciplinary skills need to design, improve and assess renewable energy systems. 1. To develop an increased awareness among students on issues in areas of									
Course C	Dbjective	sustainability 2. To make studer sustainable develo 3. To give studer sustainable produ 4. To establish i	nts understand the opment nts some familiarit ct-service system d n students an un ties and engineeri	role of ty with evelopi derstar	engined the m ment nding o	ering and technolo ethods and tools f the role and ir	gy within used for npact of				
Course C	Dutcome	Upon completion 1. describe the pr 2. assess technolo	of this course, the inciples of sustaina ogies and their impa ncept of Green En	bility w act on e	ith case nvironr	studies. nent.	rojects at				

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			anage									<i>.</i> .			
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CO-3	3	3	2	-	2	-	-	-	2	2	-	1	-	-	1
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MODULE 1: PRINCIPLES OF SUSTAINABLE SYSTEMS												(5L)			
Sustainability Definitions - Principles of Sustainable Design, Sustainable Engineering -												g -	CO-1		
Frameworks for Applying Sustainability Principles - Summary & Activities.													BTL-2		
MODULE 2: TECHNOLOGY DEVELOPMENT AND LIFECYCLE ASSESSMENT													(5L)		
Technology as a part of anthropogenic environment - Technology readiness levels (TRL) -													CO-2		
technical metrics - Emerging, converging, disruptive technologies - Life Cycle Assessment												nt l	BTL-3		
(LCA) methodology - Summary & Activities.															
											(5L)				
Principles of Green Engineering - Frameworks for assessment of alternatives - Green Engineering examples - Multifunctional Materials and Their Impact on Sustainability -												CO-3			
-	-	-	- Mult	ifunct	ional	Mate	rials	and T	heir	Impac	t on	Susta	inabilit	v -	BTL-3
Summary															
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	J.B. Gui		tal (	2011)	Life	Cycle	Δςςρ	ssmen	t. Pa	st Pre	sent	and I	uture	Enviro	n Sci
1       Technol. 45, 90-96.         2       Anastas, P.T., Zimmerman, J.B. (2016), Innovations in Green Chemistry and Green															
2	Anastas, Engineer				ian, J	.B. (2	2016),	Innov	vation	s in	Gree	n Che	mistry	and	Green
Christensen, T(2010),Solid Waste Technology & Management, Volume 1 & 2, Wiley a											ey and				
4.	Sons. Weinste	in. M	1.P. ai	nd Tu	rner	R.F	(Fds )	(201	2). 5	ustain	ahilit	v Scie	nce: Tl	he Fm	eraina
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	Paradigm and Urban Environment, Springer Science+Business Media, LLC.
E BOOKS	
1.	https://www.oreilly.com/library/view/sustainable-engineering-
1.	concepts/9780132756563/
MOOC	
1.	https://www.coursera.org/learn/sustainability
2.	https://www.academiccourses.com/Certificate/Sustainability-Studies/India/
3.	https://onlinecourses.nptel.ac.in/noc18_ce08/preview
4.	https://www.coursera.org/learn/ecosystem-services

COURSE	TITLE			INTRO	DUC			iITAL S	YSTEN	/IS	(	CREDIT	S		3
COURSE	CODE		EE	B4101		CO	JRSE C	ATEG	ORY	P	C	L	-T-P-S		3-0- 0-1
Version	1.0	)	Appr	oval D	etails		23 AC	CM, 06	.02.20	21	L	EARNI	EL	BTL- 3	
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Description         techniques and circuit implementation.           1         To Utilize binger and boundering pumplementation.															
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MODULE (9L)		1		-		Int	roduc	tion		to		Digit	al	Sy	/stems
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Properties) - Digit <b>Practical Compor</b> Lab: - ( <i>To be done</i> 1. Logic gates sin 2. Boolean Identi 3. Digital control	al controllers (ON-O nent: e in Simulation enviro nulation ities and Property ve ler design	DFF). onment) erification	oolean algebra (Identities ems in consumer and indus	3
MODULE (12L)	2	-Sensors	and	Displays
Thermocouples, T displays. <b>Practical Compor</b> 1. Simulation 2. Simulation 3. Simulation 4. Simulation 5. Simulation	Tactile transducers <b>nent</b> : - (To be done in of Sensor character of Sensor Character of Sensor character of Sensor character of Sensor character	- Displays: - Light Em n Simulation environmen ristics- potentiometer ristics-Strain Gauge ristics-LVDT		
MODULE (9L)	- 3	: Signal	Conditioning	Circuits
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MODULE	- 4	:Introduction	to Micro	controllers
(9L) Introduction: M			roller (8 bit), Architecture, g of Digital Input/Output,	

5. Prop	oortional +Inte	egral + D	erivative con	troller simulation	۱.		
Sugge	sted Reading:	Hobby	electronics w	ith Microcontroll	er interfac	e.	
MODU	LE 5	-	Consumer	Electronics	and	Communication	System
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Consu	mer Electroni	ics: Tele	vision, Mobil	e Phones, Air co	onditioners	, Refrigerators, Wash	ing
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1.				ndamentals, , Pe			
2.		A. Gayak	(wad (2017),	Op-amps and Li	near Integ	rated Circuits, Prentio	ce Hall,4"
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3.						ments, Oxford Univers	
4.	•			nammad All Ma. bly And C, Pearso		, The 8051 Microcont	roller And
5.		•	5	· ·		, McGraw-Hill Education	<b></b>
	NCE BOOKS		2010], 110grt		untioners,		511.
1.		1ano (20	)16). Diaital L	ogic and Comput	er Desian.	Prentice-Hall.	
2.				· ·		ge International Pub	lishers. 4th
	, edition, 2018		,,	5	,	0	,
3.	Thomas W.	Schultz,	Thomas W. (2	2018), C and 805	1, Schultz I	Publishers, 4 <sup>th</sup> edition.	
4.	S.P Bali (200	8), Cons	sumer Electro	nics, Pearson Edu	cation Asi	a Pvt., Ltd.,	
E BOOK							
1.	http://www	.ee.iitm	.ac.in/~giri/po	dfs/EE4140/textb	ook.pdf		
2.	https://elec	tronics.ł	nowstuffwork	s.com/home-au	lio-video-c	hannel.htm	
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1.	http://nptel	.ac.in/co	ourses/10610	8099/Digital%20	Systems.po	df	
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3.	http://www	.nptel.a	c.in/courses/	Webcourse-cont	ents/IISc-		
5.	BANG/Micro	process	ors%20and%	20Microcontrolle	ers/pdf/Tea	acher_Slides/mod3/M	3L6.pdf
4.	http://nptel	.ac.in/co	ourses/10810	5063/pdf/L-09(S	S)(IA&C)%2	20((EE)NPTEL).pdf	
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COURSE	TITLE	ENGI	NEERING AND DESIG	N		CREDITS	3
COURSE	COURSE CODE EEB4118		COURSE CATEGOR	Y PO	2	L-T-P-S	3-0-0- 1
Version	Version 1.0 Approval Details		23 ACM, 06.0	2.2021		LEARNING LEVEL	BTL-4
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		-	2. Recognise the main drivers for design engineering 3. Describe how human variation impacts on design engineering											
Course	2		. Describe how human variation impacts on design engineering . Apply some basic concepts and methods from design engineering to exp											
Object						•					gn en	gineerir	ng to	explore
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		5. Demo								ation,	inforn	nation	handli	ng and
		numera	numeracy through the completion of activities.											
		•	Upon completion of this course, the students will be able to											
			Describe the different elements involved in good designs and to apply the											hem in
		practice	actice when called for.											
		2. Identi	fy the	prod	uct ori	ented	and u	ser or	iented	aspe	cts tha	t make	the d	esign a
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Functional and Strength Designs. Design form, function and strength; How to initiate creative designs Initiating														
the thinking process for designing a product of daily use Need identification. Problem									itiate c	reativ	<u>CU_1</u>			
the th	inking pr	ocess for	desigr	ning a	a prod	luct of	daily	use.	Need	ident	ificatio	n; Prot	olem	CO-1 BTL-3
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wants;	Evaluation and	choosing of a de	sign. Design Cor	nmunication	neeting what the customer ; Realization of the concept	
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and stre	-					
-	-		-		d modelling; Detailed 2D	
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		s realization and				
_		the detailed des			4445	
MODU (9L)	LE	III:		ENERGY	AND	SOURCE
	yping- rapid pr	ototyping; testi	ing and evalua	tion of des	ign; Design modifications;	
	g the design; Co					
Engine	ering the desig	n - From protot	type to produc	t. Planning;	Scheduling; Supply chains;	CO-3
invento	ory; handling; r	nanufacturing/co	onstruction ope	erations; sto	rage; packaging; shipping;	BTL-4
market	ing; feed-back c	n design				DIL-4
Project	:: List out the s	tandards organi	izations. Prepar	e a list of st	tandard items used in any	
enginee	ering specializat	ion. Develop any	design with ove	er 50% stand	ard items as parts	
MODU	LE IV:	INTRO	DUCTION	то	ENGINEERING	DESIGN
(9L)						-
-		• • •	•		ng/construction, assembly,	
	nance. logistics.	handling disass	embly: recycling	g; re-enginee	ring etc.	CO-4
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-	: Example: List	out the design r	equirements(x)	_	g a rocket shell of 3-meter	
diamet	:: Example: List er and 8-meter	out the design r	equirements(x)	_	g a rocket shell of 3-meter could be packed compactly	BTL-4
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1.	https://www.elsevier.com/books/introduction-to-engineering-design/samuel/978-0-7506- 4282-8
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1.	https://www.mooc-list.com/tags/engineering-design

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CO-2		1	2	3	-	-	-	-	-	-	-		-	-	-	2	2
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<ul> <li>Lap joints.</li> <li>Machining: Facing</li> <li>Turning</li> <li>UNTOMOBILE ENGINEERING</li> <li>Dismantling and Studying of two stroke gasoline engine.</li> <li>Dismantling and Studying of two stroke gasoline engine.</li> <li>Dismantling and Studying of four stroke gasoline engine.</li> <li>Assembling of two stroke gasoline engine.</li> <li>Assembling of two Pattern around Various Objects.</li> <li>Force measurement on Aircraft Model</li> <li>Determination of Young's Modulus for Aluminum Cantilever Beam</li> <li>Binary Addition &amp; Subtraction using Microprocessor</li> <li>Clift ENGINEERING</li> <li>Plumbing- Basic Pipe Connection using valves, couplings and elbows.</li> <li>Carpentry - Sowing, Planning and making common Joints.</li> <li>Bar Bending</li> <li>Construction of a 50 cm height brick wall without mortar using English Bond</li> <li>Study of tolos and accessories.</li> <li>Study of toles.</li> <li>Study of toles.</li> <li>Study of foles.</li> <li>Study of fole:</li> <li>Study of clocincuits.</li> <li>Making simple circuit using Electronic Components.</li> <li>Measuring of parameters for signal using CRO.</li> <li>Installation of various operating systems, their capabilities, Windows, Unix, Linux.</li> <li>Installation of commonly used software like MS Office</li> <li>Assembling digital computer.</li> <li>Installation of commonly used software like MS Office</li> <li>Assembling digital computer.</li> <li>Installation of arious operating systems, their capabilities, Windows, Unix, Linux.</li> <li>Installation of commonly used software like MS Office</li> <li>Astudy</li></ul>		· · · .	
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SLOT X - LIST OF EXPERIMENTS         V.ELECTRICAL ENGINEERING         1. Study of tools and accessories.         2. Study of cables.         3. Staircase wiring, Tube light and Fan connection.         4. Measurement of energy using single phase energy meter.         VI. ELECTRONICS ENGINEERING         1. Study of Active and Passive Components.         2. Study of Logic Circuits.         3. Making simple circuit using Electronic Components.         4. Measuring of parameters for signal using CRO.         VII. COMPUTER SCIENCE         1. Troubleshooting different parts of the computer peripherals, Monitor, Keyboard & CPU.         2. Installation of various operating systems, their capabilities, Windows, Unix, Linux.         3. Installation of commonly used software like MS Office         4. Assembling digital computer.         VIII. MECHATRONICS ENGINEERING         1. Study of Key Elements of Mechatronics Systems         2. Sensors – Load Cell, Thermocouple         3. Actuators – Linear & Rotary Actuators         4. Interfacing & Measurements – Virtual Instrumentation         REFERENCE BOOKS         1. Jeyapoovan T and Saravanapandian M. (2015), Engineering practices lab manual, 4th Edition,	Constru	ction of a 50 cm height brick wall without mortar using English Bond	
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VI. ELECTRONICS ENGINEERINGCO2 &1. Study of Active and Passive Components.CO2 &2. Study of Logic Circuits.CO2 &3. Making simple circuit using Electronic Components.CO2 &4. Measuring of parameters for signal using CRO.CO2 &VII. COMPUTER SCIENCECO2 &1. Troubleshooting different parts of the computer peripherals, Monitor, Keyboard & CPU.CO3/BTL32. Installation of various operating systems, their capabilities, Windows, Unix, Linux.CO3/BTL33. Installation of commonly used software like MS OfficeCO3/BTL34. Assembling digital computer.VIII. MECHATRONICS ENGINEERING1. Study of Key Elements of Mechatronics SystemsSensors – Load Cell, Thermocouple3. Actuators – Linear & Rotary ActuatorsInterfacing & Measurements – Virtual InstrumentationREFERENCE BOOKSI.1.Jeyapoovan T and Saravanapandian M. (2015), Engineering practices lab manual, 4th Edition,			
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<b>REFERENCE BOOKS</b> 1.Jeyapoovan T and Saravanapandian M. (2015), <i>Engineering practices lab manual</i> , 4th Edition,		-	
1. Jeyapoovan T and Saravanapandian M. (2015), <i>Engineering practices lab manual</i> , 4th Edition,			
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2. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K. (2010), "Elements of	۷.		-
Workshop Technology", Media promoters and publishers private limited, Mumbai.			
3. Ibrahim Zeid (2011), CAD/CAM Theory and Practice, Tata McGraw-Hill Publishing Company	3.	ibranim Zeid (2011), CAD/CAM Theory and Practice, Tata McGraw-Hill Publis	ning Company

	Ltd., New Delhi
4.	Robert Quesada, Jeyapoovan T. (2006), Computer Numerical Control Machining and Turning
	Centers, Pearson Education, New Delhi

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			(Co	ommo	n to A	ALL bra			ngine	ering)		CILDI	5		-
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Versio	n 1.0	4	Appro	val De	etails	24	th AC	M - 30	.5.20	18	LEA	RNING	LEVEL		BTL-3
ASSESS	MENT SCHEI	ME													
Ехр	erimental		Calcu	latio	n		Result	t		Viva		Re	ecord		ESE
	30		:	10			10			20			10		20%
Course	<b>Course Description</b> This course imparts practical knowledge on experimental met determine mechanical and optical properties of materials.										metho	ds to			
1. To train students to determine elastic properties of materials															
Course	Objective	3 4 5	. To tr .To eq	ain sti uip st	udent uden	s to es ts to u	stimat tilize l	e the ight b	therm eam t	o analy	ducti /se m	vity of ateria	a bad o		
	Outcome uisites: Physi	2. 3. 4. re 5.	deter meas deter apply fracti analy	mine sure vi mine phen ve ind se V-I	the Y iscosif therm omer lex of chara	oung's ty of lig nal cou na of li a mat acteris	s mod quids nducti ght to erial tics of	ulus a by Poi vity o deter a p-n	nd rig seuill f a ba mine	e's flov d cond	odulı v uctor ickne	us of m by Lee	naterial e's disc thin w	metho	
-	AND PSO M			i at m	Siler	SCCOTA									
		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
СО	PO 1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1	3	3	-	-	-	-	-	-	3	-	-	1	1	-	-
CO-2	3	3	-	-	-	-	-	-	3	-	-	1	1	-	-
CO-3	3	3	-	-	-	-	-	-	3	-	-	1	1	-	-
CO-4	3	3	-	-	-	-	-	-	3	-	-	1	1	-	-
CO-5	3	3	-	_	-	-	-	-	3	-	-	1	1	-	-
	1	: Wea	akly re	elated	, 2: N	lodera	tely r	elated	l and	3: Stro	ngly	related	ł		
MODU	LE 1: PROPE	RTIES	OF IV	IATTE	R- SO	LID								(9	9 P)
1. To	orsional Pend	dulum	ı – De	eterm	inatio	n of r	igidity	/ mod	ulus	of the	mate	erial o	fa		
	<ol> <li>Torsional Pendulum – Determination of rigidity modulus of the material of a wire.</li> <li>CO-1</li> </ol>														
2. N	Ion Uniform I	Bendi	ng – D	etern	ninati	on of `	Young	's Mo	dulus						BTL-3
	Iniform Bend		-				-								
	LE 2: PROPER						-							(	3P)
	scosity – De						of vise	cosity	of a	liquid	by Po	oiseuill	e's	·	CO-2
	flow.							•		-	-				BTL-3

MO	DULE 3: THERMAL CONDUCTIVITY	(3 P)								
5.	Lee's Disc – Determination of thermal conductivity of a bad	CO-3								
	conductor.Preparation of urea-formaldehyde resin.	BTL-3								
MO	DULE 4: OPTICS	(6 P)								
6.	Air – Wedge – Determination of thickness of a thin wire	CO-4								
7.	7. Spectrometer – refractive index of a prism									
MO	DULE 5: ESTIMATION METAL ION CONTENTS IN THE SAMPLE	(6 P)								
8.	Semiconductor laser – Determination of wavelength of laser using grating	CO-5								
9.	Semiconductor diode – VI characteristics	BTL-3								
TEXT	BOOKS									
1.	P. Kulkarni (2015), Experiments in Engineering Physics Bachelor of Enginee	ring and								
	Technology									
REFE	RENCE BOOKS									
1.	Glenn V. Lo, Jesus Urrechaga – Aituna (2015), Introductory Physics Laboratory Manua	al, Part-I.								
E BO	OKS									
1.	http://www.aurora.ac.in/images/pdf/departments/humanities-and-sciences/engg-pl	ny-lab-								
1.	manual.pdf									
MOO										
1.	https://www.coursetalk.com/providers/coursera/courses/introduction-to-chemistry-	-1								

COURSE	TITLE		HEMISTRY LABORA L branches of Engin	-		CREDITS	1
COURSE	CODE	CYA4131	COURSE CATEGO	RY B	S	L-T-P-S	0-0-2-0
Version	1.0	Approval Details	24th ACM - 30	.5.2018	LE	ARNING LEVEL	BTL-3
ASSESSM	ENT SCI	HEME					
Experim	ental	Calculation	Result	Viva		Record	ESE
30		10	10	20		10	20%
Cour Descrip		This course imparts p analyses of lubricar spectrophotometric an	nts, refractories	& other		• • •	
Course Objective		measurement. 2. To give a pract partially- miscible liquid 3. To provide the (urea-formaldehyde res 4. To impart hands	students practica	the const stem) I knowled	truct ge ir on of	ion of phase di n preparation of refractories.	agram, for f polymers
Course Outcome		<ol> <li>analyze the phase</li> <li>apply the praction</li> <li>preparation of other single</li> </ol>	ants based on visco se diagram and inte cal knowledge gain	sity erpret the e ed on the p les.	critic	al solution tempe	

		5.				photo	ometri	c met	hod fo	or the	deter	rminat	ion of	metal i	ons in	
Drorogu	ucitoc: NI		ent env	vironm	ient.											
Prerequisites: NIL CO, PO AND PSO MAPPING																
										PSO	PSO					
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO-1		3 2	1	-	-	-	2	-	-	-	-	2	1	-	-	
CO-2	3	3 2	1	-	-	-	2	-	-	-	-	2	1	-	-	
CO-3	3	3 2	1	-	-	-	2	-	-	-	-	2	1	-	-	
CO-4	3	3 2	1	-	-	-	2	-	-	-	-	2	1	-	-	
CO-5		3 2	1	-	-	-	2	-	-	-	-	2	1	-	-	
			eakly re			odera	tely r	elated	and 3	3: Stro	ngly r	related	4			
	.E 1: PRO													(	6 P)	
	erminatior			• •		-		d Visco	omete	er.				6	0-1	
	erminatior		-												BTL-3	
	ermination							scome	eter.						( )	
MODULE 2: PHASE DIAGRAM IN LIQUID SYSTEM									(6 P)							
4. Construction of phenol-water phase diagram.										CO-2						
5. Determination of adsorption isotherm for acetic acid on activated charcoal.										BTL-3						
MODULE 3: PREPARATION POLYMER RESIN.         6. Preparation of urea-formaldehyde resin.									(6 P)							
6. Prep	aration of	r urea-r	ormaid	enyae	e resin	•									CO-3 BTL-3	
MODULE 4: BASIC PROPERTIES OF REFRACTORIES									(6 P)							
	rminatior						_3								(0 P) CO-4	
	ermination	-	-			•	solids								.0-4 TL-3	
	.E 5: ESTI								MPIF						(6 P)	
											metrv	,			(01)	
<ol> <li>Estimation of dye content in the effluent by UV-Visible spectrophotometry.</li> <li>Determination of copper / iron content in the alloy by colorimetry.</li> </ol>							0	0-5								
	nation of	•	• •											B	TL-3	
	fication of		-			•			•							
TEXT BO					U		-									
1. P.	S. Raghav	an (201	L8), <i>Ma</i>	terials	G Chen	nicals	Labor	atory	Manu	<i>al,</i> Dh	anam	Public	cations			
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EBOOKS					2 20			2 20								
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MOOC																
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#### **SEMESTER - II**

COURSE	TITLE	ANALY	CREDITS	4		
COURSE	CODE	MAA 4117	COURSE CATEGORY	BS	L-T-P-S	3-0-2-1
Version	1.0	Approval Details	24th ACM - 30.5.2018	S LI	ARNING LEVEL	BTL-3

ASSESSI	IENT S	CHEN	ΛE												
First Periodical Assessment		I	Second Periodical Assessment			Seminar/ Assignments/ Project			Surprise Test / Quiz		est	Attendance		;	ESE
15	%		1	.5%			10%			5%		5%			50%
Cou		Т	To make the student understand the basic analytical mathematical skills										that is		
Descri	ption	in	imperative for effective understanding of engineering subject using MATLAB.										LAB.		
Course Objective			<ol> <li>To demonstrate the fundamental understanding of integrals</li> <li>To apply problem solving skills vectors</li> <li>To understand the concepts of Laplace Transforms</li> <li>To understand the concept of Fourier series</li> <li>To understand the concepts of complex variables</li> </ol>												
Course Outcome			<ul> <li>Upon completion of this course, the students will be able to</li> <li>1. evaluate surface and volume integrals</li> <li>2. perform vector operations and interpret the results geometrically</li> <li>3. solve the system of ordinary differential equations using Laplace Transform</li> <li>4. develop any periodic function satisfying Dirichlet's conditions as a Fourier series</li> <li>5. construct the analytic function and finding the harmonic function.</li> </ul>												
Prerequi	isites:														
CO, PO		PSO	MAPI	PING											
СО	РО 1	РО 2	РО 3	РО 4	PO 5	PO 6	PO 7	PO 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	3	-	-	-	-	3	-	-	-	-	-	2	1	1
CO-2	3	3	2	3	-	-	-	-	-	-	-	-	2	1	1
CO-3	3	3	2	3	-	-	-	-	-	-	-	-	2	1	1
CO-4	3	3	-	-	-	-	-	-	-	-	-	-	2	1	1
CO-5	3	3	-	-	-	-	3	-	-	-	-	-	2	1	1
	•	1	: Wea	kly rel	ated, 2	2: Moo	lerate	ly relat	ted an	d 3: St	rongly	relate	d	•	
MODULI	E 1:MU	ILTIPI	.E INTE	GRAL	S							(10L+	-2P=12)		
Double integration – Cartesian and polar co-ordinates – Change of order of integration. Area as a double integral – Triple integration in Cartesian coordinates – Volume as a triple integral – Change of variables between Cartesian and polar coordinates. Suggested Reading: Line Integrals Lab: Area and Volume using double and triple integration.								CO-1 BTL- 1,2,3							
MODULI							1	<b>D</b> :		1 1 1		•	+2P=12		
Gradient, Divergence and Curl – Unit normal vector, Directional derivative – angle between surfaces–Solenoidal and Irrotationalvector fields, Green's theorem - Gauss divergence theorem and Stoke's theorem (without proof) – Verification and evaluation of the above theorems - Simple applications to regions such as square, rectangle, triangle, cuboids and rectangular parallelopipeds. Suggested Reading: Basics of Vectors									rem 1s -	CO-2 BTL- 1,2,3					
Lab: Ar						d Volu	me us	ing Ga	uss di	iverge	nce th				
MODULE 3:LAPLACE TRANSFORMS (10L+2P=12)												(10L	+2P=12	)	

T1	Transformer Conditions of emistance. Transformer of allower formations								
	ace transform – Conditions of existence – Transform of elementary functions –								
	erties – Transforms of derivatives – Initial and final value theorems – Transform of periodic	CO-3							
	ctions. Inverse Laplace transforms using partial fraction and convolution theorem. Solution inear ODE of second order with constant coefficients.								
		BTL-							
	ested Reading: Basics of Transform	1,2,3							
	Finding Laplace and Inverse Laplace Transform of Elementary Functions,								
	ions of Ordinary differential equations using Laplace transform ULE 4: FOURIER SERIES (10L+2P=12)								
	hlet's Conditions – General Fourier Series – Odd and even functions – Half range sine								
	osine series –Harmonic Analysis.	CO-3							
	iggested Reading: Basics of series								
	Fourier series Expansion of simple functions, Harmonic Analysis	1,2,3							
	DULE 5: COMPLEX VARIABLES (10L+2P=12)								
	tions of a complex variable – Analytic function – Cauchy - Riemann equations (Statement								
	- Properties of analytic function (Statement only) - Construction of Analytic functions								
	ilne – Thomson method.	CO-4							
•	ested Reading: Complex Numbers	BTL-							
	Complex Numbers	1,2,3							
Luoi									
TEXT	BOOKS								
1.	Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edit	ion, New							
т.	Delhi, 2016.								
2.	A.P.Santhakumaran, P.Titus, Engineering Mathematics - II, NiMeric Publications, N 2012	lagercoil,							
3.	Chandrasekaran A, Engineering Mathematics- II, Dhanam Publication, 2014								
4.	Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma, "MATLAB and its Applic	cations in							
4.	Engineering", Pearson Publication, Second Edition, 2016.								
REFEI	RENCE BOOKS								
1.	Sastry, S.S, —Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4 <sup>th</sup> Edition, New Delhi, 2014								
2	Wylie, R.C. and Barrett, L.C., -Advanced Engineering Mathematics - Tata McGraw Hil	1							
2.	Education Pvt. Ltd, 6th Edition, New Delhi, 2012.								
3.	Dean G. Duffy., "Advanced Engineering Mathematics with MATLAB", CRC Press, Thir	d Edition							
5.	2013.								
e boc	DKS								
	http:// nptel.ac.in/courses/122104017/28								
	https://www.khanacademy.org//double-integrals/double-integral.								
1	nptel.ac.in/courses/115101005/downloads/lectures-doc/Lecture-1.pdf								
1.	nptel.ac.in/syllabus/122104017/								
	nptel.ac.in/courses/111105035/22								
	nptel.ac.in/syllabus/111103070/								
моо									
1.	https://www.edx.org/course/introduction-engineering-mathematics-utarlingtonx-engr3-0x								

COURSE	TITLE	ELECTR	ROMAGNETIC THEORY	CREDITS	4	
COURSE	CODE	EEB4116	COURSE CATEGORY	РС	L-T-P-S	3-1-0-1
Versio	1.0	Approval Details	23 ACM, 06.02.2021	LEA	RNING LEVEL	BTL-4

n															
ASSESS	MEN.	T SCI	HEME												
Fi	rst		Se	econd		S	emina	r/	Surr	orise T	oct				
Perio	odical		Per	iodica	I	Ass	ignme	nts/	-	Quiz	est	Atte	ndance		ESE
Asses	smen	t	Asse	essmer	nt		Project	t		Quiz					
1	5%			15%			10%			5%			5%		50%
	urse												•	ic field	s and
Descr	iptior	ו	applica										-		
1.To introduce the basic mathematical concepts related to electromagnetic fields.2.To impart knowledge on the concepts of electrostatics, electric potential, density and their applications3.To impart knowledge on the concepts of magnetostatics, magnetic flux scalar and vector potential and its applications.4.To impart knowledge on the concepts of Faraday's law, induced e Maxwell's equations.5.To impart knowledge on the concepts of concepts of electromagnetic wa transmission lines.													ential, o c flux d ced em	energy ensity, of and	
Course Outcon	ne		1. Appl electro 2. Anal electro 3. Anal electro 4. Sun Maxwe 5. Exa interfac	y diffe magne yze th magne yze th magne nmariz Il's equ mine ces anc	rent to tic fiel e elec tic law e mag tic law e the uation the p d in ap	echniq d thec tric fie vs with netic vs with conc s. henon plicatio	ues of ory. Id inte the as field ir the as epts of nena of	vecto ensity f ssociat ntensit ssociat of elec of wa	r calcu from the ed bou y from ed bou ctrody ve pro	Ilus to he stat undary n the s undary namics	under tionary cond steady cond s & t sion ir	y char itions. currei itions o deri	ge distr nt distri ive anc	nt conce ibutions ibutions d discus nedia a	s using s using ss the
			AA4102		lied Lir	near A	lgebra								
CO, PO	AND PO	PSO PO	PO	NG PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
со	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1	3	3	1	3	3	-	-	-	1	-	-	-	1	3	-
CO-2	3	3	1	3	3	-	-	-	1	-	-	-	1	3	-
CO-3	3	3	1	3	3	-	-	-	1	-	-	-	1	3	-
CO-4	3	3	1	3	3	-	-	-	1	-	-	-	1	3	-
CO-5	3	3	1	3	3	<u> </u>	-	-	1	-	-	-	1	3	-
			1: We		lated,	2: Mo	derate	ely rela	ted ar	nd 3: S	trongl	y relat	ed		
			ODUCT			··- ·· ·	-l /			·C - ·				(12L	)
Diverge	ence tl	heor	cts of el em - Stc <b>ng</b> : Vect	oke's th	neorer	n.			ias-Dit	terent	co-or	dinate	system		CO-1 3TL-2
MODU	LE 2:	ELEC	TROSTA	TICS											(12L)
law and	Coulomb's Law-Electric field intensity-Field due to point and continuous charges-Gauss's law and application-Electrical potential-Electric field and equipotential plots-Electric field <b>CO-2</b> in free space, conductors, dielectric-Dielectric polarization, Electric field in multiple <b>BTL-4</b>														
dialacti	ics-bo	ound	ary con	ditions	, Pois	son's a	and La	place's	equa	tions I	Unique	eness <sup>-</sup>	Theorer	n,	

-	cal Solution in one dimension using MATLAB - Capacitance-energy density-	
	ric strength.	
Sugges MATLA	ted Reading: Determination of Electric field intensity and Stored energy using B	
MODU	LE 3: MAGNETOSTATICS	(12L)
Lorent	z Law of force, magnetic field intensity-Biot-Savart's Law-Ampere's Law-Magnetic	
field du	ue to straight conductors, circular loop, infinite sheet of current - Magnetic flux	
density	in free space, conductor, magnetic materials - Magnetization-Magnetic field in	CO-3
multipl	e media-Boundary conditions - Scalar and vector potential - Magnetic force -	BTL-4
	<ul> <li>Inductance - Energy density -Magnetic circuits.</li> </ul>	
	ted Reading: Determination of Magnetic field intensity and inductance using	
MATLA		
MODU	LE 4: TIME VARYING	FIELDS
(12L)	ula lower induced and Transformer and motional ENT Manually equations	
	y's laws, induced emf- Transformer and motional EMF, Maxwell's equations	CO 4
circuit	ntial and integral forms)-Displacement current-Relation between field theory and	CO-4 BTL-4
	ted Reading: Solution of boundary conditions using MATLAB	DIL-4
MODU		WAVES
(12L)		
	ation - Electro Magnetic Wave equations - Wave parameters, velocity, intrinsic	
	ince, propagation constant - Waves in free space, lossy and lossless dielectrics,	CO-5
-	tors-skin depth, Poynting vector - Plane wave reflection and refraction.	BTL-4
	ted Reading: Modeling and Simulation of an electromagnetic wave in an isotropic	DIL-4
and ani	sotropic media using MATLAB	
TEXT BO	DOKS	
1	Matthew Sadiku, (2014) "Elements of Electromagnetics", Sixth edition, Oxford	University
	Press.	
2	William .H.Hayt, John A.Buck, (2012) "Engineering Electromagnetics", Eighth Edi	tion, Tata
	McGraw Hill.	
REFERE	NCE BOOKS	
4	John.D.Kraus, Daniel Fleisch, (2010) "Electomagnetics with Applications", Fift	h Edition,
1.	McGrawHill.	
2.	Karl E.Longren, Sava V.Savov, Randy J.Jost, (2007) "Fundamentals of Electromagr	etics with
۷.	MATLAB", Second Edition, Scitech Publishing.	
3.	Matthew N.O. Sadiku (2009), Numerical Techniques in Electromagnetics with MAT	LAB, Third
5.	Edition CRC Press.	
4.	Dr. M.H. Bakr (2012) , "Matlab Experiments manual for Electromagnetics".	
E BOOK	S	
1.	https://easyengineering.net/elements-of-electromagnetics-sadiku/	
2.	https://easyengineering.net/electromagnetics-by-kraus-and-carver/	
MOOC		
1.	https://www.coursera.org/learn/electrodynamics-introduction	
2.	https://www.coursera.org/learn/electrodynamics-electric-magnetic-fields	
3.	https://nptel.ac.in/courses/108/104/108104087/	
4.	https://www.coursera.org/learn/electrodynamics-analysis-of-electric-fields	
-т.	inteps.//www.coursera.org/rearry/creetrouy/farmes-analysis-or-erectric-fields	

## 5. https://www.coursera.org/learn/electrodynamics-solutions-maxwells-equations

COU TIT					CIRCL	JITS A	ND NET	WORK	s			CREDIT	rs		4	
COU COI			EEE	84117		COL	IRSE CA	TEGOR	Y	P	С	L-T-	-P-S	3-1	-0-1	
Versio n	1		Appr	oval D	etails		23 ACI	M, 06.0	2.2021	L	LEA	RNING L	EVEL	B1	rL-3	
ASSESS	MEN	T SC	HEME													
Fir: Perioo Assess	dical	t	Peri	cond odical ssment	t	/Seminar Assignment Project		nts/	-	irprise Test / Quiz		Atten	dance	E	SE	
15	%		1	.5%			10%			5%			%	5	0%	
Cou Descri		n \	15%10%5%50%The course begins with description with circuit elements , sources. Understanding of various interesting network theorems applied to solve linear, time invariant network problems efficiently in time and s-domain													
Course Objectiv			noda metl 2. Tou 3. Tou 4. Tou	al ana hods o nderst nderst underst	lysis,r f simp and th and fr tand f	mesh Ilifying ne con requer the Di	analysi netwo cept of ncy resp	s, the ks. graphic onse ir types	orems, cal solu electr of two	, so ution ical o-po	urce to ele circuit: rt net	analysi transfor ectrical r s work ar	rmation network	and	several	
Course Outcom			L. Fam anal 2. Desc any 3. Desc 4. Eval 5. Anal port	niliarize yzing e cribe or elemer cribe re luate A yze va netwo	e the l lectric n vario nt esonar pplica rious orks.	basic l cal circ ous el nce an ation c paran	cuits. ectrical d coupl of Laplac neters o	urce tr theore ed circu ce trans of TWC	ansfor ms to f uits sform i	mati find n an	ons, t voltag alyzing	ble to heorem e, curre g the cire s and in	nt and p cuits.	oower tl	nrough	
Prerequ						n to Di	igital Sy	stems								
CO, P(	1		SO MA	1	1			DO.	<b>DO</b>	DO			DSO	DSO	DSO	
со	РО 1	РО 2	РО 3	PO 4	PO 5	PO 6	PO 7	PO 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
CO-1	3	3	2	2	2	-	-	-	-		-	-	1	1	1	
CO-2	3	3	3	3	3	-	-	-	-	-	-	1	3	3	1	
CO-3	3	3	3	3	3	-	-	-	-	-	-	-	3	3	1	
CO-4	3 3	3	3	3	3	-	-	-	-	-	-	1	3	3	1	
CO-5	ა	3	_	-	_		- Inderati	- lv rola	- ted ar		- Stron	gly relat	-	ാ		
MODU	F 1·	BAS				-	iouerat	ciy i ela		iu J.	5000	5191010	.cu	(61 -	6L=12)	
Fundan	MODULE 1: BASIC CIRCUIT ANALYSIS(6L+6L=12)Fundamental concepts of R, L and C elements, Ohm's Law - Kirchoffs laws - DC circuits, series and parallel circuits - loop and nodal analysis, A.C circuits - complex impedance - BTL-2BTL-2															

phaso	r diagram, real and reactive power - loop and nodal analysis applied to AC circuits.	
	JLE 2: NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND	AC CIRCUITS
•	e source –current source transformations, Star-delta transformations, Various	
-	ork theorems and applications to dc and ac circuits: Superposition theorem,	CO-2
	nin's theorem, Norton's theorem, Reciprocity theorem, Millman's theorem, and	BTL-2
	num power transfer theorem.	
MODU	JLE 3: RESONANCE AND COUPLED CIRCUITS (6L+6L=12)	
Reson	ance in series and parallel circuits, self and mutual inductances, coefficient of	CO-3
coupli	ng - dot convention - analysis of coupled circuits.	BTL-3
MODU	JLE 4: TRANSIENT RESPONSE FOR DC CIRCUITS (6L+6L=12)	
Time r	response of RL, RC and RLC circuits using Laplace transform for step and sinusoidal	CO-4
inputs		BTL-2
MODU	JLE 5: TWO PORT	NETWORKS
(6L+6L	=12)	
Two p	port networks, Z parameters, Y parameters, Transmission (ABCD) parameters,	CO-5
Hybrid	(H) Parameters, Interconnection of two port networks, Symmetrical properties of	BTL-2
T and a	π networks.	
TEXT B		
1.	Hayt, W. H, Kemmerly J. E. & Durbin, (2013) 'Engineering Circuit Analysis', Publications, 8th Edition	McGraw Hill
2.	Charles K. Alexander, Matthew N. O. Sadiku, (2007) 'Fundamentals of Elec McGraw-Hill Publications, 3rd Edition	etric Circuits',
DEEEDI	ENCE BOOKS	
1.	Robins & Miller, 'Circuit Analysis Theory and Practice', (2012) Delmar Publishers,	5 <sup>th</sup> Edition
1.	Sudhakar A and Shyam Mohan SP, Circuits and Network Analysis and Synthesi	
2.	McGraw Hill	3, (2007) 1818
E BOOI		
1.	https://ia800708.us.archive.org/25/items/EngineeringCircuitAnalysis_280/HaytKer EngineeringCircuitAnalysis.pdf	mmerly-
2.	Solutions of Fundamentals of Electric circuits	Alexander-
	https://docs.google.com/file/d/0B21HoBq6u9TsYUt2cW9RZEs5UEk/edit	
3.	Circuit analysis, Robins	miller-
моос	https://drive.google.com/file/d/0B7qpgUTOwkAdMnpFZlYyWTg3U2s/view	
1.	https://www.mooc-list.com/course/6002x-circuits-and-electronics-edx	
2.	https://www.mooc-list.com/course/linear-circuits-1-dc-analysis-coursera	
3.	http://www.nptel.ac.in/courses/108102042/	
5.		

COURSE	OURSE TITLE CIRCUITS AND NETWORKS LABORATORY CREDITS								
COURSE	CODE	EEB4141	COURSE CATEGOR	RY F	°C	L-T-P-S	0:0:2:0		
Version	1.0	Approval Details	s 23 ACM, 06.02	2.2021	LEA	RNING LEVEL	BTL-3		
			ASSESSMENT S	CHEME					
First Peri	odical	Second	Seminar/	Surpr	ise	Attendence	гсг		
Assessment Periodical		Assignments/	Assignments/ Test / Quiz		Attendance	ESE			

			Asse	ssmen	t	Р	roject								
:	15%		1	L <b>5%</b>			10%		5	%		5%		50%	Ś
	ourse criptio	n	Enable	the st	udent	ts to de	velop tl	he bas	sic conc	epts of	fsimpl	e DC 8	k AC Cir	cuits	
Cours	e				-	ectrical a given i			pplving	variou	ıs Netv	vork T	heorem	IS.	
Object					•	-		•							
		<ol> <li>To measure three phase Active and Reactive power.</li> <li>To understand the locus diagrams</li> </ol>													
			Upon completion of this course, the students will be able to												
Cours	е	1. Analyze the characteristics of Electrical circuits using PSpice Simulation.													
Outco	me		2. Analyse various network theorems.												
		3. Analyse the response of AC Circuits													
	quisite														
CO, P	1		MAPPI												
со	PO 1	РО 2	PO 3	РО 4	PO 5	PO 6	РО 7	PO 8	PO 9	РО 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	3	3	3	3	-	-	-	1	-	-	-	2	2	1
CO-2	3	3	3	3	3	-	-	-	1	-	-	-	2	2	1
CO-3	3	3	3	3	3	-	-	-	1	-	-	-	2	2	1
												-			
S.No.	EXPE			<u> </u>											
1			on of Oh					/S.					CO-	1, BTL-3	6
2			on of Me											,	-
3	-		on of The					orem							
4			on of Sup	•									CO-2	2, BTL-4	Ļ
5			on of Ma				ter the	orem						-	
6			on of Rec												
7			respons												
8			ency response of Series and Parallel resonance circuits CO-3, BTL-4												
9		quency response of Single tuned coupled circuits ctrical circuit simulation using Multisim (Additional)													
10	Elect	rical	circuit si	mulati	on us	ing Mul	tisim (A								

## **SEMESTER - III**

τοι	JRSE TITLE	PARTIAL DI		ENTIAL EQUAT ANSFORMS	IONS A	AND	CREDITS	4			
COL	JRSE CODE	MAA 4201	MAA 4201 COURSE CATEGORY BS					3-1-0- 1			
Versio n	1.0	Approval Deta	24th AC 30.5.2018	M	- LE	ARNING LEVEL	BTL-3				
ASSESSN	IENT SCHEME					<u>.</u>					
	Periodical sessment	Second Periodical Assessment	Periodical Assignments/ Surprise Attendance								
	15%	15% 10% 5%					5%	50%			
Course	e Description	To make the student understand the basic concepts of partial differential equations and transforms and its applications									
Course C	Objective	1. To present the main results in the context of partial differential									

dependence 3. to mathematically model the way thermal energy moves throug plate 4. To understand the concept of Fourier transform 5. To understand the concept of Z-transform and its properties Upon completion of this course, the students will be able to													osition		
Course Outcome1. formulate and solve standard types of partial differential equations2. solve the Wave and Heat equations3. obtain the solution of two dimensional heat equations4. evaluate the definite integrals using Fourier transform5. compute the solution of difference equation using Z-Transform.															
Prerequisites:															
CO, PO A	AND PSO M	APPIN	r			1			1		1			1	
со	PO 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	3	2	<b>4</b> 2	2	-	-	- -	-	-	-	2	2	1	1
CO-2	3	3	2	2	2	_	-	_	_	_	-	2	2	1	1
CO-3	3	3	2	2	2	-	-	-	-	-	-	2	2	1	1
CO-4	3	3	2	2	2	-	-	-	-	-	-	2	2	1	1
CO-5	3	3	2	2	2	-	-	-	-	-	-	2	2	1	1
	1	: Wea	kly re	lated	, 2: N	lodera	ately r	elated	l and 3	3: Stro	ongly	related	d	I	
MODUL	E 1: PARTIAI		-		-						<u> </u>		+3T=12	)	
functions linear ec coefficies	on of partia - Solution quation - I nts. ed Reading:	of sta Lineai	ndard part	type tial c	s of fi liffere	irst or	der pa	rtial d	iffere	ntial e	quatio	ons - L	Lagrang	ge's ant	CO-1 BTL- 1,2,3,4
	E 2: ONE DI					ID HE	AT FLC	DW EC	UATI	ON		(9	L+3T=1	2)	
Classific dimensio proof) an Suggeste	ation of se onal wave en ad applicationed Reading:	econd quatic n in s Partia	orde on (wi tring a ll Diff	r lin thout and ro erent	ear p proo od pro ial Eq	artial f) - C blems uatior	differ One dir S. Is, Hal	rential mensio f rang	equa onal h	ations leat fl	ow eq	olution	s of c ı (witho	one	CO-2 BTL- 2,3,4
MODULE 3: TWO DIMENSIONAL HEAT FLOW EQUATION(9L+3T=12)Steady state solution of two dimensional heat equations and applications in finite plates and infinite plates problems.(9L+3T=12)											CO-3 BTL- 1,2,3,4				
identity. Suggested Reading: Basic integration .									CO-3 BTL- 1,2,3						
	E 5: Z-TRAN											-	3T=12)		
<b>V</b> 1										CO-4 BTL-					

Suggeste	d Reading: Basic calculus	1,2,3,4
TEXT BOO	DKS	
1.	P. Sivarama Krishna Das, C. VijayakumarL, "Transforms and partial differential eq 1 Pearson Publication, 201	uations",
2.	Grewal. B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publisher 2012	s, Delhi,
3.	Chandrasekaran A, "A Text Book of Transforms and Partial Differential Equations", Publication, 2015	Dhanam
REFEREN	CE BOOKS	
1.	BalLN.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Laxmi Publications Pvt Ltd, 2007.	Edition,
2.	Datta.K.B., "Mathematical Methods of Science and Engineering", Cengage L India Pvt Ltd, Delhi, 2013.	earning
3.	Veerarajan. T., "Transforms and Partial Differential Equations", Tata McG Education Pvt. Ltd., New Delhi, Second reprint, 2012.	raw Hill
E BOOKS		
1.	nptel.ac.in/courses/122107037/	
2.	nptel.ac.in/courses/122107037/22	
MOOC		
1.	https:f/www.mooc-list.com/tags/laplace-transforms	
2.	https://www.edx.org/course/introduction-differential-equations-bux-math226-1x-1	

COURSE TITLE	ELE	CTRICAL MACHINES			CREDITS	4
COURSE CODE	EEB4201	COURSE CATEGO	DRY	PC	L-T-P-S	3-1-0-1
Version 1.0	Approval Details	23 ACM, 06.02.2	021	LEA	ARNING LEVEL	BTL-3
ASSESSMENT SCH	EME					
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project		urprise t / Quiz	Attendance	ESE
15%	15%	10%		5%	5%	50%
Course	Electrical Machine	s deals with princip	le, pe	rformance	e and applications o	f DC and
Description	AC machines					
	1.To learn the prine	ciple and construction	on of D	DC and AC	machines	
	2.To derive the cha	aracteristics and per	forma	nce of tra	nsformers	
Course	3.To impart knowle	edge about the princ	ciple, d	characteri	stics and applications	s of three
Objective	phase induction mo	otors and synchrono	us ma	chines.		
	4.To analyze and se	elect different specia	al mac	hines for	specific applications	
	5. To simulate diffe	erent testing using '	V-LAB	S .		
	Upon completion	on of this course, the	e stud	ents will b	e able to	
Course Outcome	1. Examine the pri	nciple, construction,	, classi	ification o	f DC generators and	motors,

			and a	i ylgge	n real	time a	pplica	tion.							
		2. Analyze performance parameters, equivalent circuit, phasor diagram,												gram, p	arallel
			oper	ation c	of tran	sform	ers.								
		3.	Desc	ribe tł	ne co	nstruct	tion, p	orincip	le, ch	aracter	istics	and a	pplicat	ions of	three
			phas	e indu	ction	motor.									
		4.	Desc	ribe th	e prir	nciple,	constr	uctior	, appl	ication	s of al	ternat	ors and	l synchr	onous
			moto	ors.											
		5.	Analy	yze th	e prir	nciple	and a	pplica	tions	of sing	le ph	ase in	ductior	n moto	rs and
			speci	ial mad	chines	like st	epper	moto	rs, relu	ictance	e moto	ors etc			
Prerequisites: Physics and Mathematics CO. PO AND PSO MAPPING															
CO, PO AND PSO MAPPING															
CO         PO 1         PO 2         PO 4         PO P															PSO 3
CO-1	3	3	1	-	_	-	-	-	-	-	-	-	1	2	1
CO-2	3	3	2	-	1	-	-	-	-	-	-	-	1	2	1
CO-3	3	3	1 - 1 1 2											2	1
CO-4													2	1	
CO-5         3         3         1         -         -         -         -         -         2         2           1: Weakly related, 2: Moderately related and 3: Strongly related													2	1	
				ly rela	ted, 2	: Mod	erately	/ relat	ed and	d 3: Str	ongly	relate	d		
wodu	e I:- DC N	ACHI	INES											(9L+3 <sup>-</sup>	T)=12)
Suggested Reading: Generators used for battery charging systems, speed control of dc motor for an industrial application.													-	of	
operation compou Swinbu Sugges for an in	on of D.C und mot rne's tes ted Read	C. mot ors - t – Spe ling: C applic	or – Ba Startir eed co Genera cation.	ack em ng of [ ntrol c ntors u	series of and D.C. n of D.C. sed fo	s, shur torque notors shunt	nt and e equa – Typ motor	d com tion – es of rs.	pound Chara starte	d gene Icterist ers - To	erator: ics of esting	s – Pi series, , brake	rinciple shunt a e test a	of and and	CO-1 BTL-2
operation compou Swinbu Sugges for an in SIMULA	on of D.C und mot rne's tes ted Read ndustrial	C. mot ors - t – Spe ling: C applic SING	or – Ba Startin eed co Genera cation. V-LAB	ack em ng of I ntrol c ntors u ,MHRI	series of and D.C. n of D.C. sed fo	s, shur torque notors shunt	nt and e equa – Typ motor	d com tion – es of rs.	pound Chara starte	d gene Icterist ers - To	erator: ics of esting	s – Pi series, , brake	rinciple shunt a e test a f dc mc	of and and	BTL-2
operation composed Swinbu Suggest for an in SIMULA Module Constru- Transfo All day	on of D.C und mot rne's tes ted Read ndustrial <u>ATION: U</u> <b>e II:- TRA</b> uctional ormer on efficience l operatic	C. mot ors - t – Spe ling: C applic SING SING MSFO detail no lo load - y	or – Ba Startin eed co Genera cation. V-LAB <b>RMER</b> s – Pr oad – Regu	ack em ng of I ntrol c tors u ,MHRI ,MHRI S Paran Ilation	series of and D.C. n of D.C. sed fo D e of c neters - Test	s, shur torque notors shunt r batte perati s refer ting – I	nt and e equa — Typ motor ery cha on — I red to Load to	d com tion – es of rs. arging EMF e HV/l est, op	equation Chara starte systen equation V wir	d gene acterist ers - To ns, spe on – T adings cuit ar	erator ics of esting ed co ransfo – Equ nd sho	s – Pr series, , brake ntrol o ntrol o ormati uivalen ort circ	rinciple shunt e test f dc mc f dc mc <u>(9L-</u> on rati t circu uit test	of and and otor • <b>3T=12)</b> o – it – s. –	BTL-2
operation composed Swinbur Suggest for an in SIMULA Module Construct Transfo Transfo All day Parallel - Vector	on of D.C und mot rne's tes ted Read ndustrial <u>ATION: U</u> <b>e II:- TRA</b> uctional ormer on efficience l operatic	C. mot ors - t – Spe ling: C applic SING SING MSFO detail no lo load - y on of s	or – Ba Startin eed co Genera cation. V-LAB <b>RMER</b> s – Pr oad – Regu ingle p	ack em ng of I ntrol c itors u ,MHRI S Finciple Paran Ilation	series of and D.C. n of D.C. sed fo c e of c neters - Test cransfo	s, shur torque notors shunt r batte perati refer ting – I	nt and e equa — Typ motor ery cha on — I red to Load to S - Auto	tion – es of rs. arging EMF e HV/l est, op	equation Sforme	d gene acterist ers - To ns, spe on – T adings cuit ar er - Thr	erator ics of esting ed co ransfo – Equ nd sho	s – Pr series, , brake ntrol o ormati uivalen ort circ ase tra	rinciple shunt e test f dc mc (9L- on rati t circul uit test	of and and otor • <b>3T=12)</b> o – it – s. –	BTL-2
operation composed Swinbu Suggess for an in SIMULA Module Constru Transfo Transfo All day Parallel - Vector Sugges	on of D.C und mot rne's tes ted Read ndustrial ATION: U e II:- TRA uctional ormer on efficience l operation r group.	C. mot ors - t – Spe ling: C applic SING SING SING NSFO detail no le load - y on of s <b>ling:</b> :	or – Ba Startin eed co Genera cation. V-LAB <b>RMER</b> s – Pr oad – Regu ingle p	ack em ng of I ntrol c ators u: ,MHRI <b>S</b> inciple Paran Ilation bhase t apers	series of and D.C. n of D.C. sed fo e of c neters - Test cransfo <u>1 com</u>	s, shur torque notors shunt r batte operati s refer ting – l ormers	nt and e equa — Typ motor ery cha ery cha on — I red to Load to s - Auto	tion – es of rs. arging EMF e HV/l est, op	equation Sforme	d gene acterist ers - To ns, spe on – T adings cuit ar er - Thr	erator ics of esting ed co ransfo – Equ nd sho	s – Pr series, , brake ntrol o ormati uivalen ort circ ase tra	rinciple shunt a e test a f dc mc (9L- on rati t circul uit test ansform as PPT	of and and otor • <b>3T=12)</b> o – it – s. –	BTL-2 CO-2 BTL-3
operation compose Swinbu Suggess for an in SIMULA Module Constru Transfo All day Parallel - Vector Suggess Module Constru circuit, rotor te Starting and do Suggess	on of D.C und mot rne's tes ted Read ndustrial ATION: U e II:- TRA uctional ormer on efficience l operation r group.	C. mot ors - t – Spe ling: C applic SING ' NSFO detail no le load - y on of s ling: : LY PH, atures and ency . eed cc ge ind ding:	or – Ba Startin eed co Genera cation. V-LAB <b>RMER</b> s – Pr oad – - Regu ingle p IEEE p ASEINI s, proc powe Induction uction Induct	Ack em ag of I ntrol c itors us <u>,MHRI</u> <b>S</b> inciple Paran lation bhase t apers <b>DUCTI</b> ductior r equ tion ge (with a moto ction n	series of and D.C. n of D.C. sed fo o e of c neters - Test cransfe 1 com <b>ON M</b> n of ro ations enerat and w ors , co notor	s, shur torque notors shunt r batte perations refer ting – I ormers pulsor <b>OTORS</b> otating s, torc or. ithout gging	nt and e equa — Typ motor ery cha on — I red to Load to S - Auto S	d com tion – pes of rs. arging EMF e HV/l est, op o trans ach str netic f p cha awling	equation voice of the starts system equation voice of the starts equation voice of the starts sformed udent ield, production iracter stion in stion in	d gene acterist ers - To ns, spe on – T adings cuit ar er - Thr and giv phasor istics, n the ro	erator: ics of esting ed co ransfo – Equ nd sho ve the diag no l otor c	s – Pr series, , brake ntrol o ormati ivalen ort circ ase tra work a ram, oad ar ircuit),	rinciple shunt i e test i f dc mc (9L- on rati t circui uit test ansform as PPT (9L- equival nd bloc	of and and otor • <b>3T=12</b> ) o – it – s. – hers • <b>HT=12</b> ) ent ked bar	BTL-2 CO-2 BTL-3

mouu	le IV:- SYNCHRONOUS MACHINES (9L+3T=	-12)
S.C. te triangle Synchr dampin Sugges	uctional features, E.M.F equation, winding coefficients, armature reaction, O.C. and sts, voltage regulation- Synchronous impedance method, MMF Method, Potier 's e method and parallel operation. ronous Motor - Principle of operation, starting methods, , V -curves, hunting and ng, synchronous condenser sted Reading: Application of synchronous motor, IEEE papers in this topic. ATION –V-LAB	CO-4 BTL-3
Modu	le V:- SINGLE PHASE INDUCTION MOTOR AND SPECIAL MACHINES	
	(9	L+3T=12)
and bl A.C.Co motor Sugges	Phase Induction Motor - Double revolving field theory, equivalent circuit, no load ocked rotor tests, starting methods, repulsion motor. mmutator Motor - E.M.F .induced in commutator windings, single phase a.c. series , Universal motor, Reluctance motor – Hysteresis motor – Stepper motor. sted Reading: single phase motor domestic and industrial applications ,MHRD	CO-5 BTL-2
TEXT B		
1	Vincent Del Toro.Pearson (2015), Basic electric machines, publications electric machine ind power system, Theodore wildi	es drives
REFER	ENCE BOOKS	
1.	3.L Theraja and A.K .Theraja (2018), Electrical machines , ,S.Chand publications	
2. I	Dr.P.S Bimbra (2018), Electric machines	
E BOOK	'S	
1.	www.freeengineeringbooks.com/Electrical/Electrical-Machines-Ebooks.php	
2	https://www.studynama.com/community/threads/322-Electrical-Machine-1-pdf-dowr ebook-lecture-notes-for-EE-engineers	nload-
3	http://www.uotechnology.edu.iq/dep- eee/lectures/2nd/Electrical%20machines%201/DC%20MACHINES%20(PART1).pdf	
MOOC		
1.	https://www.mooc-list.com/course/fundamentals-electrical-engineering-coursera?sta	tic=true
2.	nptel.ac.in/courses/108105017	

COURSE TIT	ΓLE	A	NALOG ELECTRONICS				CREDITS	4				
COURSE CO	DE	EEB4202	COURSE CATEGO	ORY	F	PC 2C	L-T-P-S	3-1-0-0				
Version 1	1.0	Approval Details	23 ACM, 06.02.	2021	EARNING LEVEL	BTL-4						
ASSESSMEN	IT SC	CHEME										
First Periodical Assessmen		Second Periodical Assessment	Seminar/ Assignments/ Project	-	orise ⁄Quiz		Attendance	ESE				
15%		15%	10%		5%		5%	50%				
Course Description	n	This course covers	the design, construct	on, an	d det	ouggir	ng of analog electron	ic circuits.				
Course		1. To familiarize the	1. To familiarize the fundamental properties of semiconductors									
Objective		2. To prepare stude	nts to perform the an	alysis	of an	alog e	lectronics circuit.					

									ne des	ign and	l worki	ng of B	JT / FET	amplifi	ers,									
			cillator _		•		-							_	<b>.</b>									
			-	epare	the st	udent	s for	advan	ced co	ourses	in Cor	nmunic	cation s	ystem	Circuit									
			esign	nnlotic	n of t		urco th	o ctud	onteu	vill be a	blo to													
				•								+ of p	egative	foodba	nck on									
			•		•	•			anu a	maryses	seneo		egative	reeuba	ACK OII									
-			fferent						ngorl	oddor r	oon in	orting	omolifi	or diffo	rontial									
Course			-		-				-	adder, r	ion-in	verting	amplifi	er, une	rential									
Outcom	ie		nplifier					-		ratar ci	rouito	ucing o												
			-	-					•	rator ci		-												
			-	-	-		-			er circu		• •	mp.											
5. Design Voltage Regulator and Frequency multiplier circuits.  Prerequisites: EEB4101 Introduction to Digital System																								
CO, PO					tion to	Digita	al Syst	em																
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO									
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3									
CO-1	3	3	2	2	2	-	-	-	-	-	-	-	1	1	1									
CO-2	3	3	2	2	3	-	-	-	-	-	-	-	1	1	1									
CO-3	3	3	2	2	3	-	-	-	-	-	-	-	1	1	1									
CO-4 CO-5	3	3	2	2	3	-	-	-	-	-	-	-	1	1	1									
0-5	5	5	-		-	- 2. Mo	dorate	- alv rola	- ic hot	nd 3: St	rongly	rolato	_	L										
Module		V VICIC.												(1	2 L)									
Biasing									nalvsis	and co	omnar	ison us	ing hyh		2 LJ									
		L. Con						inci ui	1017010		sinpu													
-	ent cir			ull amr	olitier.																			
equivale		cuit –	push p	•		signal	mode	l - CS a	mplifi	ers.			ing a JFET and MOSFET - Small signal model - CS amplifiers. s of negative and positive feedback – loop gain- advantages of negative feedback -											
equivale FET: Bia	ising a	cuit – JFET a	push p and MC	)SFET -	Small	-			-		of ne	gative f	feedbac	k -	CO-1									
equivale FET: Bia Concep Feedbaa	asing a ts of ck Con	cuit – JFET a negati nectic	push p and MC ve and on Type	DSFET - positi s	Small ve fee	dback	– looj	p gain	- adva	ntages		-	feedbac		CO-1 BTL-3									
equivale FET: Bia Concep Feedbac <b>Practica</b>	asing a ts of ck Con <b>al Com</b>	cuit – JFET a negati nectic <b>npone</b>	push p and MC ve and on Type <b>nt:</b> Trar	DSFET - positi es nsistor	Small ve fee config	dback uratio	– loo <sub>l</sub> ns, Cha	p gain aractei	- adva	ntages of MOS	FET ar	d JFET			CO-1 BTL-3									
equivale FET: Bia Concep Feedbaa <b>Practica</b> Suggest	asing a ts of ck Con al Com ted Re	cuit – JFET a negati nectic <b>npone</b> a <b>ding</b>	push p and MC ve and on Type <b>nt:</b> Trar : Class	DSFET - positi s nsistor s B and	Small ve fee config Class	dback uratio AB - P	– loo <sub>l</sub> ns, Cha ower a	p gain aractei mplifi	- adva ristics ers usi	ntages of MOS ng BJT ,	FET ar Frequ	d JFET ency re	sponse	of										
equivale FET: Bia Concep Feedbac <b>Practica</b> <b>Suggest</b> BJT am	asing a ts of ck Con al Com ted Re plifier:	cuit – JFET a negationectic <b>npone</b> ading s, Sma	push p and MC ve and on Type <b>nt:</b> Trar : Class	DSFET - positi s nsistor s B and	Small ve fee config Class	dback uratio AB - P	– loo <sub>l</sub> ns, Cha ower a	p gain aractei mplifi	- adva ristics ers usi	ntages of MOS ng BJT ,	FET ar Frequ	d JFET ency re	sponse	of										
equivale FET: Bia Concep Feedbaa <b>Practica</b> Suggest	asing a ts of ck Con al Con ted Re plifier: ck Circ	cuit – JFET a negationectic <b>npone</b> <b>ading</b> s, Sma	push p and MC ve and on Type <b>nt:</b> Tran : Class all signa	DSFET - positi s nsistor s B and al moc	Small ve fee config Class lel - C	dback juratio AB - P D am	– loop ns, Cha ower a plifiers	p gain aracter mplific , casca	- adva ristics ers usi	ntages of MOS ng BJT ,	FET ar Frequ	d JFET ency re	sponse	of cal										
equivale FET: Bia Concep Feedbac <b>Practica</b> <b>Suggest</b> BJT am Feedbac	asing a ts of ck Con al Con ted Re plifiers ck Circ LE II: C	cuit – JFET a negati nection pone ading s, Sma uits DP AM	push p and MC ve and on Type <b>nt:</b> Tran : Class all signa <b>P BASI</b>	DSFET - positi ss nsistor B and al moc CS ANI	Small ve fee config Class del - C D LINE	dback Juratio AB - P CD am <b>AR AP</b>	– loop ns, Cha ower a plifiers <b>PLICAT</b>	p gain aracter mplific , casca	- adva ristics ers usi ading	ntages of MOS ng BJT , transisi	FET ar ,Frequ tor am	nd JFET ency re aplifiers	sponse 5, Practi	of cal	BTL-3									
equivale FET: Bia Concep Feedbaa <b>Practica</b> <b>Suggest</b> BJT am Feedbaa <b>MODUI</b> Introdu types, d	asing a ts of ck Con al Con ted Re plifiers ck Circ ck Circ ction esigna	cuit – JFET a negati nectic <b>pone</b> a <b>ding</b> s, Sma uits <b>DP AM</b> Block ations,	push p and MC ve and on Type <b>nt:</b> Tran : Class all signa diagran packag	DSFET - positi s nsistor b and al mod CS ANI m repr ges, pin	Small ve fee config Class del - C D LINE resenta n confi	dback guratio AB - P D am <b>AR AP</b> ation o gurati	– loop ns, Cha ower a plifiers <b>PLICAT</b> of a ty ons an	p gain aracter mplific , casca TIONS pical c d pow	- adva ristics ers usi ading op-am er sup	ntages of MOS ng BJT , transist p, Anal plies. Ic	FET ar Frequ tor am ysis op	nd JFET ency re oplifiers o-amp	sponse 5, Practi IC circu equival	of cal its, ent	BTL-3									
equivale FET: Bia Concep Feedbac <b>Practica</b> <b>Suggest</b> BJT am Feedbac <b>MODUI</b> Introdu types, d	asing a ts of ck Con al Con ted Re plifiers ck Circ LE II: C ction esigna open l	cuit – JFET a negation pone ading s, Sma uits <b>DP AM</b> Block ations, oop o	push p and MC ve and on Type <b>nt:</b> Tran : Class all signa diagran diagran packag p amp	DSFET - positi ss nsistor s B and al moc <b>CS ANI</b> m repr ges, pir configu	Small ve fee config Class del - C D LINE resenta n confi uratior	dback uratio AB - P D am AR AP ation o gurations of d	– loop ns, Cha ower a plifiers <b>PLICAT</b> of a ty ons an ifferen	p gain aracter mplifie , casca <b>TONS</b> pical c d pow tial, in	- adva ristics ers usi ading op-am er sup vertin	ntages of MOS ng BJT , transist p, Anal plies. Ic g and n	FET ar Frequ tor am ysis op deal op	od JFET ency re oplifiers o-amp o-amp, verting	sponse s, Practi IC circu equival amplifie	of cal its, ent ers,	BTL-3 (12 L)									
equivale FET: Bia Concep Feedbaa Practica Suggest BJT am Feedbaa MODUI Introdu types, d circuit, o op amp	asing a ts of ck Con al Con ted Re plifiers ck Circ ck Circ ction ction lesigna open l feedl	cuit – JFET a negati nection ading s, Sma uits DP AM Block ations, oop o pack a	push push and MC ve and on Type <b>nt:</b> Tran : Class all signa diagran diagran packag p amp mplifie	DSFET - positi s nsistor b and al mod <b>CS ANI</b> m repr ges, pin configu r analy	Small ve fee config Class del - C D LINE resenta resenta n confi uratior ysis. O	dback guratio AB - P D am AR AP ation o gurations of d p amp	<ul> <li>loop</li> <li>ns, Cha</li> <li>ower a</li> <li>plifiers</li> </ul> <b>PLICAT</b> of a ty ons an ifferen o parar	p gain aracter mplifie , casca <b>TONS</b> pical c d pow tial, in	- adva ristics ers usi ading op-am er sup vertin	ntages of MOS ng BJT , transist p, Anal plies. Ic g and n	FET ar Frequ tor am ysis op deal op	od JFET ency re oplifiers o-amp o-amp, verting	sponse s, Practi IC circu equival amplifie	of cal its, ent ers, ias	BTL-3									
equivale FET: Bia Concep Feedbac <b>Practica</b> <b>Suggest</b> BJT am Feedbac <b>MODUI</b> Introdu types, d circuit, o op amp current,	asing a ts of ck Con al Con ted Re plifiers ck Circ LE II: C ction esigna open I feedl drift,	cuit – JFET a negation pone ading s, Sma uits <b>DP AM</b> Block ations, oop op back a PSRR,	push p and MC ve and on Type <b>nt:</b> Tran : Class all signa diagran packag packag packag cMRR,	DSFET - positi s nsistor s B and al moc <b>CS ANI</b> m repr ges, pin configu r analy , offset	Small ve fee config Class del - C D LINE resenta n confi uratior ysis. O	dback uratio AB - P D am D am ation o guration s of d p amp g met	– loop ns, Cha ower a plifiers <b>PLICAT</b> of a ty ons an ifferen o parar hods	p gain aracter mplifie , casca <b>TONS</b> pical c d pow tial, in meters	- adva ristics ers usi ading op-am er sup vertin - offs	ntages of MOS ng BJT , transist p, Anal plies. Ic g and n set volt	FET ar Frequ tor am ysis op deal op oon-inv ages a	od JFET ency re oplifiers o-amp o-amp, verting nd cur	sponse s, Practi IC circu equivale amplifie rents, b	of cal its, ent ers, ias	BTL-3 (12 L) CO-2									
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<ul> <li>amplifier, phase shift oscillator, Wien bridge oscillator, square, triangular and sawtoot generator, voltage controlled oscillator, zero crossing detector, window detector.</li> <li>Practical Component: integrator, differentiator, and comparator</li> <li>Suggested Reading: introduction to analog simulation, instrumentation amplifier</li> <li>MODULE IV: NON LINEAR IC APPLICATIONS USING OPAMP</li> <li>Signal Generators: Square, triangle and ramp generator circuits using opamps - Effect rate on waveform generation- Astable multivibrator- Principles of VCO circuits. Comp Circuits: Zero Crossing Detector- Regenerative comparator circuits Active filters - Characteristics- Frequency Response of different types of filters- Order and cut off freq Butterworth low pass filter – First order filter design</li> <li>Practical Component: Application of op-amp as low pass filter, high pass filter.</li> <li>Suggested Reading: Butterworth low pass filters - Second order filter design - Sallen a second order LP filter - Butterworth high pass filters - Second order wide band and band filters, Schmitt trigger circuits. monostable and bistable circuits</li> <li>MODULE V: TIMER IC, PLL AND VOLTAGE REGULATOR</li> <li>Timer IC 555: Functional diagram astable and monostable modes with applications Phase locked loops: Principles – Building blocks of PLL-Lock and Capture ranges - C process - Study of NE565 - Applications of PLL – Frequency multiplication.</li> <li>Three terminal regulator ICs: basic block schematic - 78 x x&amp; 79 x x series , Adjustable voltage regulator LM 317</li> <li>Practical Component: PL LC 565 Frequency multiplying / FSK demodulation</li> </ul>	till L) of slew parator -Types- uency - and Key narrow till L)
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<b>Suggested Reading:</b> Adjustable output voltage regulator LM 340 and LM 337 series supply ICs. their use and basic design considerations for designing regulated power su Applications of PLL – FSK demodulator - FM demodulation.	CO-5 BTL-4
TEXT BOOKS	·
1. David A. Bell (2017),"Electronic devices and circuits", Oxford, Fifth edition.	
2 V. Boylestad and Nashelsky (2013), Electronic Devices and Circuits, Prentice F	lall of India.
3 D. Roy Choudhury &Shail B. Jain (2010), 'Linear Integrated Circuits', New Publishers, Fourth Edition.	Age International
4 BehzadRazavi (2014),"Fundamentals of Micro Electronics ",Wiley and Sons.	
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1. Theodore F. Bogart Jr. (2014), Electronic Devices and Circuits.	
2. K. R. Botkar (2013), Integrated Circuits, Khanna Publishers.	
3 Floyd (2015), Fundamentals of Analog Circuits 2e, Pearson Education.	
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1. https://archive.org/details/ElectronicDevicesCircuits	
2 http://www.rtna.ac.th/departments/elect/Data /EE304/Electronic%20Devices%20and%20Circuit%20Theory.pdf	
3 https://docs.google.com/file/d/0B9LJy8vattSMMHFZelktMHp5TG8/edit	
MOOC	
1. http://nptel.ac.in/courses/117103063/ http://nptel.ac.in/courses/122106025/2 https://onlinecourses.nptel.ac.in/noc18_ee10/preview	

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Cou Descri			the ha res	The study on ethics helps to know the people's beliefs, values, and morals, le the good and bad of them, and practice them to maximize their well-being a happiness. It involves the inquiry on the existing situations, form judgments a resolve the issues. 1.Implement the basic relationship between "values" and "skills" with the e												ng and ts and
Course Objectiv	e		pu asp 2.1 aca int 3.1 hu	rpose piratic Identi ademi tegrity Discus Iman utually	of er ons of fy etl ic y, use ss plau cond y enric	nsurin all hu nical and c usible uct, f	ig sust man b conce itation implica trustwo interac	ained eings. rns ir of sou ations orthy tion.	happi rese urces of suc and	ness a earch h a ho mutua	and pr and listic u lly sa	osper intelle unders tisfyir	ity wh ectual standin g hur	ich are contex ng in ter nan be	the p e the p ets, inc rms of e ehaviou	rimary cluding ethical
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СО	РО 1	2		PO 3	РО 4	РО 5	6	РО 7	РО 8	9 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	-		-	-	-	_	2	-	3	-	1	-	-	-	-	-
CO-2	-		-	-	-	-	3	1	3	1	1	-	-	-	-	1
CO-3	-		-	-	-	-	3	1	3	1	1	-	-	-	-	1
CO-4	-		-	-	-	_	3	1	3	1	1	-	-	-	-	1
CO-5	-		-	-	-	-	3	1	3	1	1	-	-	-	-	1
MODUL	E 1:H	UM				ited, 2	2: Mod	erate	ly rela	ted an	id 3: S	trong	y relat	ed		(6L)
Definitio virtue-Re Commiti	espect	t	for	oth	ers-Ca	ring-S	Sharing	-Hone	esty-Co	ourage	-Valui	ng t	ime-Co	poperat	tion-	CO-1 BTL-2

	tion for professional excellen udy: Case study of Discovery		agement		
MODUI		Tallure	ENGINEERING		ETHICS
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dilemma Controv Customa	of 'Engineering Ethics' – as – Moral Autonomy – K versy – Models of profession is and Religion – Uses of Ethi idy: Study the Bhopal gas tra	ohlberg's theory nal roles - Theorie cal Theories.	- Gilligan's theo	ry – Consensus and	CO-2 BTL-2
MODUI (6L)	LE 3: SA	FETY, RI	EPOSIBILITIES	AND	RIGHTS
Safety a Respect Occupat (IPR) – D	and Risk – Assessment of Sa t for Authority – Collective tional Crime – Professional Discrimination. Idy: Chernobyl explosion, Nu	Bargaining – Cor Rights – Employee	nfidentiality – Co e Rights – Intelleo	onflicts of Interest – ctual Property Rights	CO-3 BTL-2
Module			LIFE		SKILLS
(6L)	ion, Relevance, Types of va	luos changing ca	aconts of values	aims and values of	
value e values - determi forgiver	ducation- basic etiquette-m – Self – Strengths (self-cor ination, self-restraint, conten- ness) Weaknesses udy: Influences - Peer pressur	norals and values infidence, self-asse ntment, humility, s	in life-dealing wi ssment, self-relia sympathy and cor	th people. Personal ince, self-discipline, npassion, gratitude,	CO-4 BTL-2
Module		SOCIETIES	-		OGRESS
(6L)					
change conscio	on of society; Units of soc – Sense of survival, security usness and responsibility udy: Personal value and profe	, desire for comfo	rt and ease sense	e of belonging, social	CO-5 BTL-2
TEXT BC	OOKS				
1.	Subramanian R.(2015), Pro	ofessional ethics, C	xford University	oress	
REFEREN	NCE BOOKS				
1.	Megan J. Murphy (Editor) Couple and Family Therapy		ditor) (2013), Eth	ics and Professional	Issues in
2.	Andrew Belsey (Editor), R	uth Chadwick (Edi	tor) (2017), Ethica	al Issues in Journalism	
۷.	Media (Professional Ethics	5).			and the
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	Media (Professional Ethics	18), Ethics and the	Built Environmer	it (Professional Ethics)	
3.	Media (Professional Ethics Warwick Fox (Editor) (201	18), Ethics and the Education, APH F	Built Environmer Publishing Corport	it (Professional Ethics) ation, New Delhi.	).
3. 4	Media (Professional Ethics Warwick Fox (Editor) (201 RuchikaNath (2016), Value Manoharan P.K. (2015) Corporation, New Delhi.	18), Ethics and the Education, APH F	Built Environmer Publishing Corport	it (Professional Ethics) ation, New Delhi.	).
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COURSE	TITLE		EL	.ECTR	ICAL	MACH	INES	LABC	RATO	ORY		CREDI	TS		1
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Course De	scriptio	"р	erfor	nance	e of E	lectri	cal me	otor.							
		1	. То	perf	form	tests	s on	Indu	uctior	n Mo	tor,	synch	ronous	machir	ies and
Course Ob			tra	nsfor	mers	to inte	erpre	t their	. perf	orman	ices				
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			ma	chine	S										
Upon completion of this course, the students will be able to															
		1			•								motor,	and im	plement
						DC mo			5						
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Course Out	come					-						•	d single p	ohase ii	nduction
							•						0 - 1		
	motor and analyse its performance 4. Plot performance characteristics of synchronous generator and synchronous														
	motor and analyse the results														
Prerequisit	es: Nil														
CO, PO AN	D PSO N	MAPP	NG												
со	PO 1	РО 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	РО 10	PC 11		PSO 1	PSO 2	PSO 3
CO-1	3	3	3	-		_	-	-	3	-	-	-	_	1	3
CO-2	3	3	3	_	_	-	_	-	3	_	_	-	_	1	3
CO-3	3	3	3	_	_	_	_	_	3	_	-	-	-	1	3
CO-4	3	3	3	_	_	_	_	_	3	_	-	-	-	1	3
				relate	ed, 2	: Mod	erate	ly rela		ind 3:	Stro	ongly re	lated		
Load Test a	nd Spe											<u> </u>			
1. Open ci	rcuit a	nd loa	ad ch	aracte	eristi	cs of	separ	ately	excit	ed an	d s	elf exci	ted D.C.		
generator														<b>CO</b> <sup>2</sup>	1 /DTI 2
2. Load tes	t on D.C	. shur	nt mot	tor &	D.C.	series	moto	r Spee	ed Co	ntrol o	of D	C Shunt	Motor	0	1/BTL3
3. Swinbur	ne's tes	t and s	speed	cont	rol of	D.C. s	hunt	moto	r						
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4. Load tes									_					co	2/BTL3
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Load test o							<u> </u>							T	
6. Load tes								•						co	3/BTL3
7.Load test			& blo	скеб	rotor	test o	n sing	gie-ph	ase ir	nducti	on n	notor			
V & Inverte				bre -	Dhar	o (	hre:-		0+0."						
8.V and Inv						•				de				CO	4/BTL3
9.Regulatio			ase al	terna	lor D	y emt	and r	IIIIIT N	ietho	us					
				rath	(200	1) Tata		iraw L	ᆒᇉ	lucatio	n	Floctric	machino	rv - 92/	nages
E BOOKS	r. κυιή	aii, I	л. гчар	ialíi	1200	+) Idla		n aw-l	III EO	iucati(	л,-		machine	iy - 634	hages
L DOOK3															

1.	https://www.csun.edu/sites/default/files/ECE410_LabManual_2ndEdition.pdf
MOOC	
1.	https://www.mooc-list.com/tags/electric-machines

COURSE TI	TLE		Α	NALO	G ELE	CTRON	ICS LA	BORAT	ORY		0	REDIT	S	:	1
COURSE C	ODE		EEB42	232		COU	RSE C	ATEGO	ORY	PC	2	L-T-P	P-S	0-0	-2-0
Version		1.0	-	prova etails		23 A	см, с	6.02.2	2021	LE	ARNIN	IG LEV	EL	ВТ	L-4
ASSESSME	NT SC	HEME							•						
Experime	ntal		Calcula				Result			Viva		Reco			SE
30%			10%	6			10%			20%		10%	6	20	)%
Course Descriptior	<u>ו</u>	This c	ourse	focus	es on	the de	sign a	nd an	alysis	of ana	log ci	rcuits			
Course Objective		2. Ide 3. An	ntify, s alyze f	select, eedba	and ck cir	r frequ handle cuits , a ew of a	transi amplif	stors. ier cire	cuits a					rs.	
			<ul> <li>To provide an overview of amplifiers, feedback amplifiers and oscillators.</li> <li>Design and construct simple electronic circuits to accomplish a specific function.</li> </ul>												
Upon completion of this course, the students will be able to1. Apply transistor, power transistors and operational amplifier in different circuits.2. Analyze analog electronic circuits using discrete components.3. Analyze the amplitude and frequency responses of common amplification circuits.4. Measure various parameters of analog circuits and compare experimental results in the laboratory with theoretical analysis.5.Design and construct simple electronic circuits to accomplish a specific function, e.g., designing amplifiers, oscillators.Prerequisites: EEB4101 – Introduction to Digital Systems												uits. sults in			
CO, PO A	ND P	SO MA	PPIN	G											
СО	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	РО 7	РО 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	3	3	1	2	-	-	-	-	-	-	1	3	2	1
CO-2	3	3	3	2	2		-	-	-	-	-	1	3	2	-
CO-3	3	3	3	2	2	-	-	-	-	-	-	1	3	2	1
CO-4	3	3	3	2	1	-	-	-	-	-	-	1	3	2	-
CO-5	3	3	3	2	2	-	-	-	-	-	-	1	3	2	1
List of Exp	erime		/eakly	relate	ed, 2:	Moder	ately	relate	d and	3: Stro	ongly	related	ł		
1. Stuc	dy the	differei on betw				• •		uratio	ns.						)-1 L-4
3. Study 4.OPAM amplifier.	-	-		-	-						er ,nc	on-inve	rting		)-2 L-4
5. OPA		rcuits –ii and We	-					•		lizatior	n usina		ЛРs.		)-3 L-4
		n genera										-			)-4
	5.5111	000000		- 100	, .							35			

using OP	AMPs.	BTL-4
8. Ap	olication of op-amp as low pass filter, high pass filter	
9. IC 5	555 Applications as monostable and astable multi-vibrator.	CO-5
10. PI	L IC 565 Frequency multiplying / FSK demodulation	BTL-4
TEXT BOO	DKS	
1.	David A. Bell (2017),"Electronic devices and circuits", Oxford, Fifth edition.	
2	V. Boylestad and Nashelsky (2013), Electronic Devices and Circuits, Prentice Hall	of India.
3	D. Roy Choudhury & Shail B. Jain (2010), 'Linear Integrated Circuits', New Age	International
5	Publishers, Fourth Edition.	
4	BehzadRazavi (2014),"Fundamentals of Micro Electronics ",Wiley and Sons.	
5	Sedra and Smith (2016) ,"Microelectronic circuits", Oxford, Fifth edition.	
REFEREN	CE BOOKS	
1.	Theodore F. Bogart Jr. (2014), Electronic Devices and Circuits.	
2.	K. R. Botkar (2013), Integrated Circuits, Khanna Publishers.	
3	Floyd (2015), Fundamentals of Analog Circuits 2e, Pearson Education.	
E BOOKS		
1.	https://archive.org/details/ElectronicDevicesCircuits	
2	http://www.rtna.ac.th/departments/elect/Data	
2	/EE304/Electronic%20Devices%20and%20Circuit%20Theory.pdf	
3	https://docs.google.com/file/d/0B9LJy8vattSMMHFZelktMHp5TG8/edit	
MOOC		
	http://nptel.ac.in/courses/117103063/	
1.	http://nptel.ac.in/courses/122106025/2	
	https://onlinecourses.nptel.ac.in/noc18_ee10/preview	

COURS	SE TITLE		DESIGN PROJECT-I			CREDITS	1					
COURS	E CODE	EEB4233	COURSE CATEGORY	PC		L-T-P-S	0-0-2-0					
Versio n	1.0	Approval Details	23 ACM, 06.02	RNING LEVEL	BTL-6							
ASSESSN	IENT SCHE	ME										
Review 1         Review 2         Review 3         Final Review												
1	0%	20%	20%			50%						
	urse iption	critical thinking students also de	This course provides a solid foundation in core electrical engineering disciplines, critical thinking and problem-solving skills. Through the academic program students also develop excellent written and oral communication skills, learn to work as a team and project management.									
Course C	Dbjective	2.To provide the know the scale o	the students' ability e database in the res f the project that sho ent written and oral c	spective di buld be car	iscipli rried	ne and also er on.						

	Upon completion of this course, the students will be able to
	1. Develop simple electrical and electronic models based on the knowledge
Course Outcome	gained.
	2. Propose a project and defend it as a team.
	3. Develop coding for embedded System

Prerequisites: Basic Electrical Subjects

CO, PO AND PSO MAPPING															
со	РО 1	РО 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	PSO 3
CO-1	3	2	3	2	1	1	1	-	3	-	3	3	3	3	1
CO-2	3	2	3	1	-	-	-	-	3	-	3	3	3	3	1
CO-3	3	2	3	2	3	1	1	-	3	-	3	3	3	3	2
		4 1													

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

To carry out a Design project and simple prototype in the area of interest based on the knowledge gained in Electrical and Electronics Engineering from previous semesters.

The students will carry out a project in one of the following Electrical and Electronics Engineering areas but with substantial multidisciplinary components:

- Transmission and Distribution
- Electrical Machines.
- Operating Systems

Student groups will be formed (3/4 in a group) and a faculty member will be allocated to guide them. There will be three major reviews which will be carried out as listed below.

Review #	Requirement	Mark Weightage				
		Internal	External			
0	Area / Title selection	-	-			
1	Literature review / Proposal for the Project	10%	-			
2	Mathematical modelling/Circuit Design	20%	-			
3	Final simulation / Hardware presentation	20%	-			
End						
Semester	Final Viva-Voce and project demonstration	-	50%			
Exam						

## **SEMESTER - IV**

COURSE TITLE NUMERICAL METHODS CREDITS												
COURSE CODE	MAA 4217	COURSE CATEGOR	۲Y	BS	L-T-P-S	3-1-0-1						
Version 1.0	Approval Details	23 ACM, 06.02.	ARNING LEVEL	BTL-1-4								
ASSESSMENT SCHEME												
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	-	se Test Juiz	Attendance	ESE						

15	5%		1	5%			10%			5%		ļ	5%		50%
Co	urse												nniques		
	iption		solution of algebraic equation, numerical solution of differentiation, integration and their application to engineering and science.												
	L					Ū	Ŭ								
		1.		-			•		•	stitutio					
		2.	To d	efine ii	nterpo	blation	and pr	rove th	e orde	er of th	e poly	nomia	l is unic	lue.	
Course		3.	То	develo	p ov	vn nu	merica	al diff	erenti	ation	and	experi	ence d	comput	ational
Objectiv	ve		limit	ation											
		4.	To id	lentify	the su	uitable	metho	ods to s	olve c	ordinar	y diffe	rential	l equati	ons	
		5.	To id	lentify	suitat	ole met	thod to	o solve	partia	l differ	ential	equati	ions		
			Upon completion of this course, the students will be able to												
		1.	Apply the techniques for solving the algebraic and transcendental equ												ations,
			syste	em of e	equati	ons an	d Eigei	nvalue	proble	ems.				-	
	2. Construct an approximate polynomial to represent the given data and k												now to		
Course	Course find the intermediate values.														
Outcom	ne	3.						nd inte	gratio	n whe	n the	functi	ons are	in an	alvtical
		0.	form						0. 410						
		4.			arv di	fferent	tial equ	lation	using	an ann	ronria	te num	nerical r	nethod	
			<ol> <li>Solve ordinary differential equation using an appropriate numerical method.</li> <li>Solve partial differential equation using an appropriate numerical method.</li> </ol>												
Prerequisites: CO, PO AND PSO MAPPING															
, i i i i i i i i i i i i i i i i i i i	PO	PO	PO	PO	PO	PO	PO	РО	РО	PO	РО	PO	PSO	PSO	PSO
СО	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1	2	1	1	1	2	1	-	-	-	-	-	-	2	1	1
CO-2	2	1	1	1	1	-	-	-	-	-	1	-	2	1	1
CO-3	2	1	1	1	2	1	-	-	-	-	-	-	2	1	1
CO-4	2	1	1	1	2	-	-	-	-	-	-	-	2	1	1
CO-5	1	1	1	1	2	-	-	-	-	-	-	-	2	1	1
MODU	1 - 1. 60							-		d 3: St	rongi				
Solution											nosi	•	<b>3T=12)</b>	n's	
method		0				-	1				1				CO-1
Gauss-J		-													BTL-
of a mat	trix by	Gauss	s-Jorda	n meth	nod. E	igenva	lue of	a matri	x by p	ower r	netho	1.		1	L <b>,2,3,4</b>
Suggest		_	-												
MODU									C		11 -		-3T=12)		
Lagrang						ifferen	ce - N	Newton	forw	ard an	d bacl	sward	differei	nce	CO-2
method Suggest						tions									BTL-
MODU								ITECD				/01 1	27-12		L <b>,2,3,</b> 4
Derivat											ifferer		• <b>3T=12)</b> Numeri		
															CO-3
											BTL-				
rules.			•					U		<b>~</b> 1			1		L <b>,2,3,</b> 4
Suggest							-								
MODUL	E 4: NU	JMER	ICAL S	OLUTIO	ONS C	F ORD	INARY	DIFFE	RENTI	AL EQI	JATIO	NS (9L	+3T=12		

Runge metho	e-Kutta m od: Milne'	hods: Taylor Series meth ethod for solving first s and Adam's predictor a ing: Ordinary Differentia	and second order of and corrector metho	differer			CO-4 BTL- 1,2,3,4							
		UNDARY VALUE PROBLE				(9L+3T=12)								
differ dimer	ence soluti nsional way	ce solution for the sector for one dimensional ve equation and two dimensional regional partial Differential E	heat equation by in ensional Laplace an	nplicit	and expl	icit methods – one	CO-5 BTL-1, 2, 3, 4							
	BOOKS													
1.		cal Methods 3rd Edition												
2.	Educatio	C.F, and Wheatley, F n Asia, New Delhi, 2002			-		, Pearson							
3.	Science'	B.S., and Grewal. J.S., " , Khanna Publishers, Ne	w Delhi, 9th Edition	n, 2007	•									
4.		nar Bansal, Ashok Kuma eering", Pearson Publicat	, ,		,	IATLAB and its Ap	oplications							
REFER	RENCE BOC													
1.		hapra. S.C., and Canale. R.P, "Numerical Methods for Engineers", 5th Edition, Tata McGraw												
2.		New Delhi, 2007 ald. C.F., and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New												
	,	aankiusalaas, Numerical methods with engineering with Python 3, January 2013 Edition,												
3.		Cambridge Press												
	Dean G Edition 2	. Duffy., "Advanced E 2013.	ngineering Mathen	natics	with M.	ATLAB", CRC Pr	ess, Third							
E BOO	кs													
1.	http://n	ptel.ac.in/courses/11210	)6061/Module_2/Le	ecture_	2.2.pdf									
2.	http://w	ww.nptel.ac.in/courses/	122104018/node10	09.html										
3.	http://n	ptel.ac.in/courses/12210	)7036/35											
MOO	С													
1.	https://\	www.mooc-list.com/cou	rse/numerical-meth	nods-er	ngineers	-saylororg								
COUF	RSE TITLE	SIGNA	LS AND SYSTEMS			CREDITS	4							
	OURSE CODE	EEB4216	COURSE CATEGO	RY	PC	L-T-P-S	3-1-0-1							
Versi	ion 1.0	Approval Details	23 ACM, 06.02.	2021	LEA	ARNING LEVEL	BTL-4							
ASSE	SSMENT S	СНЕМЕ												
	First	Second Periodical	Seminar/	Sur	prise									
		Second renoulcar	Assignments/		/ Quiz	Attendance	ESE							
Per	iodical	Assessment	<b>-</b> .				ESE							
Per Asse	essment	Assessment	Project											
Per Asse		15%	Project 10%	ļ	5%	5%	50%							
Per Asse	essment	15% Signals and systems co	Project 10% overs the fundamer	tals of	5% signal a	nd system analysis,	50% focusing							
Per Asse	essment 15%	15% Signals and systems co on representations o	Project 10% overs the fundamer f discrete-time ar	tals of	5% signal a	nd system analysis,	50% focusing							
Per Asse	essment 15% ourse cription	<b>15%</b> Signals and systems co on representations o mathematical transform	Project 10% overs the fundamer f discrete-time ar ms	tals of nd con	5% signal a tinuous-	nd system analysis, time signals using	50% focusing							
Per Asse	essment 15% ourse cription se	15% Signals and systems co on representations o	Project 10% overs the fundamer f discrete-time ar ms s, continuous-time s	tals of nd con	5% signal a tinuous- and disc	nd system analysis, time signals using rete-time signals	50% focusing							

3. Student can perform mathematical and graphical convolution of signals and															
	s	ystem	IS												
l	2	I. Gain	know	ledge	about	the a	pplica	tion a	nd use	e of ma	athem	atical	transfo	rms an	d
	S	tate-v	ariabl	es in c	order t	o solv	e elec	trical e	engine	ering	proble	ems			
		Up	on co	mplet	ion of	this co	ourse,	the st	udent	s will k	e able	e to			
		1. Арр	ly con	tinuo	us tim	e & di	screte	times	signals	s to sys	stems.				
						• •			•	es to d		•			
Course				place	trans	form	for F	reque	ncy D	omain	Anal	ysis o	of Cont	inuous	Time
Outcome		System				_		_			(				
			-			-				-			ime Sys		Time
			-	iner s	eries	and tr	ansior	milo	Contir	iuous	time :	systen	n and D	iscrete	rime
System Prerequisites: MAA4117-Analytical Mathematics, MAA4201-Partial Differential Equations and															
Transforms	C3. N		. <b>1</b> 7 All	arytic		utifen	iatics,		14201	i ai tit		i ci ci i i		uations	, and
CO, PO ANI	D PSO	MAP	PING												
CO	РО	PO	РО	PO	РО	РО	PO	PO	PO	РО	РО	РО	PSO	PSO	PSO
	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-1	-2	-3
CO-1 CO-2	3	3	3	3	2	-	-	-	-	-	-	1	1	1	3
CO-2 CO-3	3	3	3	3	2	-	-		-	-		1	1	1	3
CO-4	3	3	3	3	2	_	_	_	_	_	_	1	1	2	3
CO-5	3	3	3	3	2	-	-	-	-	-	-	1	1	2	3
1: Weakly related, 2: Moderately related and 3: Strongly related															
Module I:- Continuous and Discrete Time Signals and Systems (12 L)															
Mathematical representation, classification of Continuous Time and Discrete Time signals,													CO-		
arithmetic c	•			-					•					al	1
representat	ion, cl	assific	ation	of CT	and D	r syste	ems, Sa	amplir	ng and	recon	struct	ion, al	iasing	E	- BTL-4
effect.	<b>T</b> :	D		l	- f C	<b>.</b>		D:					-		4211
Module II:-												-			12 L)
Properties		•		•		•	•						-		CO-2
convolution Module III:						-								i	BTL-4 (12 L)
Need of La	-	-			-				-		-	-			(12 L)
transform,	•					•			· ·				-	hd	
characteriza		•		•									•		0-3
causality, st					•							•	•	- 1 H	BTL-4
Time system	-		•		-			-							
Module IV:	- Freq	uency	Doma	ain An	alysis	of Dis	crete	Time S	Systen	n Usin	g Z- Tr	ransfo	rm	(12 L)	
Need of Z t	ransfo	orm, d	efiniti	on, pr	operti	es of ı	unilate	eral an	d bila	teral Z	Trans	form,	mappi	ng	
with s plan	e, rela	ations	hip wi	ith La	place	transf	orm,	Z tran	sform	of st	andar	d sign	als, RO	C,	CO-4
poles and z															BTL-4
LTI system	-				•		•	•		ausalit	y, sta	bility	of caus	al –	
system, Blo		-								ata Ci				(121)	
Module V:- Frequency Domain Analysis of Continuous and Discrete Signals using Fourier (12										(12 L)					
Review of Fourier series, Discrete time Fourier series and its properties, Fourier transform, properties of Fourier transform, relationship with Laplace and Z transform, Discrete time															
									•	•				''' -	CO-5 TL-4

Fourier	transform, Properties, Frequency sampling, Discrete Fourier transform, Properties.
TEXT BO	DOKS
1.	Allan V.Oppenheim, S.Wilsky and S.H. Nawab, (2014) "Signals and Systems", Pearsons.
2	Edward W Kamen & Bonnie's Heck, (2015) "Fundamentals of Signals and Systems",
2	Pearson Education.
REFERE	NCE BOOKS
1.	John G.Proakis and DimitrisG.Manolakis (2017), Digital Signal Processing, Principles,
	Algorithms and Applications, 4th Edition, PHI.
2.	B. P. Lathi (2018), "Principles of Linear Systems and Signals", Second Edition, Oxford.
3	R.E.Zeimer, W.H.Tranter and R.D.Fannin (2018), "Signals & Systems - Continuous and
	Discrete", Pearson.
4	John Alan Stuller (2018), "An Introduction to Signals and Systems", Thomson.
5	M.J.Roberts (2016), "Signals & Systems Analysis using Transform Methods & MATLAB", Tata
	McGraw Hill.
E BOOK	S
1.	http://bookboon.com/en/introduction-to-digital-signal-and-system-analysis-ebook
2	Text book companionhttp://www.scilab.in/Completed_Books#2
MOOC	
1.	Signals and Systems (web), http://nptel.ac.in/courses/117104074/
2.	Signals and Systems (web), http://nptel.ac.in/courses/117101055/

COURS		CONTROL SYSTEMS CREDITS										
COURSE CODE		EEB4217	COURSE CATEGO	RY	PC	L-T-P-S	3-1 -0- 1					
Version	1.0	Approval Details	23 ACM, 06.02	.2021	ARNING LEVEL	BTL-4						
ASSESSM	ENT S	СНЕМЕ										
First Periodio Assessm	cal	Second Periodical Assessment	Seminar/ Assignments/ Project	•	rise Test Quiz	Attendance	ESE					
15% 15%			10%		5%	5%						

		- T	This cou	irse nr	nvides	an int	roduct	ion to	linear	. svster	ns tra	nsfer f	unction	s and I	anlace	
	ırse	t														
Descr	iptior			sical and mechanical systems in terms of electrical system to construct equivalent trical models for analysis. Deemploy time domain analysis to predict and diagnose transient performance meters of the system for standard input functions and identify the needs of rent s of controllers and compensator to ascertain the required dynamic response the system ormulate different types of analysis in frequency domain to explain the nature of lity the system Joon completion of this course, the students will be able to ategorize different types of system and identify a set of algebraic equations to esent and model a complicated system into a more simplified form. aracterize any system in Laplace domain to illustrate different specification of the em using transfer function concept. terpret different physical and mechanical systems in terms of electrical system to truct equivalent electrical models for analysis. mploy time domain analysis to predict and diagnose transient performance meters of the system for standard input functions. ormulate different types of analysis in frequency domain to explain the nature of												
Course Objecti		r d F 2 F d t f f 3 s	epreser lifferent electrica 2. To en barame lifferent ypes o rom the 3. Form tability	ifferent obysical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis. 2. To employ time domain analysis to predict and diagnose transient performance barameters of the system for standard input functions and identify the needs of ifferent ypes of controllers and compensator to ascertain the required dynamic response rom the system 3. Formulate different types of analysis in frequency domain to explain the nature of tability of the system Upon completion of this course, the students will be able to 4. Categorize different types of system and identify a set of algebraic equations to												
Course Outcon	Upon completion of this course, the students will be able to 1. Categorize different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form. 2.Characterize any system in Laplace domain to illustrate different specification of the system using transfer function concept. 3. Interpret different physical and mechanical systems in terms of electrical system to												of the tem to mance ture of			
-			-			-				tiation	, Metl	nods o	f integ	ration,	Partial	
Fractio			es, Lapia MAPPII		Instor	ms, Ele	ectrica	i wacr	lines							
CO, PO	P															
СО	0 1	РО 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	РО 10	PO 11	РО 12	PSO 1	PSO 2	PSO 3	
CO-1	3	3	2	2	2	-	-	-	-	-	-	-	1	3	1	
CO-2	3	3	2	2	3	-	-	-	-	-	-	-	1	3	1	
CO-3	3	3	2	2	3	-	-	-	-	-	-	-	1	3	1	
CO-4	3	3	2	2	3	-	-	_		-	_	-	1	3	1	
CO-5	3	3	3	2	3	-	-	-	-	-	-	-	1	3	1	
			1: We	akly re	lated,	, 2: Mc	derat	ely rela	ated a	nd 3: S	trongl	y relat	ed	•		
			M REPR											<b>`</b>	9L+3T)	
						-			•				analogy		CO-1	
mechar Block d									•	os – AC	, and L	ic serv	o moto	rs –	BTL-3	
			RESPO		14C3 -	JIBIID			•					(	9L+3T)	
															1	

respon modes Sugges Continu	esponse – Time domain specifications – Types of test input – I and II order system se – Error coefficients – Generalized error series – Steady state error – P, PI, PID of feedback control. .ted Reading: - Error analysis, Time series, Binomial Series, Controller Design, Jous time systems analysis, Creating Continuous Time Models, Discrete Time Models, ntroller Tuning in Simulink	CO-2 BTL-4
	e III:- FREQUENCY RESPONSE	
(9L+3T)		
	ncy response – Bode plot – Polar plot – Constant M and N circles – Nichols chart –	
	nination of closed loop response from open loop response – Correlation between	CO-3
	ncy domain and time domain specifications.	BTL-4
•	ted Reading: - Frequency Domain characteristics and Analysis.	
Modul		SYSTE
(9L+3T)		
	teristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion	
	locus construction – Effect of pole, zero addition – Gain margin and phase margin –	CO-4
	t stability criteria.	BTL-4
	ted Reading: - Stability analysis of Systems.	
Modul		DESIGN
	(9L+3T)	
Perfor	mance criteria – Lag, lead and lag-lead networks – Compensator design using bode	
plot. Ir	troduction to Digital Control Systems, Introduction to State Variable Analysis and	CO-5
Design	- Advances in Control Systems. Practical Component: Design of compensators	BTL-4
Sugges	ted Reading:- Compensator Design, SISO, MISO.	
TEXT B	DOKS	
1.	Ogata.K (2015), Modern Control System Engineering Fifth Edition – Pearsons.	
2	I.J. Nagrath& M. Gopal (2018), <i>Control Systems Engineering</i> , New Age International P Sixth edition.	ublishers,
3	B.C. Kuo (2017), "Automatic Control Systems" Tenth Edition, McGraw-Hill Education.	
	G.F. Franklin, J.D. Powell and A. Emami-Naeini (2015), "Feedback Control of Dynamic	Systems"
4	Seventh edition, Pearson education Ltd.	,
	Norman S. Nise (2013), "Control Systems Engineering" by Seventh Edition, John Wile	y & Sons,
5	Incorporated.	. ,
C	Jairath AK (2017), "Problems and Solutions of Control Systems: With Essential Theor	y" fourth
6	edition, CBS Publishers & Distributors.	-
REFERE	NCE BOOKS	
1.	M. Gopal (2012), Control Systems, Principles & Design, Fourth edition, Tata McGraw Delhi.	Hill, New
2.	M.N. Bandyopadhyay (2017), Control Engineering Theory and Practice, Prentice Hall c	of India.
	Norman S. Nise (2015), "Control Systems Engineering: Analysis and Design " seventh	
3	edition, Wiley sons.	
E BOOK		
1.	http://engineeronadisk.com/book_modeling/	
2.	Text book companionhttp://www.scilab.in/Completed_Books#2	
MOOC		
1.	Control Engineering(web), http://nptel.ac.in/courses/108102044/	

2	Control Engineering(video), http://nptel.ac.in/courses/108102043/
3	Advanced control system(video), http://nptel.ac.in/courses/108103007/
4	http://www.nptelvideos.in/2012/11/control-engineering.html
5	Virtual Lab:- http://iitb.vlab.co.in/?sub=8&brch=117∼=959&cnt=2017
6	http://vlcsd.virtual-laboratories.com/html/index.html

COURSE		.E		TRAM	ISMIS		AND DI	STRIB	JTION			CREDITS 4					
COU COE			EE	B4218		COU	RSE CA	TEGO	RY	РС		L-T-	P-S	3-1	-0-1		
Version	1.	.0	Ар	proval	Detail	s	23 A	CM, 0	6.02.2	021	LEA	RNING	LEVEL	BT	L-4		
ASSESS	MENT	r sc	HEME														
Firs Perioc Assess	dical	;	Second Asse	Period ssmen		Ass	emina ignmei Project	nts/		orise 1 / Quiz		Atten	dance	E	SE		
159	%	15% 10% 5% 5%										50	)%				
Cour Descrij			The course describes the journey of electricity from the power plant to custome Various parameters of transmission and distribution systems is derived. Modeling a analysis of transmission lines and insulation coordination of transmission system included.														
Course Objective1.To gain knowledge of transmission and distribution systems that deliver power from a power plant to customers. 2.To identify the basic components of a transmission and distribution system and explain their functions. 3. To gain knowledge of how power grids help in continuous flow of power t customers 4.To model the transmission line with compensators. 5.To design proper grounding and insulation coordination of transmission												m and					
Course Outcom	e		Upo 1.descri transmis 2.Evalua electros 3.Mode 4.Select characte 5.Design systems	ssion ate the tatic fie l and a a pa eristics n prope	vario para eld of l nalyze rticula and fe	us star meter EHVAC the pe ir insu	ges of s of tr lines. erform lator s of Uno	power ransmi ance o based dergro	syste ssion f a trai on t und ca	m, m line a nsmiss he op ibles.	erits nd a ion li perati	and der nalyze ne. ng volt	the effe age and	ect of c	orona, in the		
Prerequ	isites	s: ES	B4201 E	lectron	nagne	tic The	eory										
CO, PO	AND	PSO	MAPPI	NG				1									
со	Р О 1	РС 2	PO 3	PO 4	PO 5	РО 6	PO 7	PO 8	PO 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3		
CO-1	3	3	2	2	2	-	-	-	-	-	-	1	1	-	1		
CO-2	3	3	2	2	3	-	-	-	-	-	-	1	1	-	1		

CO-3	3	3	2	2	3	_		_	_	_	_	1	1	_	1
CO-4	3	3	2	2	3	_	_	_	_	_	_	1	1	_	1
CO-5	3	3	3	2	3	_	<u> </u>	_	_	_	_	1	1		1
CO-J	J	5	-		-	2: Mo	derate	elv rela	ated a	nd 3: St	rongly	/ relate	_		Ŧ
MODUL	F 1: I	NTRO			.iuteu,	2. 1010	ucrut			14 5. 5		Telute		(	12 L)
Structur					m-ge	neratio	on, tra	nsmiss	ion an	d distri	bution	n-advar	tages		,
			•	•	-								-		
-	of high voltage transmission-introduction to EHV AC transmission, HVDC transmissio and FACTS devicesMechanical design of transmission line between towers – sag an														
	tension calculations using approximate equations taking into account the effect of ice														
and wind									,					СС	<b>)</b> -1
Suggest		eading	s:												L-3
		-		ion of	a Mor	nopola	r / Bip	olar /	Homo	polar H	IVDC 1	Fransm	ission		
1. Modelling and Simulation of a Monopolar / Bipolar / Homopolar HVDC Transmission system with a suitable controller using MATLAB.															
2. Simulation of FACTS Devices as Reactive Power Compensators and Voltage Controllers												ollers			
using M											0				
MODUL			SMISSI	ON LIN	IE PAR		ERS						I		(12
L)															•
Paramet	ters (	of sing	gle and	d three	e phas	se trar	nsmissi	on lin	es -re	sistanc	e, ind	uctance	e and		
capacita			-												
conduct	ors -	symm	etrical	and u	- nsymn	netrica	l spaci	ing – t	ranspo	sition	of line	es - con	cepts		
		-			-		-	-	-				-	СС	)-2
of GMR and GMD - skin and proximity effects - interference with neighbouring communication circuits. Corona discharge characteristics – critical voltage and loss.											-	ВТ	L-4		
Suggest						-					-				
1. Analy	sis of	Radio	Interf	erence	on Pe	rforma	ance of	f Trans	missio	n Line	using I	MATLA	В		
2.Deteri											_				
MODUL	E 3:	MOD	ELLING	g and	PERFC	ORMAI	NCE OF	TRAN	ISMISS	SION LI	NES				(12
L)															
Transmi	ssion	line c	lassific	ations:	Short	line, n	nediun	n line a	and lor	ng line-	equiva	lent cir	cuits-		
ferranti	effec	t- sur	ge im	pedanc	e -att	enuati	on co	nstant	and	phase	const	ant- vo	oltage		
regulatio	on an	d tran	smissio	on effic	iency	-real a	nd rea	ctive p	ower	flow in	lines:	Power-	angle		
diagram	- surg	ge imp	edance	e loadi	ng- loa	dabilit	y limit	s base	d on t	hermal	loadin	ng, angl	e and	~~~~	)-3
voltage s	stabil	ity cor	nsidera	tions;	shunt a	and se	ries co	mpens	sation						l-3 L-4
Suggest	ed Re	eading	s:											DI	L-4
1. N	/lodel	ling ar	nd Ana	lysis of	transı	missio	n line ι	ising N	1ATLA	В.					
2. V	'erific	ation	of Fe	rranti	Effect	for [	Differe	nt Ler	ngth T	ransmi	ission	Lines	Using		
MATLAB	Simu	lation	ı.												
MODUL	E 4:	INSUL	ATORS	AND (	CABLES	S									(12
L)															
Classific					-						-	-	-		
improve			-			-						es of L	T and		
HT cable	-			electric	stress	s and g	grading	, therr	nal cha	aracter	istics.				
Suggest		-			_										)-4
The Analysis and Simulation of Voltage Distribution over String Insulators Using									Using	BT	L-4				
Matlab/	Simul	ink.													
															(12 L)
<b>MODULE 5: SUBSTATION, GROUNDING AND DISTRIBUTION SYSTEM</b> Classification and functions of major components of substations-Bus-bar arrangements												nents-	CC	)-5	

main and Importa Earthing 3-wire, r 4-wire d <b>Suggest</b>	on bus schemes: single bus, double bus with double breaker and single breaker, d transfer bus, ring bus, double bus-bar with bypass isolators. nce of earthing in a substation -Qualitative treatment to neutral grounding and g practices . Feeders, distributors and service mains. DC distributor – 2-wire and adial and ring main distribution. AC distribution – single phase and three phase istribution. ed Readings:	BTL-4								
-	n and Calculation of Earth Electrode.									
	ding Design Calculations.									
TEXT BO		2								
1.	K. Mehta & Rohit Mehta M. (2018). <i>Principles of Power System</i> , S.Chand; 4 <sup>th</sup> edition , pp.									
1.	127-386.									
REFEREN	ICE BOOKS									
1.	J. Duncan Glover. (2017). Power System Analysis and Design, Cengage Learning, 6	5 <sup>th</sup> Edition.								
2.	A.S. Pabla. (2015). <i>Electric Power Distribution,</i> McGraw Hill, 6 <sup>th</sup> Edition.									
E BOOKS										
1.	http://www.eenotes.com/2017/09/principles-of-power-system-by-v-k.html									
2.	https://books.google.co.in/books/about/Electrical_power.html?id=IIvZrQEACAAJ	&redir_esc=y								
моос										
1.	https://www.mooc-list.com/course/electric-industry-operations-and-markets-co	ursera								

COURS	E TITLE	ELECTRICAL	SIMULATION LABORAT	ORY	CREDITS	1					
COURS	E CODE	EEB4241	COURSE CATEGORY	DE	L-T-P-S	0-0-2-0					
Version	1.0	Approval Details	23 ACM, 06.02.20	D21 LEAF	RNING LEVEL	BTL-4					
ASSESSM	ENT SCHEN										
		Attendance	ESE								
		75%			5%	20%					
Course DescriptionTo develop the skill for using different simulation on software MATLAB tool for analysis and processing of signals and to generate various continuous and discr time signals.											
Course O	bjective	<ol> <li>To impart known convolution and</li> <li>To understand t</li> <li>To introduce D</li> </ol>	dents on MATLAB tool. owledge on signal l correlation of signals he concept and impor Pigital logic design sof ed in real time applica	transmissio and samplir tance of Fou tware for c	ng. Irier and Z-Tran	sforms.					
Course O	utcome	<ol> <li>Familiarize with the operations of</li> <li>Verify of Samp given Signals/ Sy</li> </ol>	n of this course, the st Analyze Various Sign on Signals and Sequenc ling Theorem, Lineari ystems rier Transform of a giv	als and Seq ces. ty and Time	uences in MAT e Invariance Pi	roperties of a					

			phas	se spe	ctrum	and al	so plo	t Pole	-Zero	Maps	in Z-Pl	ane			
Prerequisit	es: Bas	ic of r	enewa	able ei	nergy	conce	pts								
CO, PO Al	ND PS	O MA	PPIN	G		1	1	T	1	T	T	T	T	1	1
СО	РО 1	РО 2	РО 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	2	1	-	3	-	-	-	1	-	2	2	3	2	2
CO-2	3	2	1	-	3	-	-	-	1	-	2	2	3	2	2
CO-3	3     2     1     -     2     -     -     1     -     2     2     3       3     2     1     -     2     -     -     1     -     2     2     3													2	2
CO-4	CO-4         3         2         1         -         2         -         -         1         -         2         2         3           1: Weakly related, 2: Moderately related and 3: Strongly related													2	2
					-		ately	relate	d and	3: Str	ongly	related	<u> </u>		(01)
1 Decis 0					MENI	5									(9L)
1.Basic O2.Perman					' moto	r cimu	lation	using	Matla	h/Sim	ulink				
3. Perman											unnk.				)-1
4. Design											rcuits	in time	e and	BTL	
frequen														0.12	_,.
5. Simulat			-	-	rectifi	er usir	ng Ma	tlab							
6. Perform									lines	using	Matla	b		CC BT	
7. Symme	trical c	ompor	ient ar	nalvsis	usino	Matla	h							Ы	L-4
8. Design								ontrol	system	1				CC	)-3
9. DC Mo		-	_						<u> </u>					BT	L-4
10. Simulat	e and t	une pa	ramet	ers of	a PID	contro	oller fo	or a giv	en sy	stem				CC BT	
TEXT BOOK	S														
1.	Basic I	Electri	cal En	gineer	ing- E	y M.S	S.Naid	u and	S. Kar	naksh	iah — 🛛	ГМН.			
2.	Basic E	Electric	al Eng	gineeri	ing –B	y T.K	.Naga	sarkar	and M	1.S. Sı	ıkhija	Oxford	1.		
REFERENCE	BOOKS	S													
1.	Theory	/ and I	Proble	ms of I	Basic	Electri	ical Er	nginee	ring b	y D.P.	Kotha	ri & I.J	I.Nagra	th PHI.	
2.	Princip	oles of	Electi	rical E	nginee	ering b	y V.K	Meht	a, S.C	hand l	Public	ations.			
E BOOKS															
1. ł	nttps://	/www.	techn	icalsyr	nposiu	ım.cor	n/Lec	turenc	otes_E	E8261	_Unit:	1.html			
2. ł	nttps://	www.	techn	icalsyr	nposiu	um.cor	n/Lec	turenc	otes_B	E8261	_Unit	1.html			
MOOC															
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2. ł	nttps://	nptel.	ac.in/	course	s/108	/107/2	10810	7115/							
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	nttps://	•	-		-				simula	ation-d	of-dc-d	lc-conv	/er		
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COURSE TITLE	CONTROL SYS	CONTROL SYSTEM LABORATORY						
COURSE CODE	EEB4242	COURSE	LAB	L-T-P-S	0-0-3-0			

						C		GORY							
Version	1.0	••	oval [	Details			3 AC .02.2	•		LE	ARNIN	G LEV	EL	ВТ	'L-3
ASSESSME First Perio Assessm	dical	Second Periodical Assessment				Assi	mina gnme rojec	nts/		urprise st / Qu	Δ	ttend	ance	E	SE
15%			15%				10%			5%		5%			)%
Cours Descript		This co manage using co	es, co	mmand			•								
Course1. To familiarize the students with MATLAB software and simulinkCourse2. To help the students understand and practice the modeling and simulationObjective3. To study the effects of poles and zeros location in the s-plane on the steady state behavior										ıd simu		nt and			
CourseUpon completion of this course, the students will be able to1.Describe various input/output models of dynamic system.2.Determine the time response of a control system for various test inputs.3.Determine the frequency response using various plots.4.Analyse the concept of stability using various stability criteria.5.Apply Bode plot to design phase lead-lag compensation.										ts.					
Prerequisi	tes: Ni					<u> </u>			0						
CO, PO AN	ID PSO	MAPPIN	G			1		1	1		T	1	T	1	
со	PO 1	PO 2	Р О З	РО 4	PO 5	Р О 6	Р О 7	Р О 8	Р О 9	РО 10	РО 11	РО 12	PSO 1	PSO 2	PSO 3
CO-1	1	2	3	-	3	-	-	-	-	-	-	3	-	2	3
CO-2	1	2	3	-	-	-	-	-	-	-	-	-	-	2	3
CO-3	1	2	3	-	-	-	-	-	-	-	-	-	-	2	3
CO-4	1	2	3	<u> </u>	-	-	-	-	-	-	-	-	-	2	3
0			akly re	elated,	2: N	lodera	ately	relate	ed an	d 3: St	rongly	relate		<b>D</b> )	
Open and				nd cloc			ct o m						(6	P)	
		e basic o <sub>l</sub> que-spee							tor						
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		te and plo Time do						•		• • •	•			C01,	/BTL3
-		order Sys		•	ise a		aryse	the p	aran		n the s	bysten	i (i ii st		
Frequency		· · · · ·		).										(8P)	
		Frequen		main r	esno	nse a	nd na	rame	ters	of with	Bode	olot (F			
-		der Syster	•				pu				2000				
<ul> <li>To study the system characteristics using Polar plot.</li> </ul>															
		ne system							1 and	N Circ	les.			CO2,	/BTL3
Challetter	••••••														
Stability A	-	the syste			hole	chart								(8P)	
<b>₩</b> 10 a	шатуzе	the syste			1015	CIIdIL	,							03	/BTL3

		-
*	To plot the poles and zeros in complex S plane.	
*	To find the stability of the system using Routh Hurwitz criterion.	
*	To find the stability of the system using Root locus method.	
*	To analyze the effect of pole & zero addition in system.	
	To analyze the system and design a Compensator for a given Mathematical	
	Model	
Applic	cation	(8P)
$\checkmark$	Deriving the Mathematical Model of a control system based on given time domain	
	specifications.	
$\succ$	Deriving the Mathematical Model of a control system based on given frequency	
	domain specifications.	CO4/BTL3
$\triangleright$	Controlling the direction of rotation of stepper motor.	
	Controlling the speed of DC motor by varying armature current.	
REFER	ENCE BOOKS	
1.	Ogata.K (2017), Modern Control System Engineering Fifth Edition – Pearsons.	
2.	I.J. Nagrath& M. Gopal (2015), Control Systems Engineering, New Age Internation	nal Publishers,
	Sixth edition.	,
3.	B.C. Kuo (2017), Automatic Control Systems, Tenth Edition, McGraw-Hill Educatio	n.
4.	G.F. Franklin, J.D. Powell and A. Emami-Naeini (2017) Feedback Control of Dynamic	c Systems"
5.	Norman S. Nise (2013) Control Systems Engineering, Seventh Edition, John N	Viley & Sons,
	Incorporated.	
6.	Jairath AK (2017), Problems and Solutions of Control Systems: With Essential	<i>Theory,</i> fourth
	edition, CBS Publishers & Distributors.	
E BOO	<s by="" compared="" seco<="" second="" td="" the=""><td></td></s>	
1.	http://engineeronadisk.com/book_modeling/	
	Text book companionhttp://www.scilab.in/Completed_Books#2	
моос		
1.	Control Engineering(web), http://nptel.ac.in/courses/108102044/	
2.	Control Engineering(video), http://nptel.ac.in/courses/108102043/	
3.	Advanced control system(video), http://nptel.ac.in/courses/108103007/	
4.	http://www.nptelvideos.in/2012/11/control-engineering.html	
5.	Virtual Lab:- http://iitb.vlab.co.in/?sub=8&brch=117∼=959&cnt=2017	
6.	http://vlcsd.virtual-laboratories.com/html/index.html	

COURSE TITLE         DESIGN PROJECT-II         CREDITS         1	
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COURSE	CODE		EEB	84243			COUR ATEG			PC		L-T-P	P-S	0-0-	2-0
Versio n	1.0	4	Approv	al Det	ails	23	ACM,	06.02	.2021	L	EARN	ING LE	VEL	BT	L-6
ASSESSM	ENT SC	HEME							-						
Revie	w 1		Rev	iew 2		R	eview	3	Final Review						
109	%		20% 20% 50%												
Coui Descrip		cr st	This course provides a solid foundation in core electrical engineering disciplines, critical thinking and problem-solving skills. Through the academic program students also develop excellent written and oral communication skills, learn to work as a team and project management.												
Course Ob	jective	e 2 kr	<ul><li>1.To investigate the students' ability in identifying and problem formulation</li><li>2.To provide the database in the respective discipline and also enable them to know the scale of the project that should be carried on.</li><li>3.Develop excellent written and oral communication skills</li></ul>												
Course Ou Prerequisi			1. [ 2. F 3. [	Develo gained Propos Develo	p sim e a pi p cod		ectrica and de	al and efend i	electr t as a	onic n team.		able t based	o d on th	e know	vledge
CO, PO AN															
со	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	РО 7	PO 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	2	3	2	1	1	1	-	3	-	3	3	3	3	1
CO-2	3	2	3	1	-	-	-	-	3	-	3	3	3	3	1
CO-3	3	2	3	2	3	1	1	-	3	-	3	3	3	3	2
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Engineerin • Tra	e stude	al and ents w s but w ion an	will ca with su	ronics arry o ubstan	Engin ut a tial m	eering projec	from	previo one o	ous ser	nester follov	s.		d on th		-
	erating														

Student groups will be formed (3/4 in a group) and a faculty member will be allocated to guide them. There will be three major reviews which will be carried out as listed below.

Review #	Requirement	Mark Weig	shtage
		Internal	External
0	Area / Title selection	-	-
1	Literature review / Proposal for the Project	10%	-
2	Mathematical modelling/Circuit Design	20%	-
3	Final simulation / Hardware presentation	20%	-
End			
Semester	Final Viva-Voce and project demonstration	-	50%
Exam			

## <u>Semester – V</u>

COUR	SE TIT	LE			C	PTIM	IZATIO	ON TEC	HNIQU	JES			CREDI	ſS		4	
COUR	SE CO	DE	MAA 4301 COURSE CATEGORY BS L-T-P-S 3										-1-0-1				
Versio	on	1.0		Ар	proval	Detai	ls	24th A	CM - 3	0.5.20	)18	LEA	RNING	LEVEL		BTL-3	
ASSES	SMEN	T SC	HE	ME													
Peri	irst odical ssmen		Second Periodical Assessment			:	Ass	Seminar/ ssignments/ Project			prise <sup>-</sup> / Quiz		Atte	ndance		ESE	
	.5%	-													50%		
~			Тс	To make the student develop a knowledge in the field of optimization techniques													
	ourse riptio	n	th	heir basic concepts, principles of linear and integer programming, assignment and													
Desc	ripuo	11	tra	ransportation problems													
				1. To understand the concept of optimization													
				2. To formulate linear programming model													
Course				<ol> <li>To understand the concept of integer programming</li> </ol>													
Object	lve			4. 1	o und	erstan	d the	assigni	nent a	nd tra	nspor	tation	proble	m			
				5. 1	o und	erstan	d the	concep	ot of ne	etwork	analy	/sis					
				Upo	n com	pletior	n of th	is cour	se, the	stude	nts w	ill be a	ble to				
				1. f	ormula	ate the	e linea	ar prog	rammi	ng pro	blem						
Course	е			2. c	leterm	ine th	e solu	tions o	f the li	near p	orogra	mming	g proble	em			
Outco	me			3. c	obtain	the so	lution	s of int	eger p	rograr	nming	g probl	em				
				4. c	leterm	ine th	e opti	mal so	lution	of assi	gnme	nt and	transp	ortatio	n proble	em	
				5. c	constru	uct the	netw	ork dia	gram a	and co	mput	e the p	roject	duratio	n		
Prerec	quisite	s:															
CO, P			1	1	-												
со	РО 1	P( 2	O	PO 3	РО 4	PO 5	PO 6	РО 7	PO 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
CO-1	3		3										1				
CO-2	3	3	3	2	-	-	2	-	-	-	-	-	-	2	1	1	
CO-3	3		3	-	-	2	2	-	-	-	-	-	-	2	1	1	
CO-4	3	3	3	2	-	2	2	-	-	I	-	-	-	2	1	1	
CO-5	3	3	3	3	-	-	2	-	-	-	-	-	-	2	1	1	

1: Weakly related, 2: Moderately related and 3: Strongly related	
MODULE 1:INTRODUCTION TO OPTIMIZATION (9L+3T=12)	
Introduction to operations research – objective – scope of OR – Limitations of OR – Introduction and formulation of linear programming – Solving LPP using Graphical method. Suggested Reading: Basics of inequalities	CO-1 BTL-1,2
MODULE 2:LINEAR PROGRAMMMING PROBLEM (9L+3T=12)	
Solving LPP using simple method – Big-M method – Two phase method – conversion of primal to dual. Suggested Reading: System of equations	CO-2 BTL- 1,2,3
MODULE 3:INTEGER PROGRAMMING (9L+3T=12)	
Integer programming – Cutting plane method – Gomory's Mixed integer method – Branch and Bound method Suggested Reading: System of equations	CO-3 BTL- 1,2,3,4
MODULE 4:ASSIGNMENT AND TRANSPORTATION PROBLEM(9L+3T=12)	
Hungarian Method – Maximization and unbalanced assignment problem – Basic feasible solution of transportation problem – Modi method – Degeneracy – Unbalanced Transportation problem. Suggested Reading: Arithmetic Calculation	CO-3 BTL- 1,2,3,4
MODULE 5:PERT AND CPM (9L+3T=12)	
Network diagram – Representation – Labeling – CPM – PERT probabilities of CPM – PERT probabilities of project duration. Suggested Reading: Basics of graphs	CO-4 BTL- 1,2,3,4
TEXT BOOKS	
1. Chandrasekaran A, "A Text book of Operation Research", Dhanam Publications, Chenn	ai, 2017
<ol> <li>V. Sundaresan, K. S. Ganapathy Subramanian, K. Ganesan, "Resource Mar Techniques", A. R. Publications, 2004</li> </ol>	nagement
3. S. D. Sharma, "Operation Research", Kedarnath Ramnath & Co, 2002	
REFERENCE BOOKS	
1. Hamdy A. Taha, "Operations Research: An Introduction (9th Edition)", Prentice Hall, 20	010
2. <u>D S Hira &amp; Prem Kumar Gupta</u> , "Introduction to Operations Research", S. Publishing, 2012	. Chand
E BOOKS	
1. http://nptel.ac.in/courses/112106134/1	
2. https://onlinecourses.nptel.ac.in/noc17_mg10/preview	
MOOC	

COURSE TITLE	P	CREDITS	4		
COURSE CODE	EEB4301	COURSE CATEGORY	PC	L-T-P-S	3-1- 0-0

Versio	on	1.	1.0     Approval Details     23 ACM, 06.02.2021     LEARNING LEVEL							BTL- 4						
ASSESS	MEN.	T SCH	IEME													
First Pe Asses			Seco Perioc Assessi	lical		Assigr	ninar/ nments oject	5/	-	Surprise Test / Quiz			Attendance			
1	5%			159				.0%			%		59			50%
Co Descr	n	cou syst	rse wo tems.	of this ould ha	ve th	e know	ledge	base 1	necessa	ry to a	lesign	workir	ng pow	er elec		
Course Objectiv	ve				tand and the stu	-		U			-					
			Upc	on com	pletion	of thi	s cours	e, the s	tudent	s will b	e able	to				
			1. Acquire knowledge about fundamental concepts and operation of													
			semiconductor devices													
Course			2. Analyze various single phase and three phase power converter circuits										•			
Outcom	е		and understand their applications.													
			3. Analyze various DC to DC converters and its applications													
			4. Analyze various single phase and three phase inverter circuits and understand their applications.										F			
					5. App						ial and	indust	rial anr	lication	ne	
Prerequ	isite	s. FF	R41			• •								EB4201		ectrical
Machine		<b>J.</b> LL	.041.	17 C	incurts	unu	Networ	K3, L			nulog i		111C5, L			.centear
CO, PC		D PS	SO M	IAPPI	NG											
со	РО 1	РО 2		PO 3	PO 4	PO 5	PO 6	РО 7	PO 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	(	3	-	-	-	-	-	-	1	-	-	-	3	3	-
CO-2	3	÷	3	-	2	1	-	-	-	1	-	-	-	3	3	-
CO-3	3		3	-	2	1	-	-	-	1	-	-	-	2	3	-
CO-4	3	-	3	-	2	1	-	-	-	1	-	-	-	2	3	-
CO-5	3		3	-	-	-	-	-	-	1		-	3	3	3	-
MODUL	E 1.				kly rela				relate	ed and	3: Stro	ngiy re	lated	(01.	+3T=12	2)
Structur									` now	er tran	sistor	MOSE	T and	•		-)
and snul	•								· •						, iver	
Suggest													0.200	-		
Practica	al con	npon	ent:													
Triggeri	-			SCR												CO-1
	66										BTL-					
b. R firii	-		_													4
c. RC Fir Charact	-				יק וכהב											
Suggest				JIĽIdĺ												
Advance			-	tors d	evices											

MODU	LE 2: PHASE-CONTROLLED CONVERTERS	(9L+3T=12	2)
2-pulse	, 3-pulse and 6-pulse converters - Inverter operation of fully controlled converter -	Effect of	
source	inductance - Distortion and displacement factor - Ripple factor - Single phase AC	voltage	
controll	ers.		CO-2
Practic	al component:		BTL-
AC to D	DC half and fully controlled converter		ыг- 4
Step do	own and step up MOSFET based choppers		4
Sugges	ted Readings:		
Simulat	tion of various converters using MATLAB		
MODU	LE 3: DC TO DC CONVERTERS	(9L+3T=12)	)
Step-do	own and step-up choppers - Time ratio control and current limit control - Switchir	ng mode	
regulato	ors: Buck, boost, buck-boost and Cukconverter .		CO-3
Practic	al component:		BTL-
Zero vo	oltage switching resonant dc-dc converter		3
	ted Readings:		5
Simula	tion of various choppers using MATLAB		
	LE 4: INVERTERS	(9L+3T=12	)
	phase and three phase (both 120degree mode and 180 mode) inverters - PWM tec	-	
	dal PWM, modified sinusoidal PWM and multiple PWM - Voltage and harmonic o	control -	
	esonant inverter - Current source inverters.		CO-4
	al component:		BTL-
	ased single phase PWM Inverter		4
	ted Readings:		
	tion of various inverters using MATLAB		
	LE 5: : APPLICATIONS	(9L+3T=12)	
	rrupted power supply topologies - Flexible AC transmission systems - Shunt and seri		со г
	mpensator - Unified power flow controller- HVDC Transmission.		CO-5 BTL-3
	ted Readings:		511-5
	ition of UPS, UPFC		
TEXT BC		D	
1.	Muhammad H. Rashid (2004) Power Electronics: Circuits, Devices and Applic	cations, Pea	arson
	Education, Third edition.		
2.	P.S.Bimbhra (2014) <i>Power Electronics</i> , Khanna Publications, fifth edition.		
E BOOK	<s< td=""><td></td><td></td></s<>		
1.	www.powerelectronics.com/learning-resources/ebooks		
2.	https://www.scribd.com/document/356197939/Power-Electronics-Book		
3.	www.freeengineeringbooks.com/Electrical/Power-Electronics.php		
MOOC			
1.	https://www.coursera.org/learn/power-electronics		
2.	https://www.mooc-list.com/tags/power-electronics		

COURSE TITLE	MICROCONTRO	OLLER AND EMBEDDED SYSTE	м	CREDITS	4
COURSE	EEB4302	COURSE CATEGORY	РС	L-T-P-S	3-0-2-

CODE														:	1	
Versior	Version 1.0			al Deta	nils			23 )6.02.20		λCM,	LEARN	IING L	EVEL		BTL-4	
ASSESS	MEN	T SC⊦	IEME		_											
First		S	econd		Sem	eminar/ , Surprise Test /										
Periodical		P	eriodic	al	Assi	gnment	· · · · ·	Quiz	103	, , ,	Atten	dance			ESE	
Assessn	nent	A	ssessm	ent	Proj											
15%			.5%		10%			5%			5%				50%	
			The course describes microcontroller-based system of hardware and software designed to perform dedicated functions within an electrical system. The main													
Course			-	-									-			
Descrip	tion	р	purpose is to control the device and to allow a user to interact with it. Programming													
			and developing real time applications is included.													
			-		wledge	e of Digi	ital Co	mputer,	, mic	ropro	cessors,	micro	contro	ollers a	nd its	
			rchitect													
			2.To do basic program for time delay, I/O interfacing, data conversion & keyboard													
			interfacing in 8051.													
Course			3. To identify the sensors and motor and do program for external interrupts, timer													
Objecti	ve		interrupts and interfacing the various types of motor control in 8051.													
			4. To gain knowledge and familiarize with Arduino and its installation. Interfacing													
			with external peripheral devices.													
			5.To design the circuit model for interfacing the motors with PIC microcontroller and analyze the speed response.													
						•										
			Upon completion of this course, the students will be able to													
			1.Describe the architecture and real time functioning of 8051													
Course			2.Develop basic program for time delay, interrupts and interfacing with external													
Outcom	ıe		peripherals.													
			3. Describe the architecture and real time functioning of Arduino Microcontroller													
			4.Describe the architecture, functions and application of PIC microcontroller 5.Develop systems using Microcontroller													
Prerequ	uicito					•										
CO, PO					ction t	O Digita	ai sysi	lems								
CO, PO	PO	P30	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	
СО	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO-1	3	2	2	2	3	-	-	-	1	_	1	2	-	1	1	
CO-2	3	3	2	2	3	-	-	-	2	-	1	2	2	2	1	
CO-3	3	3	2	2	3	-	-	-	2	-	1	2	2	2	1	
CO-4	3	3	2	2	3	-	-	_	2	-	1	2	2	2	1	
CO-5	3	3	2	2	3	-	-	-	2	-	1	2	2	2	1	
	kly re	lated	l, 2: Mo	derate	ly rela	ted and	d 3: St	rongly r	elate	d	1	1	1			
	-				-			TROLLER					(9L +	3 P = 3	12)	
								rs, micr		ntroll	ers, Va	n Neu	•			
Harvard Architecture CISC and RISC Processors																
8051 Micro controller – Architecture - Addressing modes - Instruction set - Interfacing with								with I	CO-1							
real time peripherals.									BTL-3							
Practica	•	•		neratio	on of c	ontrol s	signals	5								
							-	/ING AN	ID IN	TERF	ACING			(9L +	3 P =	
12)																
-																

	1 C programming basics and time delay in 8051 C, I/O programming in8051 C, Logic rations in 8051 C, Data conversion programs in 8051 C, Accessing code ROM space in 8051	
ADC	C, DAC and Temperature Sensor interfacing with 8051 microcontroller. LCD and Matrix board interfacing with 8051 microcontroller.	CO-2 BTL-4
Pra	ctical Component : Room Temperature Indicator, Level detection application, DC Motor	
cont	rol, stepper motor control, relay, DC motor and servomotor control using scilab	
	dule III:- 8051 TIMER, SERIAL PORT, INTERRUPT PROGRAMMING IN C & MOTOR CONTROL + 3 P = 12)	-
RS23 inte	gramming 8051 timers/Counter in C. Basics of serial communication, 8051 connection to 32, 8051 serial port programming in C. 8051 interrupts programming in C: Timer rrupts, external hardware interrupts and serial communication interrupt. anys and Opt-isolators, Stepper motor interfacing, DC motor interfacing and PWM using 1.	CO-3 BTL-4
Pra	ctical Component:Case study: Industrial Controllers using 8051.	
Mo	dule IV:- ARDUINO MICROCONTROLLER BOARD (9L + 3 P = 1	2)
Intr	oducing the Arduino Board, Installing and familiarizing the Arduino IDE, Interfacing the	CO-4
Ardı	uino Uno into Keypad, LCD, Sensors and motor	BTL-4
Pra	ctical Component : Case study: Controllers using Arduino Uno.	
	dule V:- PIC MICRO CONTROLLER (9L + 3 P = 1	2)
	L6F7X series- Architecture- Instruction set- Programs for pulse generation, Controllers for	
	or control – stepper motor and servo motor control	CO-5
Pra	ctical Component : Case study: Industrial Controllers using PIC16F7X	BTL-4
TEX	T BOOKS	
1.	Muhammad Ali Mazidi, Janice GillispieMazidi, RolinMcKinlay (2017) 'The 8051 Microcc and Embedded Systems using Assembly and C', Prentice Hall Publications, 2nd Edition.	ontroller
REF	ERENCE BOOKS	
1.	MykePredko , 'Programming and Customizing the 8051 Microcontroller (2017), Tata Hill publishing company limited, New Delhi, Sixteenth reprint.	Mcgraw
2.	K. J. Ayala, D. V. Gadre (2016) ,'The 8051 Microcontroller & Embedded Systems using As and C', <i>Penram Intl. Publishing</i> .	ssembly

COURSE TITL		MEASUREN	IENT 8	& INSTRUMENT	TATION		CREDITS 3			
COURSE COD	COURSE CODE		EB4303	c	COURSE CATEGORY	DE		L-T-P-S	2-0-2-0	
Version 1		.0	Approv Detail		23 ACM, 06.02.2021			LEARNING LEVEL	BTL-3	
ASSESSMENT SC	HEM	E								
First Periodica Assessment		l Second Periodical			Seminar/ signments/	Surprise Test /		Attendance	ESE	
Assessment		As	sessment		Project	Quiz				
15%			15%		10%	5%		5%	50%	
Course Description	This course will introduce the basic measurement techniques employing electronic test equipment including the operation and usage of digital multimeters, function generators and oscilloscopes.									
Course Objective1. To familiarize with the concepts of various measuring instruments										

2. To understand the concept of resistance measurement         3. To understand the working principle of AC bridges         4. To recognize the functioning of waveform generators and analyzers         5. To understand the construction and working of various display and recording devices.         Students will be able to         1. Describe the concepts of various meters, measurement of voltage and power.         2. Describe the measurement of various types of resistances         3. Analyze the measurement of impedance, capacitance and inductance using AC Bridges         4. Analyze the functioning of the various waveform generators and analyzers         5. Demonstrate the construction and working of various display and recording devices.         Prerequisites: Prerequisites:- Fundamental Definitions in Electrical & Electronic Measurements basics of mathematics, Methods of differentiation,									y and e and tance s and y and						
-			•								- ~ 11				
CO, PO AND PSO MAPPING															
со	PO	PO	PO									PSO	PSO		
CO-1	1 3	<b>2</b> 3	<b>3</b> 3	4 3	<b>5</b> 3	6	7	8	9	10	11	12	1	2 2	<b>3</b> 1
CO-1 CO-2	3	3	3	3	3	-	-	-	_	-	_	-	3	2	1
CO-2 CO-3	3	3	3	3	3	_	-	-	_	-	_	-	3	2	1
CO-3 CO-4	3	3	3	3	3		<u> </u>	-	_	-	_	-	3	2	1
CO-5	3	3	3	3	3	-	-	-	_	-	_	-	3	1	1
	5	-	-	-	-	2: Mo	derate	lv relat	ed and	3: Str	ongly r	elated		-	
1: Weakly related, 2: Moderately related and 3: Strongly related           MODULE 1: MEASUREMENT OF VOLTAGE ,CURRENT AND POWER         (6L+								(6L+3I	P=9)						
GalvanometersD'ArsonavalgalvanometerTheory, calibration, applicationPrinciple, rectifierconstruction, operation and comparison of moving coil, moving iron meters, dynamometer, induction type& thermal type meter, rectifiertype calibration of voltmeter and ammeterCO-2 BTL-voltmeterand ammeterErrors and compensation-Electrodynamometertype BTL-vattmeter, Theory & its errors.Practical component: hard ware Lab experiments/virtual lab calibration of voltmeters, ammetersBTL-															
Sugges Concep		-		nes of	Damp	ina									
		-	<u> </u>	•	-	<u> </u>								(6L+3	P=9)
MODULE 2: RESISTANCE MEASUREMENT       (e)         Measurement of low, medium & high resistance Ammeter, voltmeter method       Wheatstone bridge Kelvin double bridge Series and shunt type ohmmeter High resistance measurement , Megger Direct deflection methods – Price's guard-wire method Loss of charge method - Earth resistance measurement.       Practical component: Hardware         1. Measurement of resistance using Kelvin' bridge       2. Measurement of resistance using Anderson's bridge         Suggested Readings: Basic electrical laws, Bridge balance conditions								C	0-2 TL-4						
Bugges		cauiii	59. Da	.510 010	cuicai	1aws, I	Juge	Jaranet	Conul	10115					
MODU	LE 3: I	MPED	ANCE	MEAS	UREM	ENT								(6L+3I	P=9)
A.C bri	dges	Mea	suren	nent c	ofindu	ctance	, capa	citance	Q of	coil	Maxw	rell	Bridge	<u> </u>	0-3

ay's dge Schering bridge- Anderson bridge-Campbell bridge to measure mutu inductance Errors in A.C. bridge methods and their compensation-Detectors-Excit									
field. A.C. galvanometer - Vibration galvanometer Introduction to cable fa and eddy current measurement.									
Suggested Reading: - Analysis of circuits, AC Bridge balance Conditions									
<b>Practicals</b> : Hardware									
3. Measurement of resistance using Maxwell' bridge									
4. Measurement of resistance using Schering's bridge									
MODULE 4: SIGNAL GENERATORS AND ANALYZERS	(6L+3P=9)								
Sine wave generator Frequency synthesized sine wave generator pulse and square									
wave generator Function generator Wave analyzer Applications Harmonic distortion									
analyzer Spectrum analyzer Applications Audio Frequency generator Noise									
generator.									
5	CO-4								
Gatiloue hay oscilloscope serveris for effet gratienes vertical a									
horizontal deflection systems Probes-Digital CRO	512 2								
Suggested Reading: -Properties and analysis of periodic waves									
Practicals: Hardware/MATLAB									
1.Sinewave generation 2.Pulse width modulation									
MODULE 5: DISPLAY AND RECORDING DEVICES	(6L+3P=9)								
Bar graph display Segmental and dot matrix display X-Y recorders, magnetic tap									
recorders Digital recording Data loggers. Interference and screening- Electrostatic ar									
electromagnetic interference & earth loops. CO-5									
<b>Suggested Reading</b> :- Measurement of electrical quantities, SI units of measurements <b>BTL-2</b>									
<b>Practicals</b> : MATLAB									
1.Digital simulation of 1st and 2 <sup>nd</sup> order systems for different inputs <b>TEXT BOOKS</b>									
Alan S Morris and Reza Langari (2015) Measurement and Instrumentation	. Theory and								
<sup>1.</sup> Application, Academic Press, Second Edition.	_								
2. A.K Sawhney (2012) <i>A course in electrical and electronic measurements and ins</i> Fourth Edition	trumentation,								
3. Bela G Lipak, Krista Vencizel (2017) <i>Measurement and Safety: Volume 1</i> , CRO Edition,	C Press, , Fifth								
4. Robert V Northrope (2014) Introduction to measurement and instrumentatic Francis, 4 <sup>th</sup> edition.	n, Taylor and								
REFERENCE BOOKS									
Romen Maleric(2015) Instrumentation and measurements in electrical	enaineerina.								
1. Universal Publishers, Second Edition									
Arun G Ghosh (2012) Introduction to measurement and instrumentation,	McGraw Hill,								
2. Fourth Edition									
E BOOKS									
1. Measuring Instruments (web), http://nptel.ac.in/courses/108105053									
2. Electrical and Electronic Measurements(video), http://nptel.ac.in/courses/10	8106070/								
MOOC									
1. https://www.udemy.com/course/electronic-measurements-and-instrumenta	tion/								
2. https://www.udemy.com/course/measurements-and-instrumentation/									

COURSE CODE Version 1.0 ASSESSMENT SCH First Cycle Assessment 35% Course Description	Second Cycle Assessment 35% Power electroni operation of dir controllers To understand an To prepare the st Upon the comple able to 1. Design and	23 A cs lab e fferent d acquir tudents t etion of	cm, of enables types re know o analy Power	the store the st	21 ndanc 0% tuden ppers about desig	ts on , rective variou	fiers, ir	nental	skills t		
ASSESSMENT SCH First Cycle Assessment 35% Course Description	Details EME Second Cycle Assessment 35% Power electroni operation of dir controllers To understand an To prepare the si Upon the comple able to 1. Design and	cs lab e fferent d acquir tudents t etion of	enables types re know o analy Power	Atter 1 5 the st of cho vledge st vze and c electr	ndanc 0% tuden ppers about desig	ts on , rective variou	EVEL experim fiers, ir	iverter	skills t	ESE 20%	
First Cycle Assessment 35% Course Description	Second Cycle Assessment 35% Power electroni operation of dir controllers To understand an To prepare the st Upon the comple able to 1. Design and	fferent d acquir tudents t etion of	types e know o analy Power	1 s the store of cho vledge store vze and c electr	<b>0%</b> tuden ppers about desig	ts on , recti variou gn diffe	fiers, ir	iverter	skills t	<b>20%</b> coward	
Assessment 35% Course Description	Assessment 35% Power electroni operation of dir controllers To understand an To prepare the st Upon the complet able to 1. Design and	fferent d acquir tudents t etion of	types e know o analy Power	1 s the store of cho vledge store vze and c electr	<b>0%</b> tuden ppers about desig	ts on , recti variou gn diffe	fiers, ir	iverter	skills t	<b>20%</b> coward	
35% Course Description	35% Power electronic operation of director controllers To understand and To prepare the set Upon the complector able to 1. Design and	fferent d acquir tudents t etion of	types e know o analy Power	1 s the store of cho vledge store vze and c electr	<b>0%</b> tuden ppers about desig	ts on , recti variou gn diffe	fiers, ir	iverter	skills t	<b>20%</b> coward	
Course Description	Power electronic operation of dir controllers To understand an To prepare the si Upon the complet able to 1. Design and	fferent d acquir tudents t etion of	types e know o analy Power	the store the st	tuden ppers about desig	, rective variou gn diffe	fiers, ir	iverter	skills t	oward	
Description	operation of dir controllers To understand an To prepare the st Upon the complet able to 1. Design and	fferent d acquir tudents t etion of	types e know o analy Power	of cho vledge a vze and electr	ppers about desig	, rective variou gn diffe	fiers, ir	iverter			
Course	To prepare the second the complete to 1. Design and	tudents t etion of	<u>o analy</u> Power	yze and electr	desig	gn diffe	s power	· semic			itage
Course ObjectivesTo understand and acquire knowledge about various power semiconducto To prepare the students to analyze and design different power converter of the students							circuit	ts			
Course OutcomeUpon the completion of Power electronics laboratory course, the able to 1. Design and obtain the characteristics of SCR, MOSFET and IG 2. Construct single phase and three phase controlled rect commutating circuits. 3. Construct and design different types of Choppers and invert 4. Design the different power electronic circuits using MATLAB						IGBT. ectifier erters.					
Prerequisites: - El	B4202 - Analog El	ectronic	s								
CO, PO AND PS	O MAPPING										
CO	PO PO PO 3 4 5	D PO PSO PSO									
<b>CO-1</b> 2 3	3 - 3	-	-	-	2	-	-	-	2	1	1
<b>CO-2</b> 2 3	2 - 3	-	-	-	2	-	-	-	2	1	1
<b>CO-3</b> 2 3	3 - 3	-	-	-	2	-	-	-	2	1	1
<b>CO-4</b> 2 3	3 - 3	-	-	-	2	-	-	-	2	1	1
LIST OF EXPERIMENTS											

1	Triggering circuits for SCR a. UJT Trigger circuit b. R firing circuit c. RC Firing circuit	CO1, BTL-3						
2	Characteristics of MOSFET and IGBT							
3	Characteristics of TRIAC							
4	Characteristics of SCR							
5	Transient characteristics of SCR and MOSFET	CO2, BTL-3						
6	AC to DC half and fully controlled converter							
7	Step down and step up MOSFET based choppers	CO3, BTL-3						
8	IGBT based single-phase PWM inverter							
9	Zero voltage switching resonant dc-dc converter	CO4, BTL-3						
10	Zero current switching resonant dc-to-dc converter	CO4, B1L-5						
TEXT BOOKS	) )							
1	Muhammad H. Rashid (2017) <i>Power Electronics: Circuits, Devices and Applications</i> , Pearson Education, Third edition.							
2	P.S.Bimbhra (2018) Power Electronics, Khanna Publish	ners, fifth edition.						
REFERENCE	BOOKS							
1.	Ned Mohan, Tore.M.Undeland, William.P.Robbin Converters, Applications and Design, John Wiley and s							
2.	G.K. Dubey(2001) <i>Fundamentals of Electrical Drive</i> . Delhi, 2nd Edition.	s, Narosa Publishing House, New						
3.	G.K. Dubey (2011) <i>Power Semi-conductor Controlled Drives</i> , Prentice Hall of India, Second Edition							
4.	S.K. Pillai (2012) A First Course on Electrical Drives, Wiley Eastern Limited, Second Edition.							

COURS TITLE	E	ELECTRICAL MACHINE DESIGN LAB CREDITS 1										
COURS CODE		EEB433 2	COURS	E CATEGORY	P	PC L-T-P-S		0:0:2:0				
Versio n	1.0	-	proval etails	23 ACN 06.02.20			ARNING LEVEL	BTL-4				
ASSESSM	ENT SO	CHEME	EME									
First Cyc	le	Second C	Second Cycle Attendance ESE									
Assessme	ent	Assessm	EJE									
35%		35%			10%			20%				
Course		The objec	tive of ele	ctrical machine	design l	ab is t	o expose t	he students to analyze				
Objectives	s	and desigr	n parts of b	oth DC machine	es and A	C mach	ines					
		Upon	the comple	etion of electric	cal mach	ine de	sign laborate	ory course, the student				
		will be	able to ar	alyze and								
Course		1. Design a DC Machine and cylindrical pole synchronous Machine using MATLAB										
Outcome		and obtain the results.										
		2. Develop a program Using MATLAB and design a Squirrel cage Induction Motor										

			for	the gi	ven sp	ecific	ations	5									
			3. D	evelo	рар	rogra	m Usi	ng M/	ATLAB	and	design	a sir	ngle-ph	ase tran	sformer for		
			the g	given	specif	icatio	ns										
			4. A	ssemt	ble the	e part	ts of b	oth D	C mac	hines	and A	C mac	hines				
Prerea	uisite	s: - EE															
-	Prerequisites: - EEB4201 - Electrical Machines CO, PO AND PSO MAPPING																
со	РО	РО															
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
CO-1	2	3	3	3	3	2	1	-	2	-	2	1 - 1 -					
CO-2	2	3	2	3	3	2	1	-	2	-	2	1 - 1 -					
CO-3	2	3	3	2	3	2	1	-	2	-	2	1					
CO-4	2	3															
	1: Weakly related, 2: Moderately related and 3: Strongly related																
LIST OI	EXPE	RIME	NTS														
1	D	esign	of cyli	ndrica	al pole	e sync	hronc	ous Ma	achine	<u>e</u>							
2	D	esign	of DC I	Machi	ne (Se	eries d	conne	cted)					C	CO-1, BT	L-4		
3	D	esign	of Squ	irrel c	age In	ducti	on Mo	otor					~		<del>.</del> .		
4			· ·		-							-	C	O-2, BT	L-4		
5		Design of Single-phase Transformer Simple control circuit's for controlling machines using PCB CO-3, BTL-3															
6		Assembly of DC Machines															
7		Assembly of 3-phase induction motor CO-4, BTL-2															
8		ssembly of 3-phase Synchronous motor CO-4, BTL-2															
0	A	ssemu	19 01 5	-pilas	e syn		ousii										

COURSE TITLE	D	ESIGN PROJECT-III		CREDITS	1				
COURSE CODE	EEB4333	COURSE CATEGORY	РС	L-T-P-S	0-0-2-0				
Version	1.0	Approval Details	23 ACM, 06.02.2021	LEARNING LEVEL	BTL-5				
ASSESSMENT SCHEME									
Review 1	Review 2   Review 3   Final Review								
10%	20% 20% 50%								
Course Description	This course provides a solid foundation in core electrical engineering disciplines, critical thinking and problem-solving skills. Through the academic program students also develop excellent written and oral communication skills, learn to work as a								
Course Objective	<ul> <li>team and project management.</li> <li>1.To investigate the students' ability in identifying and problem formulation</li> <li>2.To provide the database in the respective discipline and also enable them to know the scale of the project that should be carried on.</li> <li>3.To enable the coding skills.</li> <li>4.Develop excellent written and oral communication skills</li> </ul>								
Course	Upon completion of this course, the students will be able to								
Outcome		1.Develop simple electrical and electronic models based on the knowledge gained.							

	<ul><li>2.Propose a project and defend it as a team.</li><li>3.Implement a real time system as proposed</li></ul>														
Prere	Prerequisites: Basic Electrical and Computer Engineering subjects														
CO, P	O ANI	D PSO	MAPF	PING											
со	РО	PO	PO	РО	PO	РО	PSO	PSO	PSO						
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1	3	2	3	2	1	1	1	-	3	-	3	3	3	3	1
CO-2	3	2	3	1	-	-	-	-	3	-	3	3	3	3	1
CO-3	3	2	3	2	3	1	1	-	3	-	3	3	3	3	2
	1: Weakly related, 2: Moderately related and 3: Strongly related														

To carry out a Design project and simple prototype in the area of interest based on the knowledge gained in Electrical and Electronics Engineering from previous semesters.

The students will carry out a project in one of the following Electrical and Electronics Engineering areas but with substantial multidisciplinary components:

- Control System
- Real Time Embedded System
- OOPS

Student groups will be formed (3/4 in a group) and a faculty member will be allocated to guide them. There will be three major reviews which will be carried out as listed below.

Review #	Requirement	Mark Wei	ghtage
		Internal	External
0	Area / Title selection	-	-
1	Literature review / Proposal for the Project	10%	-
2	Mathematical modelling/Circuit Design	20%	-
3	Final simulation / Hardware presentation	20%	-
End Semester Exam	Final Viva-Voce and project demonstration	-	50%

	URSE TLE		POWER SYSTEM PROTECTION AND CONTROL CREDITS 4													
	URSE DDE	EE	B43	16			COUR ATEGO			DE			L-T-	P-S	3-1	-0-1
Vers		1.0		D	prova etails			23 A 06.02.	•		LE	ARNI	NG	LEVEL	BT	L-3
ASSES	SSME	NT SCI	IEM	E					•						1	
Perie	irst odical ssmen	t	Pe	econd riodical essmer		Assi	emina gnme Projec	nts/		urpris t / Q		At	tend	dance	E	SE
1	5%		15% 10% 5% 5% 50%													
	ourse ription		The course deals with various protective schemes in power system and power system control schemes like Load frequency Control and Reactive Power Control													
Cours Objec		2. 3. br 4. 5.	<ol> <li>To familiarize various protection schemes, fault analysis and earthing.</li> <li>To comprehend various relays and its principle.</li> <li>Overview of various protection schemes for apparatus protection and circuit breakers</li> <li>To familiarize real power –frequency control and underlying techniques.</li> <li>To explain various reactive power-voltage control schemes and choose the appropriate scheme .</li> </ol>													
Cours Outco Prere		2. 3. 4. 5.	<ul> <li>Upon completion of this course, the students will be able to</li> <li>Apply the Symmetrical Components techniques for fault analysis.</li> <li>Choose appropriate protection schemes and select the necessary protective relays</li> <li>Choose appropriate apparatus protection scheme and explain the characteristics of circuit breakers</li> <li>Apply fundamentals of real power-frequency control, when there is a system load variation.</li> <li>Apply different methods of voltage control.</li> </ul>													
	-			IAPPI												
со	PO 1	P 0 2	P 0 3	PO 4	P 0 5	Р О 6	P 0 7	P 0 8	P 0 9	PC 10			PO 12	PSO 1	PS O 2	PS O 3
CO1	3	3	3	3	3	-	-	-	-	-	-		1	3	-	1
CO2	3	3	3	3	3	-	-	-	-	-	-	.	1	2	-	1
CO3	3	3	3	3	3	-	-	-	-	-	-		1	2	-	1
CO4	3	3	3	3	3	-	_	_	-	-	-		1	3	-	1
CO5	3	3	3	3	3	_	_	_	_		-		1	3	_	1
			1: W	eakly r	elated	d, 2: N	Iodera	ately r	elate	d and	d 3: St	rongl	y re	lated		
MOD	ULE 1							-				3	-			
(9L+3																
•																

faults earthin schem <b>Sugge</b>	sted Reading: Pow	alculation usin otection and	ng symmetric essential qua thing design	al compon lities of pr	ents - Power sy rotection - Prote	ction CO-1 BTL-2,3
MODI (9L)	ULE 2:		RELAY	PRIN	CIPLE AN	ID TYPES
freque Micro relay,	omagnetic relays ency relays - static processor control digital <b>sted Reading:</b> Rela	relays for overcurr d	ent relay, imp istance		ay, direction and	mho CO-2
MODI (9L+31		PPARATUS	PROTECTIO	N ANI	D CIRCUIT	INTERRUPTION
transn Physic voltag interru	atus protection: nission lines - CTs a cs of arc phenom e, rate of rise of uption of capacitive sted Reading: Adv	and PTs and the nena and arc recovery vol e current	eir applicatior interruption. tage, resistar	s in protect Restriking	tion schemes voltage & Recc	overy CO-3
MODI (9L+61			:	REAL	POWER-FREQUE	NCY CONTROL
charac of con uncon	imentals of specteristics - Load sha atrol area, LFC con trolled and control gested Reading: M	aring between trol of a singl led cases.	two synchron e-area systen	ous machir	nes in parallel; con	ncept CO-4
MODI (9L+31			REA	CTIVE	POWER-VOLTAG	E CONTROL
compe voltag reactiv	al excitation sys ensation; generati e, power and reac ve power. ested Reading: MA	on and abso tive power at a	rption of rea a node; meth	ctive pow	er: Relation betw	
TEXT E	BOOKS					
1.	Hill pub.					gear, Tata McGraw
2.	P. Kundur (2008) / ENCE BOOKS	ower system.	Stability & Col	<i>itrol,</i> McGr		ns, USA, 2008.
1.		nd S.R Bhide (	(2003) <i>Funda</i> ı	mentals of	Power System Pro	otection, Prentice-
2.				3. Sheblé (2	2013) Power Gene	eration, Operation,
E BOO						

1.	https://dokumen.pub/power-system-protection-and-switchgear-2-e-2nbsped- 9780071077743.html							
2.	Power-system-operation-and-control-by-jeraldin-ahila.pdf							
MOO	MOOC							
1.	NPTEL / Online learning materials: http://nptel.ac.in/courses/108101039/3							

COUR TITL					SOLII	O STATI	E DRIV	ES			CRE	DITS			4
COUR COD			EEB43	317			JRSE GORY		Р	С		L-T-	P-S	:	3-0-2- 1
Versi on	1.0	D		oroval tails		23 A0	CM, 06	.02.20	21		LEARN	ING LE	VEL		BTL-4
ASSESS	MEN	T SO	CHEME												
Firs Period Assessr t	ical	Se	econd Pe Assessr		al	Assign	inar/ ments oject	/	Surpris / Q	se Test uiz		Attend	dance		ESE
15%	6		15%	6		1	0%		5	%		5%	%		50%
Cour Descrij n		fro co	nis cours om a po ntrollers To und	ower	electr	onic c	onvert	er an	d also	o prov	ides t	he de	esign o	concep	ots of
Course Objecti		3.	motor o To und motor drives. To prep	illiarize imple p dy and drives. lerstar drive pare th	e with proble I unde id the and t and t	the op ms. erstand differe o learr dents te	the c ences in the l o unde	perati betwe basics	on of en syr of pe I the d	both o nchrono rmanei	classica ous mo nt mag	ll and otor di gnet sy	moder rive an ynchroi	n indu nd indu nous r	uction uction motor
_	ne uisite	<ol> <li>To prepare the students to understand the design of current and speed controllers for a closed loop solid-state DC motor drive</li> <li>Upon completion of this course, the students will be able to</li> <li>Describe motor load dynamics and its steady state stability with Multi quadrant dynamics in the speed torque plane</li> <li>Analyze and design converter and chopper fed DC drive</li> <li>Analyze different speed control methods of Induction motor drives</li> <li>Distinguish the different control strategies of Synchronous Motor drives</li> <li>Analyze the current and speed controllers for a closed loop solid state DC motor Drive</li> </ol>													
<b>CO</b> , <b>P</b>	U AN		PSO MA	1		<b>PO</b>	PO.	DO			PO.	PO.	DEO	DEO	DEO
со	PO 1	P 2		РО 4	PO 5	PO 6	PO 7	PO 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3

<b>20</b> 4	2	2	4	4			r	T		T		1			
CO-1	3	3	1	1	2	-	-	-	-	-	-	-	1	2	1
CO-2 CO-3	3	3	2	3	3	-	-	-	-	-	-	-	3	3	1
CO-3	3	3	1	3	2	-	-	-	-	-	-	-	3	3	1
CO-4	3	3	1	3	3	_	-	_	_	-	_	-	3	3	1
	0	-		akly re	lated,	2: Mo	derate	lv relat	ed an	d 3: Sti	rongly	relate	d		
MOD (9L+3F					RISTICS			iy rela		<u>u 01 01</u>	011817	renate			
Equat	ions go	vernir	ng mo	tor loa	ad dyna	mics -	- Equili	brium	operat	ing po	int and	its st	eady st	ate	
stabili	ty - Ma	athem	atical	condit	tion fo	r stead	ly stat	e stabi	lity an	d prob	lems -	Multi	i quadr	ant	
dynamics in the speed torque plane - Basics of regenerative braking - Typical load torque															
characteristics - Acceleration, deceleration, starting and stopping.												CO-1			
Practi	ical cor	npone	ent:												BTL-4
1. Siı	mulatio	on of d	leterm	ninatio	on of st	eady s	tate st	ability	in MA	ГLAB					
Sugge	ested R	eading	zs:												
		-	-	ur aua	adrant	operat	ion								
MOD		2:		ONVER		/		IOPPE	2	FED	DC	Ν	NOTOR	2	DRIVE
(9L+3F						,	-								
•		analy	sis of	the sir	ngle an	d thre	e nhas	e fullv	contro	lled co	nverte	r fed	separat	elv	
		•			-		•	•					er fed	-	
														5.0	
drive: Time ratio control and current limit control - Operation of four quadrant chopper. <b>Practical component:</b>															
2. Single Phase half and fully controlled converter fed DC Drive in MATLAB												CO-2			
													BTL-4		
3. Four Quadrant Chopper in MATLAB															
Suggested Readings:															
Simulating simple choppers and converters using MATLAB, Boost Converter Voltage Control, First and Second Quadrant Chopper Control													age		
		and S	econc		arant Ci										
MOD				3:		I	NDUC	ION			мото	JR			DRIVES
(9L+3														16	
													drives:		
			•	•							contr	ol –	Basics	of	
-				rters -	Block o	liagrai	n of cl	osed lo	op dri	ve.					
	ical cor	•													CO-3
					mulatio		0								BTL-4
		-		ase PV	VM inv	erter	using N	/ATLAI	3						
	ested R	-	-												
Vecto	r Contr	ol of I	nduct	ion Mo	otor us	ing M/	ATLAB								
MOD	ULE		4	4:		SY	NCHRC	NOUS			МОТ	OR			DRIVES
(9L+3F	P=12)														
Open	loop	volts/l	nertz	contro	ol and	self-c	ontrol	of sy	nchror	nous n	notor:	Marg	inal an	gle	
contro	ol and p	ower	factor	contr	ol - Pei	rmane	nt mag	gnet sy	nchror	nous m	otor.				
Practi	ical cor	npone	ent:												<u> </u>
1. Sp	eed co	ntrol c	of BLD	C mot	or fed o	drive i	n MAT	LAB							CO-4
<b>2.</b> Sp	eed co	ntrol d	of PMS	SM mo	otor fea	l drive	in MA	TLAB							BTL-4
•	ested R														
	r Contr	-	-	in M4	TLAR										
MOD			5:		ESIGN		OF			ROLLEF	RS	FC	DR	Г	DRIVES
		-			201014		01			OLLI				-	
(9L+3F	P=12)														

speed contro chara <b>Pract</b> 1. Tr <b>Sugge</b> Close	fer function for dc motor, load and converter – Closed loop control with current and I feedback - Armature voltage control and field weakening mode control - Design of ollers: Current controller and speed controller - Converter selection and cteristics. <b>ical component:</b> ansfer function of separately fed DC motor using MATLAB <b>ested Readings:</b> d loop control of VSI fed Induction Motor drive in MATLAB	CO-5 BTL-4
TEXT	BOOKS	
1.	Krishnan, R (2016). Electric Motor & Drives: Modelling, Analysis and Control, Prentice	
1.	Hall of India, 2003.	
2.	G.K. Dubey, Fundamentals of Electrical Drives, Narosa Publishing House , New De	elhi 2nd
۷.	Edition, 2001.	
REFER	ENCE BOOKS	
4	G.K. Dubey(2002) Power Semi-conductor Controlled Drives, Prentice Hall of India,	Second
1.	Edition.	
2.	S.K. Pillai(2003) A First Course on Electrical Drives, Wiley Eastern Limited, Third Edition.	
2	Bimal K. Bose (2002) Modern Power Electronics and AC Drives, Pearson Education,	Second
3.	Edition.	
E BOO	KS	
1.	https://www.amazon.in/Electric-Motor-Drives-Modeling-Analysis/dp/0130910147	
2.	http://www.academia.edu/26714897/RKrishnan-	
	Electric_Motor_Drives_Modeling_Analysis_and_Control_2001_	
3.	https://books.google.co.in/books/about/Fundamentals_of_Electrical_Drives.html?id=2	2NsGKp
	LolsQC	
MOO		
1.	https://nptel.ac.in/courses/108/104/108104140/	
2.	https://www.coursera.org/learn/motors-circuits-design	
3.	https://www.udemy.com/course/switched-reluctance-motor-drive/	
4.	https://www.udemy.com/course/complete-electrical-machinesacdc-motor-drivevfdm	atlab/

COURSE	TITLE	E POWER SYSTEM ANALYSIS CRED							4
COURSE	CODE	EEB4318	С	OURSE CATEGO	RY		PC	L-T-P-S	3-1-0-1
Version	1.0	Approval Details 23 ACM, 06.02.2021 LEARNING LEVEL							BTL-4
ASSESSM	ENT SCH	EME							
First Per Assess		Second Periodical Assessment	Þ	Seminar/ Assignments/ Project		urpr st / (	rise Quiz	Attendance	ESE
15	%	15%		10%		5%	'n	5%	50%
Course DescriptionTo make the student understand the basic concepts and techniques or numerical solution of algebraic equation, numerical solution of different integration and their application to engineering and science.									

			1.	To sol		tem o	flinea	r equ	ations	by sul	ostitut	ion an	d elimi	nation				
								•		•				al is uni	aue			
Course						-		•				•	•	omputa	•			
Objective				limita	•	000111	Turrici		increi	itiatioi	i unu	слреп		Sinputa				
Objective						ho su	itahla	moth	ods to	solvo	ordina	ny diff	orontia	l equat	ions			
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					•					udents				ect and indirect				
				metho		ie son	ution	UI SYS	tem t	л equ	ations	using	unect	anu m	unect			
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Course Out	tcom	e				oa of	Interp	olatio	on and	i extra	ipolati	on tor	equal	and ur	iequai			
intervals																		
	3. differentiate and integrate numerically																	
	<ol> <li>compute the solutions of initial value problems numerically</li> <li>determine the solution of boundary value problems numerically</li> </ol>																	
									undary	/ value	prob	ems n	umeric	ally				
Prerequisit EEB4201- E					ission	& Dis	tribut	ion										
CO, PO AN																		
со	РО	РО	РО	РО	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO			
CO-1	<u>1</u> 3	2 3	3 2	4	<b>5</b> 3	6 2	7	8 -	9 -	10 -	<u>11</u>	12 -	1	2 2	3 1			
CO-2	3	3	2	2	2	-	-	-	-	-	2	-	1	2	1			
CO-3	3	3	2	2	3	2	-	_	_	_	-	-	2	2	1			
CO-4	3	3	2	2	3	-	-	_	_	_	-	-	2	2	1			
CO-5	3	3	2	2	3	-	-	-	-	-	-	-	1	2	1			
		1:\	Neakl	v relat	ted. 2:	Mod	eratel	v relat	ted an	d 3: St	rongly	v relat						
Module I:	NTR				,						- 0			(12 L)				
Need for	syste	em pl	anning	g and	opera	ationa	l stud	lies-ba	asic co	ompor	nents	ofap	ower					
system and			-	-		-	•					-	-					
unit quanti		-	•			•				e qua	ntities	-advar	ntages		<b>D-1</b>			
of per unit	-			-		-	-							BT	L-3			
Suggested transmissio		-		pnas	se an	aiysis-	Gener	rator	NIOG	ei, tra	nstorr	ner n	nodel,					
Module II:				ALYSI	s									(12 L)				
Introductio						etwo	rk mo	del f	ormul	ation-	format	tion o	f bus	(/				
admittance					•													
load flow p			•												)-2			
analysis on	ly) aı	nd Fas	st Deco	oupled	l meth	nod.								ы	L-4			
Suggested Readings: Principle of DC load Flow																		
Module III: SYMMETRICAL FAULT ANALYSIS(12 L)																		
Introduction –need of power system protection- Power system faults-effects of faults- Symmetrical Faults - short circuit capacity –current limiting reactors- Z bus																		
•						•	•			-				СС	<b>D-3</b>			
formulatior matrix.	тру	DUS D	unaing	s algoi	nnm	- syste	ematic	. rault	analy	SIS USI	ig bus	mpe	uance	ВТ	'L-4			
11101117.																		
Suggested	Rear	linge	Meth	nds of	analy	sing fa	ulte ir	) svmr	netric	al case	•							

groun seque fault i	Unsymmetrical faults- single line to ground fault - line to line fault - double line to ground fault -fundamentals of symmetrical components - sequence impedances sequence networks - Unbalanced fault analysis using bus impedance matrix-Effect of fault impedance. Suggested Readings: Methods of analysing faults in unsymmetrical case Module V: STABILITY ANALYSIS								
Modu	ule V: STABILITY ANALYSIS	(12 L)							
powe Repor integr	r system stability –steady state-dynamic-transient- (elementary view only) – r angle curve-steady state stability limit-Swing Equation-Equal area criterion – nses to a short circuit fault- factors influencing transient stability - Numerical ration methods - Euler method - modified Euler method – RK method. ested Readings: Methods of increasing stability limits	CO-5 BTL-4							
	BOOKS								
1.	HadiSaadat (2017), Power system analysis, Tata McGraw Hill Publishing Company,	New Delhi.							
2	P.Kundur (2018), <i>Power System Stability and Control</i> , Tata McGraw Hill Publishing Delhi.	g Company, Ne							
REFER	ENCE BOOKS								
1.	Stevenson W. D. (2014) Elements of Power System Analysis, 4/e, McGraw Hill.								
2.	Wadhwa C. L. (2014), <i>Electrical Power Systems</i> , 33/e, New Age International.								
3	Weedy B. M., B. J. Cory, N. Jenkins, J. B. Ekanayake and G. Strbac, (2016), <i>Electric</i> John Wiley & Sons.	Power System							
4	Kothari D. P. and I. J. Nagrath (2017) Modern Power System Analysis, 2/e, TMH.								
E BOO	KS								
1.	https://docs.google.com/file/d/0B27aSM6YQlq2WmU3Q0FrTUphU1E/edit								
MOO	C								
1.	https://www.openlearning.com/courses/power-system-analysis/								

COUR	-	BUS		CREDITS	2									
COUR: CODE	-	GEA4304	COURSE CATEGO	ORY	РС	L-T-P-S	2-0-0-2							
Versio n	1.0	Approval Details	23 ACM, 06.0	1	LEARNING LEVEL	BTL-3								
ASSESSIV	1ENT S													
First Periodi Assessm	cal	Second Periodical Assessment	Seminar/ Assignments/ Project	-	orise Tes ' Quiz	t Attendance	ESE							
15%	,	15%	10%		5%	5%	50%							
Cours Descript		Business Economic providing aspirants process of decision		oply e	conomic	-								
Course Objective	2	1.To familiarize 2. To understan 3. To familiarize stages of produc 4. To understa structure.	the students with the demand and set students with the demand and set students with the	ne bas upply produ nd ou	ic conce analysis ction an tput de	in business applic d cost structure t cisions under v	cations under different arious market							

understand the market structure.																	
		U							udents	will be	e able t	to					
			•	•						nd day			ition				
Course	е		. Apply	-	-			• •		,	,	•					
Outco	me									or appl	ying va	arious	laws				
			. Classi				•				, 0						
			. Classi	-	-												
Prerec	auisit		A4123-														
	<u> </u>		MAPPI						-								
СО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	PSO	PSO	PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
CO-	-	-	1	-	-	1	-	1	-	-	3	1	-	-	1		
1																	
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2														_			
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3			<u> </u>					<u> </u>							-		
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5																	
			1: We	akly re		2: Mc		<u> </u>		nd 3: 9	strong	ly relat	ted				
MODU	JLE		-		1:		IN	TROD	υςτιο	N		то		ECON	DMICS		
(6L)								_									
	Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of																
-	-	-		ics – I	Engine	ering	efficie	ency, E	conor	nic eff	iciency	y, Scoj	pe of	BT			
engine		econc	omics														
MODU	JLE			-			2:				COST			AN	ALYSIS		
(6L)																	
						-			-	al Rev			cost,	CO			
Oppor		/ cost,	Break-	even a										BT	L-3		
MODU	JLE	-		3:	C	ONSU	MER'S		AND		PROD	DUCER	S	BEHA	VIOUR		
(6L)													T				
						-	-		•	Equi	-		-				
Consu														CO			
– Law			ns to S	Scale ·	– Proc	ducer'	s equi	libriun	n — E	conom	ies of	Scale	Cost	BT	L-3		
Classif		n															
MODU	JLE				-	-				4:				BL	JDGET		
(6L)																	
		-	-					-		s – eva		•		CO	-4		
types				•	y – in	dicato	rs —	taxatio	on – c	entre,	state	and lo	ocal –	BT			
-	ublic debt and management.																
MODU	JLE				-	-				5:				FIN	ANCE		
(6L)																	
										s of fir					_		
							-		-					CO			
typoc	of se	ntermediation – investment banking and brokerage services – securities – <b>CO-5</b> ecurities – market for securities – how and where traded – initial public <b>BTL-2</b>															
types	01 50		rities – market for securities – how and where traded – initial public BIL-2 – secondary markets – trading on exchanges and trading with margins.														

TE	XT BOOKS
1	S.Shankaran (2017) Business Economics, Margham Publications.
2	H.L. Ahuja (2015) Business Economics – Micro & Macro, Sultan Chand & Sons - New Delhi – 55.
RE	FERENCE BOOKS
1	S.A.Ross, R.W.Westerfield, J.Jaffe and Roberts (2017) Corporate Finance, McGraw-Hill.
2	Joseph E Stiglitz (2002) Principles of Macroeconomics, W. W. Norton & Company, Third Editiom
ON	ILINE SOURCES
1	https://sites.google.com/site/readbookpdf7734/pdf-download-business-economics-bymark-
	taylor-read-online
2	https://bookboon.com/en/economics-ebooks
M	000
1	https://www.coursera.org/specializations/managerial-economics-business-analysis

COURSE TITLE	POWER SYSTEM	A PROTECTION LA	BORAT	ORY	CREDITS	1		
COURSE CODE	EEB4341	COURSE CATEGORY		LAB	L-T-P-S	0-0-2-0		
Ver 1.0 sion	Approval Detail	s 23 ACM, 06.0	2.2021	LI	EARNING LEVEL	BTL-3		
ASSESSMENT S	CHEME							
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surp Test /		Attendance	ESE		
<u>15%</u> <u>15%</u> <u>10%</u> <u>5%</u> <u>5%</u>								
Course Description	Demonstrate the	e principles and te	echnique	es of ir	dustrial power syste	em design.		
Course Objective	parameters of a 2. To gain know short circuit capa 3. To gain knowl	transmission line ledge on hands o acity. edge on hands or	on Analy n Analyzi	zing f	e of determining th ault in the transmis ious measuring tran arious relay , protec	ssion line using Isformer		
Course Outcome	<ol> <li>Apply measurement</li> <li>phenomena</li> <li>Evaluate the indicated on the indin the i</li></ol>	nfluence of transi operation of prote	ues asso ients on ective de	ociate prote vices	d with power sys ctive systems	tem transient		
Prerequisites:	EEB4218 -Transmi	ssion and Distrik	oution, I	EEB43	16-Power System I	Protection and		

cont	rol															
CO,	PO		D PSO	MAPP	ING	•		•	I	•	1	1	1	T	1	
СС	)	Р О 1	РО 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	PSO 3
CO-	1	1	2	3	-	3	1	1	-	-	-	-	-	2	2	3
CO-	2	1	1	3	-	3	1	2	-	-	-	-	-	3	2	3
CO-		1	2	3	-	3	1	1	-	-	-	-	-	1	2	3
CO-	4	1	2	3	-	3	1	2	-	-	-	<u> </u>	<u> </u>	3	2	3
Tree					akly re	lated,	2: Moo	derate	ly relat	ed and	d 3: Sti	rongly	relate	d		
1 rar			on Line	e (9P) nissior	ling	vnorir	nonto									
2. 3.	Me loa Me	ediu ad, o ediu	um-len capaci	igth tra tive loa igth tra	ansmis ad	sion lir	ne test		ninal-pi ninal-pi	·			, ohmio ,	C	CO1/E	STL3
Rela (9P)																
	•			mpon			test								CO2/E	STI 3
		ure	ment	of eart	h resis	tance									-	
Curr (9P)																Relay
				urrent nsform	-	oltage	transfo	ormers	5)						CO3/E	STL3
App (9P)	licat	tion	1													
				ansfor ent pro	•			forme	rs)						CO4/E	STL3
REFE			BOOK													
1.													fourth			
2.	Ind	lia P	vt. Lto	l, New	Delhi.				-					-	ntice H	
3.										-	-				nd Editio	
4.	Ba Hill		Ram &	k d n v	/ishwa	karma	(2007	). Pow	er syst	em pr	otectic	on & sv	witch g	iear, T	ata Mo	Graw
E BO	OKS															
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COURSE TITLE	E		COMPREHENSION CREDITS 1									
COURSE CODE	E		EEB4342	С	OURSE CATEGORY	I	PC	L-T-P-S	0:0:2:0			
Version	1.0	)	Approval Det	tails	23 ACM, 06.02.202	21	LEA	ARNING LEVEL	BTL-4			
ASSESSIV	ESSMENT SCHEME											

		S	emin	ar/ As	signm	ents/	Proje	ct			prise / Quiz		Atter	ndance		ESE
					30%						10%		1	0%	!	50%
	Cou scri	rse ption		-	to und nics En			comp	orehen	d any	giver	n prob	lem re	elated to	5 Elect	rical and
Cou Obj	urse ecti		the previous semesters													
Cou Out	urse tcon		Upon completion of this course, the students will be able to Comprehend any given problem related to Electrical Engineering field.													
	erequisites: The knowledge acquired from the first Semester to fifth Semester of B.Tech Degree urse															
C	CO, PO AND PSO MAPPING															
	C D	РО 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
С О		1	2	2	3	-	1	3	2	1	-	1	2	2	2	2
TEX	т во	OOKS														
1.				-	ring fo	r GATI	E/PSUs	5 (201	6), Disl	na Puk	olicati	on, Se	cond I	dition		
		-	BOOK	-												
1. 2.	-				's Refe											
E BC			/engi	neenr	iginter	viewq	uestio	15.00	nycse		va-IIIl	erviev	v-ques	stions-a		wers/
1.	1		/drive		le.con	n/file/	d/15d	iKf5ne	vwiNa	SrG M	l xwd	6NFtC	ìhn de	eu/view		
2.																
3.																
MO		1/		0-70	,	, -1			7					-		
1.		•			nginter swers/		uestio	ons.coi	n/eleo	trical-	engin	neerin	g-mult	iple-cho	pice-int	erview-

COURSE	TITLE	D	ESIC	GN PROJECT-IV			CREDITS	1		
COURS		EEB4343	C	OURSE CATEGOR	Y P	С	L-T-P-S	0-0-2-0		
Version	1.0	Approval Detail	S	23 ACM, 06.0	2.2021	LEA	RNING LEVEL	BTL-5		
ASSESSM	ENT SO	CHEME								
Review	v 1	Review 2		Review 3			<b>Final Review</b>			
10%		20%		20%	50%					
Cours Descript	-	This course provid critical thinking an also develop skills oral communication	d pr to in	oblem-solving sk nplement real tin	ills. Throu ne system	gh the also e	e academic prog develop excellen	ram students t writting and		
Course Objective		oral communication skills, learn to work as a team and project management. 1.To investigate the students' ability in identifying and problem formulation.								

	2.To provide the database in the respective discipline and also enable them to know the scale of the project that should be carried on.
	3.To provide coding skills and give practical exposure for implementing the project proposed.
	Upon completion of this course, the students will be able to
Course	1. Develop simple electrical and electronic models based on the knowledge gained.
Outcome	2. Propose a project and defend it as a team.
	3. Implement a real time system as proposed.
Prerequisites	s: Basic Electrical and Electronics Engineering subjects

CO, PC	CO, PO AND PSO MAPPING														
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	PSO 3
CO-1	3	2	3	2	1	1	1	-	3	-	3	3	3	3	1
CO-2	3	2	3	1	-	-	-	-	3	-	3	3	3	3	1
CO-3	3	2	3	2	3	1	1	-	3	-	3	3	3	3	2
									<b>.</b> .						

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

To carry out a Design project and simple prototype in the area of interest based on the knowledge gained in Electrical and Electronics Engineering from previous semesters.

The students will carry out a project in one of the following Electrical and Electronics Engineering areas but with substantial multi-disciplinary components:

- Power Electronics
- Transmission and Distribution
- Machine Learning

Student groups will be formed (3/4 in a group) and a faculty member will be allocated to guide them. There will be three major reviews which will be carried out as listed below.

Review #	Requirement	Mark Weightage				
		Internal	External			
0	Area / Title selection	-	-			
1	Literature review / Proposal for the Project	10%	-			
2	Mathematical modelling/Circuit Design	20%	-			
3	Final simulation / Hardware presentation	20%	-			
End Semester Exam	Final Viva-Voce and project demonstration	-	50%			

#### **SEMESTER-VII**

COURSE TITLE		. ENERGY UTILIZATION / CONSERVATION	AND	CREDITS	4
COURSE CODE	EEB4401	COURSE CATEGORY	PC	L-T-P-S	3-1-

															0-1	
Version	1.0		Appro	val De	tails	23 A	CM, C	6.02.2	021		LEAR	NING	LEVEL		BTL-4	
ASSESSM	ENT S	CHEN	1E											ľ		
First Per Assessr		I	Peri	cond odical ssmen		Assi	emina gnme Project	nts/		Surprise Test / Quiz			endanc	e	ESE	
15%	6		1	.5%			10%			5%			5%		50%	
Cou	rse	Т	his co	urse is	desig	ned to	make	e the st	tuden	ts conv	versan	it with	the ba	isic asp	ects of	
Descrip	otion	р	ower g	enera	tion, c	conserv	vation,	, and u	tilizat	ion of e	electri	cal en	ergy.			
Course Objective		2	<ul> <li>To impart knowledge on</li> <li>1. Electrical energy conservation, energy auditing and power quality.</li> <li>2. Principle and design of illumination systems and methods of heating welding.</li> <li>3. Electric traction systems and their performance.</li> <li>4. Industrial applications of electric drives.</li> </ul>													
Upon completion of this course, the students will be able to1. Demonstrate Economics of power generation and conservation.2. Apply and analyze the concepts of illumination, Industrial heating, a welding.Outcome3. Apply and analyze the concepts of Economic dispatch and computer cont of Power system.4. Analyse the performance of Electrical traction.5. Choose appropriate Industrial Electric Drives for various applications														-		
	•					•						anous	applic	ations		
Prerequis					Mach	nines, E	EB43	L7 - SO	id sta	te Driv	es					
CO, PO	AND I PO	PSU 1 PO	VIAPP PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	
СО	1	2	3	4	5	6	7	8	9	10	PO 11	12	1	2	3	
CO-1	3	2	3	2	2	-	-	-	_	_		_	2	2	1	
CO-2	3	3	3	3	3	-	-	_	_	-	-	_	2	2	1	
CO-3	3	3	3	3	3	-	-	_	_	-	-	_	2	2	1	
CO-4	3	2	3	2	2	-	-	-	_	_	-	_	2	2	1	
CO-5	3	2		2	2	-	-	_	_	-	-	_	2	2	1	
MODULE 1: ELECTRICAL ENERGY GENERATION AND CONSERVATION (9L+3T)=12 System load variation: System load characteristics, load curves - daily, weekly, and annual, load-duration curve, load factor, diversity factor. Reserve requirements: spinning reserves, cold reserves, hot reserves. Economics of generation, Number and size of units, cost of energy, tariff, need for conservation, conservation, methods, energy, saving, equipment, Energy, management, and																
auditing, improven <b>Suggeste</b> Bureau o	econ nent. d <b>Read</b> f ener	omics <b>lings:</b> gy eff	of ficienc	powei y, Enei	r fact	tor in	nprove	ement, act 200	sele	ection	of c	apacit	ors fo	r pf	BTL-2	
MODULE (9L+3T)=1		2:	ILLU	JMINA	ATION		ENGIN	IEERIN	G,	HE	ATING		AND	WE	LDING	
	1															

types of Metho genera <b>Sugge</b>	of lamps, energy ods of heating, r ator, welding trar <b>sted Readings:</b> nosity of eye, Fac	efficient lamps.	eating material, f ir characteristics	urnaces, typ	of illumination syst bes of welding, we COMPUTER	Iding CC	0-2 ГL-4
(9L+31		ECONOMIC	DISPATCH	AND	CONFORM	CONTR	NOL
Stater Priorit ordina metho hardw Sugge	ment of Unit Co y-list methods, f tion equations v od. Energy contro	orward dynamic vithout loss and v	programming app with loss, solutions - Monitoring, d	proach. Incre n by direct	:UC solution methemental cost curve method and λ-iteration and control. System	, co- ation	0-3 ГL-4
MODU (9L+31		4:		ELECTRIC		TRACTI	ION
Requir motor Sugge Diama	rements of tract s and control, mu sted Readings: agnetism, Magne	ltiple units, brakin	ng, recent trends i	n traction	ain movement, tra	CC BT	0-4 ГL-2
	JLE5:ELECTRIC	DRIVES	AND TH	EIR IN	IDUSTRIAL A	PPLICATIO	NC
(9L+31		<u> </u>					
					d transient loads,		0-5
-	sted Readings:	applications, mod	ern methods of s	peed control	of industrial drives		L-3
	on motors in Ind	ian Railways					
TEXT B		ian nanna ys					
1.		3) Generation of I	Electrical Energy,	Eurasia pub	lishing House, New	Delhi.	
2.					of electrical energy		Age
		) ltd, Second Editi					-
REFER	ENCE BOOKS						
1.	H Partab (2014 Edition.	) Art and Science	of Utilization of E	Electrical En	ergy, Dhanpat Rai &	k Co., Seco	ond
2.	and Application	s", CRC Press, Th	nird Edition.		avings, Productivity		
3.		Vhitman, Willian omson Delmar, Se		(2005) Refi	rigeration & Air	Condition	ıing
4.	—		—		<i>tion</i> , S K Kataria ar		
5	Gopal K Dubey Delhi.	v (2002) Fundame	ntal of Electrical	<i>drives</i> , Naro	sa Publishing House	e (P) ltd, N	√ew
E BOO	KS						
1.		com/download/el c0d603125c34618		y-dhanpat-			
2.		katariaandsons.c		px?producti	d=8012		
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ASSESS	MEN	T S	CHE	ME													
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15	5%			1	5%			10%			5%			5%		50%	
	Course escriptionStudents would be able to learn the specifications, installation commissioning and maintenance of the Transformer, Synchronous Mach Induction Motors												methods, iines, and				
Course Objecti			1. 2. 3. 4.	<ol> <li>Synchronous Machines Specifications and Installation methods</li> <li>Induction Motor Specifications, Installation methods and Commissioning Test</li> </ol>													
Course Outcon	ne		2. 3. 4.	Desc per Sele Mea curr Cone mac	cribe t the sta ct the sure t ent m duct hines	the spandar site a the ir achin comr and p	pecifica ds. and ins nsulatio es. mission protect	ations tall the on res ing te	applic e trans istance est an vices.	cable sform e of a nd P	er and armatu erform	alterr re an ance	ners ar nating o d field test	nd rota current windir on alt	machin ngs of a	achines as es. Iternating g current	
Prereq							on and	Distrik	oution	, Prot	ection	and s	witchg	gear			
CO, PO	) AN PO		PSO vo	MA PO	PPINO PO	G PO	PO	PO	PO	PO	PO	РО	PO	PSO	PSO	PSO	
СО	PO 1	2		РО 3	РО 4	РО 5	6	РО 7	8 8	9 9	10	PO 11	12	PSO 1	2 2	PSU 3	
CO-1	3		1	-	I	-	1	-	1	-		-	1	_	2	1	
CO-2	3		1	-	_		1		1	_	-	-	-	_	2	1	
CO-3	3	-	1	-	-	-	1	-	1	-	-	-	-	-	2	1	
CO-4	3		1	-	-	<u> </u>	1	-	1	<u> </u>	-	-	1	-	2	1	
MODI					-	elate	d, 2: M	odera	tely re	elate	d and 3	: Stro	ngly re	lated		N - 2D	
MODU a. Spec b. Insta code of and ger	ificati Illatio <sup>E</sup> prac	ions n: L tice	s: Pc Loca e for	ower a tion, s term	and dis site, s	electi	on, fou	Indatio	on det	ails (I	ike bol	ts size	e, their		er, etc),	3L+3P) CO-1 BTL-2	
Practical component: Identifying the types of transformer with their rating																	

Sugges	ted Readings:	
	ormer types	
MODU	LE II:SYNCHRONOUS MACHINES	9L+3P)
b. Inst cooling <b>Practic</b> To perf	ifications: As per BIS standards. allation: Physical inspection, foundation details, alignments, excitation systems, and control gear, drying out. al component: orm the heating of winding coil.	CO-2 BTL-2
	ted Readings:	
	of synchronous machines	
		(8L+3P)
<ul> <li>b. Inst apparate</li> <li>winding</li> <li>c. Com</li> <li>vibratic</li> <li>Practic</li> <li>To perf</li> <li>Sugges</li> </ul>	ifications for different types of motors, Duty, I.P. protection allation: Location of the motors (including the foundation details) & its control cus, shaft & alignment for various coupling, fitting of pulleys & coupling, drying of gs. missioning Test: Mechanical tests for alignment, air gap symmetry, tests for bearings, ons & balancing. al component: form the efficiency of induction motor. ted Readings: of induction motor	CO-3 BTL-3
	LE IV :SWITCH GEAR & TRANSFORMER	(8L+3P)
type & <b>Practic</b> To test <b>Sugges</b>	rds, types, specification, installation, commissioning tests, maintenance schedule, routine tests. Break down voltage of transformer. al component: the breakdown voltage of transformer oil with different gaps. ted Readings: and functions of switchgear	CO-4 BTL-3
TEXT BO	-	
1.	B.G Liptak (2005) <i>Instrumentation Engineers Handbook (Process Measurement &amp;</i> Chilton Book Co, CRC Press, Fourth Edition.	
2.	S. Rao (2004) <i>Testing &amp; Commissioning Of Electrical Equipment,</i> Khanna Publish edition.	ers, third
REFERE	NCE BOOKS	
1.	<i>The Industrial Design Reference &amp; Specification Book: Everything Industrial Designer Know Every Day</i> (2013) Paperback.	
2.	Standards-ANSI/ISA-75.01.01-2002 (60534-2-1 Mod): Flow Equations for Sizin Valves; ISA84 Process Safety Standards and User Resources (2011), Second Edition	_
E BOOK		
1.	https://www.engineeringbookspdf.com/download/?file=13023	
моос		
1.	https://nptel.ac.in/courses/108/105/108105064/	
2.	https://www.udemy.com/course/the-complete-electrical-power-control-and-protection	tion/

COURSE TITLE	ARTIFICIAL INTELLIGENCE FOR ELECTRICAL	CREDITS	3

						ENGI	NEERS								
COURSE		DE	EEI	34404			COUR	SE		РС		L-T-P	-S	3-0-	0-1
Versio n	1.	0		roval tails	2	3 ACN	1, 06.0	02.2021	L	LEAI	RNING	G LEVEL	-	BT	-3
ASSESS	VENT	<sup>-</sup> SC	HEME												
First Per Assess			Peri	cond iodical ssment		Assi	emina gnmei Project	nts/		Surprise Test / Quiz				ES	ε
15	%		1	L <b>5%</b>			10%			5%		5%		50	%
Cou Descri			The course describes the journey of AI technology. Various parameters of AI Technology and implemented for Electrical applications. Modeling and analysis of electrical systems with AI.												
Course Objectiv	e		Fuzzy lo 2.To ok neural r 3.To p compre 4.To an	cate sof ogic and oserve the networks oractice hensive alyze ge evelop th	gene he co s. the kno neti	etic Alg oncept conc wledge c algor	gorithi ts of f cept of e of fu	ms. eed fo of fuz zzy log geneti	rwaro zines: ic cor c ope	d neura s invo ntrol ar rations	lved d to d and g	works a in vai design t	and ab rious the fuz	out fee systems zy contr	dback and
Course Outcom			1.Apply techniq 2.Analy 3.Deve 4.Deve 5. Appl	vze fuzzir lop fuzzy lop gene y the Al	orwa ness / log etic a in el	ard ne involv ic cont Ilgorith ectrica	ed in v red in v rol for nm for al syste	various r applic applic ems.	ks, fe syste ation	edbacl ems an is in ele	k neu d fuzz ectrica	ral net y set th al engin	works neory. leering		arning
			Indamen		Elect	trical e	engine	ering							
CO, PO /				1 1	00	<b>DO</b>	<b>DO</b>	<b>DO</b>	DO	<b>DO</b>	00		DCO	<b>DCO</b>	000
СО	РО 1	РС 2	) PO 3		PO 5	PO 6	PO 7	PO 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	3		2	2	-	-	-	-	-	-	-	1	-	1
CO-2	3	E C	2	2	3	-	-	-	-	-	-	-	1	-	1
CO-3	3	3		2	3	-	-	-	-	-	-	-	1	-	1
CO-4	3	3		2	3	-	-	-	-	-	-	-	1	-	1
CO-5	3	3	-	2	3	-	-	-	-	-	-	-	1	-	1
MODU	C 1. /	\_+: <b>f</b>	1: Weal	kly relat			erate	iy relat	ed a	na 3: S	rong	iy relat	ea		
(9L)	C 1: A	AT LIT		i ai wetv	VOIR	12									
Introduction-Models of Neural Network – Architectures – Knowledge representation         – Artificial Intelligence and Neural networks – Learning process – Error correction         learning – Hebbian learning – Competitive learning – Boltzman learning – Supervised         learning – Unsupervised learning – Reinforcement learning – learning tasks.         Suggested Readings:         1. knowledge of AI and Neural network.         2. learning process like error correction, hebbian, competitive, boltzman, supervised, unsupervised and reinforcement.															

MODU (9L)	LE	2:	ANN		Paradigms
Multi – Radial E Sugges 1. back	Basis Function Netw ted Readings propagation algori	using Back propagation ork – Functional link, ne thm works-functional link, ne	twork – Hopfield Net	work.	CO-2 BTL-3
MODU (9L)		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Fuzzy	Logic
Introdu set ope Fuzzy re system <b>Sugges</b> 1.	erations – Propertie elations – Fuzzy log – Defuzzification m <b>ted Readings:</b>	ship function and set op	cartesian Product – Fuzzy Inference – Fu	Operations on	CO-3 BTL-3
MODU (9L)	-	4:	Geneti	с	Algorithms
Introdu Modelin crossov Rate – I operato Sugges	ng – Genetic oper ver – Multi point cr Inversion & Deletio ors – Generational c <b>ted Readings:</b>	Fitness Function-Rep rators – Crossover – S ossover-Uniform crossov n – Mutation operator – cycle-convergence of Ger rations, genetic algorithm	Single–site crossover ver – Matrix crossov Mutation – Mutation netic Algorithm.	r – Two-point er – Crossover	CO-4 BTL-3
MODU		APPLICATIONS	OF	AI	TECHNIQUES
control stability <b>Sugges</b> 1.	<ul> <li>– Single area systery) Reactive power content</li> <li>ted Readings:</li> <li>load forcasting, flow</li> </ul>	flow studies – Economi em and two area system ontrol – speed control of v studies, dispatch. y and speed control of De	n – Small Signal Stal f DC and AC Motors		CO-5 BTL-3
TEXT BO	DOKS	· · · · · · · · · · · · · · · · · · ·			
1.					
	PHI, New Delhi.	d G. A. V. Pai (2013), "Ne			
2	PHI, New Delhi. G. J. Klir and T. A.	d G. A. V. Pai (2013), "Ne Folger (2011), "Fuzzy set			
2	PHI, New Delhi. G. J. Klir and T. A. NCE BOOKS	· · ·	s, Uncertainty and In	formation"-PHI	, Pvt.Ltd.
2 REFERE	PHI, New Delhi. G. J. Klir and T. A. NCE BOOKS P. D. Wasserman, New York.	Folger (2011), "Fuzzy set	s, Uncertainty and In (2012), "Neural Cor	formation"-PHI mputing Theory	, Pvt.Ltd. & Practice" –
2 <b>REFERE</b> 1.	PHI, New Delhi. G. J. Klir and T. A. NCE BOOKS P. D. Wasserman, New York. S.N. Sivanandam, Berlin Heidelberg S	Folger (2011), "Fuzzy set Van Nostrand Reinhold S.N.Deepa (2008)," Intr	s, Uncertainty and In (2012), "Neural Cor oduction to Genetic	formation"-PHI nputing Theory Algorithms"- S	, Pvt.Ltd. & Practice" – pringer-Verlag
2 <b>REFERE</b> 1. 3.	PHI, New Delhi. G. J. Klir and T. A. NCE BOOKS P. D. Wasserman, New York. S.N. Sivanandam, Berlin Heidelberg S https://www.igi-g engineering/23783	Folger (2011), "Fuzzy set Van Nostrand Reinhold S.N.Deepa (2008)," Intr lobal.com/book/applicat	tions-artificial-intellig	formation"-PHI mputing Theory Algorithms"- S gence-electrical-	, Pvt.Ltd. & Practice" – pringer-Verlag
2 REFERE 1. 3. E BOOK	PHI, New Delhi. G. J. Klir and T. A. NCE BOOKS P. D. Wasserman, New York. S.N. Sivanandam, Berlin Heidelberg S https://www.igi-g engineering/23783	Folger (2011), "Fuzzy set Van Nostrand Reinhold S.N.Deepa (2008)," Intr lobal.com/book/applicat 32 dreads.com/book/show/	tions-artificial-intellig	formation"-PHI mputing Theory Algorithms"- S gence-electrical-	, Pvt.Ltd. & Practice" – pringer-Verlag

1.	https://www.coursera.org/learn/ai-for-everyone
2	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-
Ζ.	intelligence-fall-2010/lecture-videos/

COUR				ILI	UMIN	NATIO	N LABO	ORATO	DRY			CREDI	TS	1		
COUR			EEB	84431		COU	IRSE C	ATEGO	DRY	PC	2	L-T-P	P-S	0:0:	2:0	
Versio n	1. 0	A	pprov	al Det	ails	23 A	СМ, 0	6.02.2	021	LE	ARNIN	IG LEV	EL	BTI	4	
ASSESSN	SSESSMENT SCHEME															
First Cy	cle		Secon	d Cycl	е				Attend	lance				ES	F	
Assessm	nent		Asses	ssmen	t				Attent	anec				L	, <b>L</b>	
35%	•		35% 10% 20%													
Cours Descript		Т	This course focuses on design and analysis of illumination system													
		To impart knowledge on														
		1	1. Different luminaires and its effects on light distribution													
Course		2	2. Understanding the luminous efficacy of various luminaires													
Objective	es	3	3. The effect of cover glass and lamp focus on the beam spread													
						•		•		ferent		•				
					-							able to				
		1.	-	-									aracter	istics		
		2.				ect of r			in the	applied			nacici	131103		
Course	_					lizatior			l							
Outcome	2	3.														
		4.				inaire	-									
		5.									s on be	eam sp	read.			
Prerequi					••	lizatio	n and	Consei	vatior	1						
CO, PO				1		DO	BO	DO	DO	DO	DO	DO	DCO	DEO	DCO	
	0	PO 2	PO 3	РО 4	PO 5	PO 6	РО 7	PO 8	PO 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
	2	2	3	3	3	2	1	-	1	-	2	1	-	1	-	
CO-2	2	2	2	3	3	2	1	-	1	-	2	1	-	1	-	
	2	2	3	2	3	2	1	-	1	-	2	1	-	1	-	
CO-4	2	2	3	3	3	2	1	-	1	-	2	1	-	1	-	
CO-5	2	2	3	3	3	2	1	_	1	-	2	1	-	1	-	
				akly re	lated,	2: Mo	derat	ely rela	ated a	nd 3: 9	Strong	ly rela	ted			
LIST OF E	EXPE	RIM	NTS													

1	Study of Construction and function of each component of road/flood light etc.	
-	luminaries.	
	To plot the candlepower, power consumed, current drawn v/s voltage	
2	characteristic curve of an incandescent lamp and compare with the theoretical	CO 1
	curves.	CO-1,
3	To determine luminous efficiency of a luminaire.	BTL-4
	To plot the candlepower, power consumed, current drawn v/s voltage	
4	characteristic curve of a road lighting luminaire and compare with the theoretical	
	curves.	
5	To study the effect of reflectors on luminairs intensity distribution	CO-2,
5	To study the effect of reflectors on luminaire intensity distribution.	BTL-4
6	To determine utilization factor of a luminaire.	CO-3,
0		BTL-4
	To plot the candlepower, power consumed, current drawn v/s voltage	CO-4,
7	characteristic curve of a flood lighting luminaire and compare with the theoretical	CO-4, BTL-4
	curves.	DIL-4
8	To obtain polar curve of the light distribution of a flood lighting luminaire	CO-5,
0	To obtain polar curve of the right distribution of a flood righting furninance	BTL-4
TEXT B	DOKS	
1	D.C. Pritchard, (2016) Lighting, Routledge,	
2	Jack L. Lindsey, (1997) Applied Illumination Engineering, PHI.	
4	M.A. Cayless, (2012), Lamps and Lighting, Routledge,	
REFERE	NCE BOOKS	
1.	IS CODE 3646	
2	IS CODE 6665	
3	Ryer, Alex. Light Measurement Handbook. 2nd ed. Newburyport: International Lig	,ht <i>,</i> 2008.

COURSE TIT	TLE	POWER SYSTE	M SIMULATION LABORAT	ORY	CREDITS	1							
COURSE CODE		EEB4432	COURSE CATEGORY	РС	L-T-P-S	0:0:2:0							
Version 2	1.0	Approval Details	23 ACM, 06.02.2021	NING LEVEL	BTL-4								
ASSESSMEN	NT S	CHEME											
First Cycle	le	Second Cycle	Attend	lanco		ESE							
Assessmer	nt	Assessment	Attend		ESE								
35%		35%	109	%		20%							
Course Objectives		<ol> <li>Load flow a flows.</li> <li>Analyzing the flow a flow a flows.</li> <li>Identifying the flow a flow</li></ol>	<ul><li>flows.</li><li>2. Analyzing the fault in a transmission line</li><li>3. Identifying the transients in travelling waves</li></ul>										
Course Outcome		<ul><li>Upon completion of this course, the students will be able to</li><li>1. Determine the various line parameters of a transmission line</li><li>2. Analyse the transients in travelling waves.</li></ul>											

		5.	. Арр	ly load	d flow	analy	sis for	the gi	ven p	ower	systen	n netw	ork by	using	Gauss-
			Seid	al met	hod, I	Vewto	n-Rapl	hson n	nethoo	d and	FDLF a	nd det	termine	e line lo	sses.
		4	. Ana	lyze fa	ult in t	the tra	insmis	sion lir	ne usir	ng sho	rt circu	uit cap	acity.		
		5	. Ana	lyze th	e stab	ility of	f the g	iven po	ower s	system	n netw	ork us	ing swi	ng curv	e.
Prerequ	uisite	s: - EE	B4318	-Powe	r Syste	em An	alysis,	EEB42	18-Tra	ansmi	ssion a	nd Dis	stributi	on	
CO, PC					<u> </u>		<u>, ,</u>								
со	РО 1	PO 2	PO 3	РО 4	РО 5	РО 6	РО 7	РО 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	2	3	3	3	3	-	-	-	2	-	1	1	1	2	1
CO-2	2	3	2	3	3	-	-	-	2	-	1	1	1	2	1
CO-3	2												1	2	1
CO-4	2	3	3	3	3	-	-	-	2	-	1	1	1	2	1
CO-5	2	3	3	3	3	-	-	-	2	-	1	1	1	2	1
		1: Weakly related, 2: Moderately related and 3: Strongly related													
LIST OF												-			
1	Moo	delling	of tra	nsmiss	sion lir	ne.							-1, BTL		
2	Elec	Electromagnetic transients in travelling waves CO-2, BTL-4													
3	Forr	Formation of bus admittance matrix.													
4	Pow	er flov	w anal	ysis by	Gaus	s-Seida	al met	hod.				CC	\ <u>2</u> рт	тл	
5	Power flow analysis by Gauss-Seidal method.CO-3, BTL-4Power flow analysis using Newton-Raphson method.CO-3, BTL-4														
6	Pow	er flov	w anal	ysis by	/ Fast o	decoup	oled m	ethod	•						
7	Forr	natior	n of bu	s impe	edance	matri	x usin	g build	ing alg	gorith	m.		)-4, BT	L-4	
8	Sho	rt circı	uit ana	lysis o	f trans	missic	on line	•					, , , , , , , , , , , , , , , , , , , ,	2 .	
9	Stab	oility a	nalysis	of po	wer sy	stem.							)-5, BT	L-4	
10	Ana	lysis o	fswitc	hing s	urge u	sing E	TAP.					00	, D 1	2 .	
TEXT BC	OKS														
1	Had Delł		lat (20	)07) P	ower .	system	n anal	ysis, T	ata M	lcGrav	v Hill	Publis	hing Co	ompany	, New
2			P (200 New l		ower S	System	ı Stak	oility c	ind C	ontrol	, Tata	McG	iraw H	lill Pub	lishing
3					ehta (	2008)	Princi	oles of	Power	r Syste	em, S.C	Chand,	fourth	edition	
														McGra	
4		-	g comp			-									
REFERE	NCE E	BOOKS	5												
1.			•	•	•		niques	in po	ower s	systen	n Ana	lysis,	Tata N	1cGraw	- Hill
			g comp							+6					
2.			•					a pub							
3.	J. Edit		in Glo	verate	I (200	8) Pov	ver Sy	stem .	Analys	sis and	d Desi	gn, Ce	ngage	Learnir	ng, 4th

COURSE TITLE	RENEWABLE	ENERGY LABORATORY		CREDITS	1
COURSE CODE	EEB4434	COURSE CATEGORY	DE	L-T-P-S	0-0-2-0

Versio	n 1.	0	Appro	val De	etails		23 ACI	M, 06.0	02.202	21	LEARN	IING LI	EVEL	BT	L-4	
ASSES	SMEN <sup>®</sup>	T SC	HEME													
			Int	Internal AssessmentAttendanceES75%5%20												
					20%											
Course				To develop the skill for using different simulation software on re												
Descrip	otion		sources and technologies.													
				. To train the students in Renewable Energy Sources and technolo												
Course	•			. To impart knowledge on the charging and discharging character											•	
Object			3. То р	To provide adequate inputs on a variety of issues in harn											wable	
			Ener	Energy.												
			4. To r	To recognize current and possible future role of Renewable en											5.	
		Upon completion of this course, the students will be able to														
	1. Familiarize with the working of various renewable energy sources											urces				
	2. Analyze battery charging and discharging characteristics															
Outcor	ne	3. Analyze various renewable energy technologies														
		<ol> <li>Analyze the integration of renewable source power with grid.</li> </ol>														
Prereq	uisite	s: Ba	asic of re	newa	ble ene	ergy c	oncep	ts								
							-									
CO, P	1		SO MAI	PPIN(	Ĵ		1	1		1	T		1	T		
со	РО 1	PO	_	РО 4	РО 5	РО 6	РО 7	PO 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO	PSO 2	
CO-1	3	<b>2</b> 3	<b>3</b>	<del>4</del> 3	3	-	3	• -	9 1	- 10	1	- 12	1 3	<b>2</b>	3 2	
CO-2	3	3		3	3	-	3	-	1	-	1	-	3	2	2	
CO-3	3	1		3	3	-	3	-	1	-	1	-	3	2	2	
CO-4	3	3	1	3	3	-	3	-	1	-	1	-	3	2	2	
			1: Wea	kly re	lated,	2: Mo	derate	ely rela	ated a	nd 3: S	Strongl	y relat	ed			
						LIST	OF EX	PERIM	ENTS							
			istics (IV							ct of ti	ilt angl	e)				
			asureme		•			-						CO	-1	
			stics of v						•					BT		
			asureme				-	erato	•							
5. Eva	iluatio	n ot	cut-in s	peed a	and cut	-ott si	peed							СС	2	
6. Bat	tery c	harg	ging and	discha	arging o	harac	teristi	CS						BT		
7. Fin	ding	MPP	o across	PV r	panel	(varvi)	ng loa	nd / v	arving	, dutv		of D	C-DC			
	verte					(,		,	,	5 0.0.07	0,00	0. 2		CO	-3	
			MPPT al	gorith	m testi	ng								BT		
9. Im	pact o	f loa	d and w	ind sp	eed on	powe	er and	its qua	lity							
10. Int	egratio	on o	f solar /	wind p	ower	to gric	t									
														CO		
														BT	L-4	
TEXT B	00Kč															
ICVIR	OOKS															

1.	D.Yogi Goswami, Frank Kreith, Jan F. Kreider (2003) Principles of Solar Engineering, , Taylor
	& Francis, 2nd Edition
2.	Solanki, Solar Photovoltaics Fundamentals, Technologies and Applications (2012), PHI,
	Eastern Economy Edition.
3.	S.R. Wenham, M.A. Green, M.E. Watt, R. Corkish (2007) Applied Photovoltaics, ARC Centre
	for Advanced Silicon Photovoltaics and Photonics, Second Edition.
REFEREN	ICE BOOKS
1.	Martin A. Green (2008) Solar Cells Operating Principles, Technology, and System
1.	Applications, Prentice- Hall, Second Edition.
E BOOKS	
1.	https://www.taylorfrancis.com/books/mono/10.1201/b18119/principles-solar-
	engineering-yogi-goswami
2.	https://www.routledge.com/Applied-Photovoltaics/Wenham-Green-Watt-Corkish-
	Sproul/p/book/9781849711425
MOOC	
1.	https://www.coursera.org/learn/photovoltaic-solar-energy
2.	https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ee35/
3.	https://www.coursera.org/learn/wind-energy

COURSE TITLE	D	ESIGN PROJECT-V		CREDITS	1							
COURSE CODE	EEB4433	COURSE CATEGORY	РС	L-T-P-S	0-0-2-0							
Version	1.0	Approval Details	23 ACM, 06.02.2021	LEARNING LEVEL	BTL-6							
ASSESSMENT SC	HEME											
Review 1         Review 2         Review 3         Final Review												
10%												
Course Description	This course provides a solid foundation in core electrical engineering disciplines, critical thinking and problem-solving skills. Through the academic program students also develop skills to implement real time system also develop excellent writting and oral communication skills, learn to work as a team and project management.											
Course Objective	2.To provide the date of the scale of the pro	e students' ability in atabase in the respec ject that should be o g skills and give pra	ctive discipline a carried on.	ind also enable	them to know							
Course OutcomeUpon completion of this course, the students will be able to 1.Develop simple electrical and electronic models based on the knowledge gained. 2.Propose a project and defend it as a team. 3.Implement a real time system as proposed.Prerequisites: Basic Electrical and Computer Engineering subjects												
CO, PO AND PSC	) MAPPING											

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

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

To carry out a Design project and simple prototype in the area of interest based on the knowledge gained in Electrical and Electronics Engineering from previous semesters.

The students will carry out a project in one of the following Electrical and Electronics Engineering areas but with substantial multidisciplinary components:

- Power System Analysis
- Big Data and Analytics

Student groups will be formed (3/4 in a group) and a faculty member will be allocated to guide them. There will be three major reviews which will be carried out as listed below.

Review #	Requirement	Mark Weightage				
		Internal	External			
0	Area / Title selection	-	-			
1	Literature review / Proposal for the Project	10%	-			
2	Mathematical modelling/Circuit Design	20%	-			
3	Final simulation / Hardware presentation	20%	-			
End Semester Exam	Final Viva-Voce and project demonstration	-	50%			

#### SEMESTER VIII

COURSE	TITLE	PRO	DJECT & VIVA-VOCE			CREDITS	8						
COURSE	CODE	EEB4441	COURSE CATEGORY	PC	2	L-T-P-S	0-0-8-0						
Versio n	1.0	Approval Details	23 ACM, 06.02.	2021	RNING LEVEL	BTL-6							
ASSESSMENT SCHEME													
Review 1   Review 2   Review 3   Final Review													
10	%	20%	20%	50%									
Cou Descrij		critical thinking a students also deve	des a solid foundation and problem-solving elop skills to implem ral communication gement.	g skills. ent real ti	Throu ime s	igh the acader ystem also deve	nic program lop excellent						
Course Objective	9	knowledge gained	and develop electr a project and defence			ic prototype b	ased on the						

	3.Able to solve real time problem an electrical domain as a computer application
	Upon completion of this course, the students will be able to
Course	1.Develop simple electrical and electronic models based on the knowledge gained.
Outcome	2.Propose a project and defend it as a team.
outcome	3.Implement a real time system as proposed.

# Prerequisites: Basic Electrical and Computer Engineering subjects

CO, PC	CO, PO AND PSO MAPPING														
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	PS O 3
CO-1	3	3	3	3	3	3	-	-	3	-	3	3	3	3	3
CO-2	3	3	3	3	3	3	-	-	3	-	3	3	3	3	3
CO-3	3	3	3	3	3	3	-	-	3	-	3	3	3	3	3
CO-4	3	3	3	3	3	3	-	-	3	-	3	3	3	3	3

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

To carry out a project in the area of interest based on the knowledge gained in Electrical and Electronics Engineering from previous semesters.

The students will carry out a project in one of the following Electrical and Electronics Engineering areas but with substantial multidisciplinary components:

- Electrical Machine
- Machine Learning
- Artificial Intelligence
- Power System
- Computer application

Student groups will be formed (2/3 in a group) and a faculty member will be allocated to guide them. There will be three major reviews which will be carried out as listed below

Review #	Requirement	Mark Weightage			
		Internal	External		
0	Area / Title selection	-	-		
1	Literature review / Proposal for the Project	10%	-		
2	Mathematical modelling/Circuit Design	20%	-		
3	Final simulation / Hardware presentation	20%	-		
End Semester Exam	Final Viva-Voce and project demonstration	-	50%		

# **Departmental Electives**

COURSE	TITLE		SOL	AR ENE	RGY	SYSTEI	MS AN	D REG	ULAT	ION	C	REDITS	6	3	3	
COURSE	COD	Ξ	EEC	4251		COU	RSE CA	TEGO	RY	DE		L-T-P	P-S	3-0-	-0-0	
Versio n	1.0	A	pprova	al Deta	ils	23	ACM,	06.02.	2021		LEAR	NING L	EVEL	ВТ	L-4	
ASSESSN	/ENT S	SCHEN	ЛE													
First Per Assess		I Se	econd Asses	Period ssment		Assi	eminai gnmer Project	nts/	Surprise Test / Quiz			Attend	ance	ES	SE	
159	%		1	5%			10%			5%		5%	5	50%		
Cou Descrij		in: so wi	This course describes the fundamentals of solar power as it applies to the system installation. The main purpose of this course is to identify the key components of solar system and explain the functions of each component in the system. Leaners will understand the solar policies and MPPT techniques.													
Course Objective														ol and ation, lation		
Course       Upon completion of this course, the students will be able to         0utcome       1. Describe the fundamental of solar cell basics, roof top and off Grid Systems         2. Elucidate the different configurations and control techniques of solar solar installation         3. Describe different solar polices, Power Purchase Agreement, Energy savir payback         4. Model the solar thermal system and design the Active Systems by f-cha											solar s gy savin	ystem ng and				
Prerequi				-	ing Pł	nysics,	Electro	onic D	evices							
CO, PO	r 1		1	1												
со	РО 1	PO 2	PO 3	РО 4	РО 5	PO 6	PO 7	PO 8	PO 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
CO-1	3	2	3	-	2	-	2	-		-	-	-	2	2	<b>3</b>	
CO-2	3	3	3	-	2	-	2	-	-	-	-	-	2	2	1	
	-				_	_	2					<u> </u>	2		_	
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	1: Weakly related, 2: Moderately related and 3: Strongly related	
MODU	LE 1: SOLAR ENERGY TECHNOLOGY AND ENGINEERING (9L)	
Connec selectio Therma Sugges	ction to Solar Energy;Solar cell basics, Roof Top and Off Grid Solar Systems, Grid ed Solar System; Tracking / Static Solar Systems, Types of trackers, Tracker type n; Concentrating Solar Power, Single and multi-junction cell efficiency chart, I Storage Systems. ted reading: solar cell properties	CO-1 BTL-2
MODU (9L)	LE 2: SOLAR SUBSYSTEMS AND IN	STALLATION
Compo Inverte Yield/lo system	nents and subsystems of PV systems, Converters, different configurations; r location trade -off studies; Planning of solar installation, Conditions & limits, ss study, Yield assessment for photovoltaic systems; Monitoring and control diesel plants, other renewable sources. ted reading: Modelling of different configurations of converter using MATLAB.	CO-2 BTL-3
MODU	LE 3: F	REGULATION
Policies Industr Certific MODU (9L) Modelli Systems Passive; Sugges MODU (9L) Power Interfac	ng of Solar Thermal Systems and Simulations in Process Design, Design of Active by f-chart and Utilizability Methods; - Water Heating Systems, Active and Passive Heating and Cooling of Buildings; Solar Distillation, Solar Drying. ted Reading: Water pumping system, Solar car.	CO-3 BTL-3 SYSTEMS CO-4 BTL-4 CO-5 BTL-4
	t Concentrator; Biomimetic solar fuels.	
TEXT BO	DOKS D.YogiGoswami, FrankKreith, Jan F. Kreider (2003) Principles of Solar Engineer	ring, Taylor &
1	Francis ,2nd Edition.	- •
2	Solanki (2012) <i>Solar Photovoltaics- Fundamentals, Technologies and Applications</i> Economy Edition.	, PHI, Eastern
	S.R. Wenham, M.A. Green, M.E. Watt, R. Corkish (2007). Applied Photovoltaics, A	DC Contro for
3	Advanced Silicon Photovoltaics and Photonics, Second Edition.	RC Centre for
		ike centre for
	Advanced Silicon Photovoltaics and Photonics, Second Edition.	

1.	https://www.amazon.com/Solar-Cells-Applications-Prentice-Hall-electronics/dp/0138222703
2.	http://www.springer.com/in/book/9789027719300
MOOC	
1.	https://ocw.mit.edu/courses/edgerton-center/ec-711-d-lab-energy-spring-2011/solar/
2.	https://ocw.mit.edu/courses/edgerton-center/ec-s07-photovoltaic-solar-energy-systems-fall-2004/index.htm

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15	5%	15% 10% 5% 5%											50	%	
CourseStudents can demonstrate their knowledge on hazards, injuries and controls associated with the electricity. Selection and suitability of electrical equipment and protective systems. Inspection and maintenance requirements for the safe execution of electrical work/use of electrical equipment.1. Ta begin and begin a														t and	
Course Objecti		2.1	<ol> <li>To know about electrical safety and hazardous</li> <li>To know about the need of insulation for electrical apparatus.</li> <li>To recall the basics of electrical systems.</li> </ol>												
Course Outcon	ne	1.D 2.A 3. [ 4.   5. [	escrik nalyz Descri nvest Mainta	be elec e and be saf igate e ain ele	ctrical l apply v ety me electric ectrical	hazard various ethod f cal safe equip	s and s groun or low, ety and ment a	afety ding a , medi d provi and im	equipr nd boi um an de pre	will be a ment. nding te d high v ecaution nt stanc	chniqu oltage s in inc	equipr dustry		ēty.	
Prereq					a elect	rical el	nginee	ring							
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	://www.lanl.gov/safe	tv/electrical/docs/ele	ss Guide	reness_study_guide.pdf	
MOD (9L)	-	GROUNDING	AND	BONDING	TECHNIQUES
Gene equip conne syster electr low vo	ment bonding of ection of groundin m grounding-ground odes-use of ground oltage and high voltag ested Reading: groun	electrically conducti g and bonding equ ling electrode system ed circuit conductor ge systems. ding techniques in su	ing materials uipment- system n grounding conforger of for grounding	s- grounding of electrical and other equipment- m grounding- purpose of onductor connection to g equipment- grounding of dustry SAFETY	CO-2 BTL-4 METHODS
The switch distan for low Sugge	ning of power systen aces- calculating the w, medium and high v ested Reading: OSHA ://www.osha.gov/dte	em- lockout-tag out- required level of arc voltage systems- the o Electrical Safety Man	<ul> <li>flash hazard protection-safe one minute safe uel</li> <li>8/sh-17792-08</li> </ul>	/electrical_english_r6.pdf	CO-3 BTL-4 PROGRAMME
Electr policy meeti invest	programme implend ngs- safety audit Sigation Ested Reading: safety	mentation- employ accident preventior programs in industry	vee electrical n- first aid- re	scue techniques-accident	
	-	ELECTRICAL N	<b>IAINTENANCE</b>	AND	STANDARDS
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E BOO	KS
1.	Electrical Safety Handbook, 4th Edition, Kindle Edition by John Cadick (Author), Mary Capelli- Schellpfeffer (Author), Dennis K. Neitzel (Author), Al Winfield (Author)
2.	Peter E. Sutherland, Principles of Electrical Safety (eBook)
MOOC	
1.	https://www.mooc-list.com/course/introduction-national-electrical-safety-code-nesc-edx
2.	https://www.oshatrain.org/courses/mods/715e.html

COURS	E TIT	LE		BAS	SIC PY	THON	PROG	RAMN	ING			CREDIT	S	3	3
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CourseThe course is designed to provide Basic knowledge of Python. Python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language1. To understand the concept of Python basics															
Course Objecti			1. To ur 2.To kn 3.To im	ow abo	out the	e Data	Wrang	gling a	nd da		sform	ation			
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1: Weakly related, 2: Moderately related and 3: Strongly related         MODULE       1       -       PythonConcepts,       Data       Structures,       Classes         (91)       1       -       PythonConcepts,       Data       Structures,       Classes         Functions - Numeric Types - Sequences - Strings, Tuples, Lists and - Class Definition -       CO-1       BTL-3         MODULE       2       -       Data       Wrangling         (91)       0ata       Moranging and Merging DataSets - Reshaping and Pivoting - Data Transformation -       CO-2         String Manipulation, RegularExpressions.       Time series & Web       Scrapping         GoupBy Mechanics - Data Aggregation - GroupWise Operations and Transformations -       Pivot Tables and CrossTabulations - Date and Time Date Type tools - Time Series         Basics - Data Ranges, Frequencies and Shifting.       Data Acquisition by Scraping web apglications -Submitting a form - Fetching web pages - Downloading web pagesthrough form submission - CSS Selectors.       BTL-4         MODULE       4       Visualization       Northolage Raspberry       Pi         MODULE       5       -       Implementation       using Raspberry       Pi         MODULE       4       Visualization       Northolage       CO-4       BTL-4         MODULE       5       -	CO-5	3	3	3	2	3	-	-	-	-	-	-	-	-		1	1
(9L)         Interpreter – Program Execution – Statements – Expressions – Flow Controls – Functions - Numeric Types – Sequences - Strings, Tuples, Lists and - Class Definition – Constructors – Inheritance – Overloading – Text & Binary Files - Reading and Writing.       CO-1 BTL-3         MODULE       2       –       Data       Wrangling (1)         Combining and Merging DataSets – Reshaping and Pivoting – Data Transformation – String Manipulation, RegularExpressions.       CO-2 BTL-4       BTL-4         MODULE       3       – Data       Aggregation – GroupWise Operations and Transformations – Pivot Tables and CrossTabulations – Date and Time Date Type tools – Time Series Basics – Data Ranges, Frequencies and Shifting.       CO-3 BTL-4         Data       Aggregation – GroupWise Operations and Transformations – Pivot Tables and CrossTabulations – Date and Time Date Type tools – Time Series Basics – Data Ranges, Frequencies and Shifting.       CO-3 BTL-4         Data       Acquisition by Scraping web applications –Submitting a form – Fetching web pages – Downloading web pagestribuigh form submission – CSS Selectors.       CO-4 BTL-4         MODULE       4       –       Visualization       In         MAtplot lib package – Plotting Graphs – Controlling Graph – Adding Text – More (9L)       CO-4 BTL-4       BTL-4         MODULE       5       –       Implementation       using Raspberry Pi       CO-5 BTL-4         MODULE       5       –       Implementation       Usin			1	L: Wea	kly re	lated,	2: Mo	derate	ely rela	ated a	nd 3: S	trong	ly relat	ted			
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(9L)       Combining and Merging DataSets – Reshaping and Pivoting – Data Transformation –       CO-2 BTL-4         String Manipulation, RegularExpressions.       BTL-4         MODULE 3 - Data Aggregation, Group Operations, Time series & Web       Scrapping (9L)         GoupBy Mechanics – Data Aggregation – GroupWise Operations and Transformations – Pivot Tables and CrossTabulations – Date and Time Date Type tools – Time Series Basics – Data Ranges, Frequencies and Shifting.       CO-3 BTL-4         Data Acquisition by Scraping web applications – Submitting a form - Fetching web pages – Downloading web pagesthrough form submission – CSS Selectors.       CO-4 BTL-4         MODULE 4 - Visualization in Python (9L)       Python         MADIOLE 5 – Implementation using Raspberry Pi (9L)       Raspberry Pi (9L)         Working with Raspberry Pi 3 Model - Installing OS and Designing Systems using Raspberry pi - Configuring Raspberry Pi for VNC Connection - Getting introduced to Linux OS       CO-5 BTL-4         Basic Linux commands and uses - Getting Started with Python - Interface sensor and Actuator with Raspberry Pi       CO-5 BTL-4         Mark Lutz (2016), "Learning Python", O'Reilly Media, 5th Edition.       CO-5 BTL-4         Rerence E BOOKS       Brandon Rhodes and John Goerzen (2016), "Foundations of Python Network Programming: 1. The Comprehensive Guide to Building Network Applications with Python", Apress, Second Edition.         1.       https://realpython.com/best-python-books/       MOOC	Construe	ctors	– Inhe	eritanc	e – Ov	erload	ling –	Text &	Binar	y Files	- Read	ling an	d Writ	ing.		DI	L-3
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COURSE	TITLE	WIND ENER	RGY CONVERSION SYSTE	MS	CREDITS	3
COURSE	CODE	EEC4266	COURSE CATEGORY	DE	L-T-P-S	3-0-0-0
Versio n	1.0	Approval Details	23 ACM, 06.02.2021	LEARN	ING LEVEL	BTL-4
ASSESSN	IENT SC	CHEME				

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Descr	iptior		ystem.					· ·	• •	6.14/2					
1. To learn the design and control principles of Wind turbine2. To learn about wind turbines and aerodynamic theory3. To understand the concepts of fixed speed and variable speedObjective4. To learn the concept of wind farm and project5. To learn cost economics												speed	, wind	energy	
	<ul> <li>5. To learn cost economics</li> <li>Upon completion of this course, the students will be able to</li> <li>1. Explore the fundamentals of Wind Energy and understanding the wind characteristics and power production.</li> </ul>														
Prerequ					es										
<b>CO</b> , <b>P</b> (			O MAP												
со	РО 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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CO-3	2	2	-	1	1	-	3	-	-	-	-	-	-	1	3
CO-4	-	2	-	-	1	-	3	-	-	-	1	-	-	1	3
CO-5	1	1	-	-	1	-	3	-	-	-	1	-	-	1	3
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MODU	LE I: V	VIND	ENERG	FUNE	DAME	NTALS								(9L)	
MODULE I: WIND ENERGY FUNDAMENTALS Wind energy basics, Components of wind turbine, wind speeds, wind characteristics and power production, terrain Roughness, turbulence, boundary layers, Betz coefficient limits Practical component: Simulation of wind characteristics Suggested Readings: Renewable energy basics															D-1 "L-2
				NES AN	ID AE	RODYN		THEO	RY					(9L)	
MODULE II: WIND TURBINES AND AERODYNAMIC THEORY(9L)Horizontal Axis and Vertical Axis wind turbine, Power developed-Thrust-Efficiency-Rotor selection-Rotor design considerations-Tip speed ratio-No. of Blades-Blade profile-Power Regulation-yaw control-Pitch angle control-stall control- Schemes for maximum power extraction, Air foil terminology , blade element theoryCO-2Practical component:BTL-2Simulation of Wind turbines using MATLABSuggested Readings: Manufacturing of wind turbines															
		-	) GENEF		S									(9L)	

Constant Speed Systems:	
Generating Systems- Constant speed constant frequency systems -Choice of Generators-	
Deciding Factors-Synchronous Generator-Squirrel Cage Induction Generator	
Variable speed systems:	
Need of variable speed systems-Power-wind speed characteristics-Variable speed	
constant frequency systems synchronous generator- DFIG- PMSG - Variable speed	CO-3
variable frequency schemes.	
Grid Connected systems:	BTL-3
Wind interconnection requirements, low-voltage ride through (LVRT)	
Practical component:	
Simulation of Wind generator using MATLAB	
Suggested Readings:	
Literature review of various wind generator control schemes	
MODULE IV: CONCEPT OF WIND FARM AND PROJECT	(9L)
Project planning, personal measurement, anemometer measurement, wind direction	
measurement, site selection, operation and maintenance, environmental concerns	
Practical component:	CO-4
Simulation of wind farms	BTL-2
Suggested Readings:	
Study of erection of wind farms	
MODULE V: COST ECONOMICS	(9L)
Fixed and variable costs, value of wind energy, return on investment, wind energy	
market, cash flow of wind power projects	
Practical component:	CO-5
Cost analysis using software	BTL-2
Suggested Readings:	
Case study of wind energy markets	
TEXT BOOKS	
1. S.N.Bhadra, Kastha, S.Banerjee (2014) Wind Electrical Systems, Oxford University Pr	es
2. Siraj Ahmed (2013) <i>Wind Energy Theory and Practice</i> , PHI, 2 <sup>nd</sup> Edition.	
2.   Straj Ahmed (2013) <i>Wind Energy Theory and Practice</i> , PHI, 2 <sup>nd</sup> Edition. <b>REFERENCE BOOKS</b>	
REFERENCE BOOKS	
<b>REFERENCE BOOKS</b> 1.       L.L.Freris (1990) Wind Energy conversion Systems, Prentice Hall.	Handbook John
REFERENCE BOOKS         1.       L.L.Freris (1990) Wind Energy conversion Systems, Prentice Hall.         2.       Joshua Earnest (2013) Wind Power Technology, PHI learning Pvt. Ltd-New Delhi.	Handbook John
REFERENCE BOOKS         1.       L.L.Freris (1990) Wind Energy conversion Systems, Prentice Hall.         2.       Joshua Earnest (2013) Wind Power Technology, PHI learning Pvt. Ltd-New Delhi.         3.       Tony Burton, David Sharpe, Nick Jenkins, Ervin Bossanyi (2011) Wind Energy	Handbook John
REFERENCE BOOKS         1.       L.L.Freris (1990) Wind Energy conversion Systems, Prentice Hall.         2.       Joshua Earnest (2013) Wind Power Technology, PHI learning Pvt. Ltd-New Delhi.         3.       Tony Burton, David Sharpe, Nick Jenkins, Ervin Bossanyi (2011) Wind Energy Wiley & Sons, Ltd , Second Edition.	
REFERENCE BOOKS         1.       L.L.Freris (1990) Wind Energy conversion Systems, Prentice Hall.         2.       Joshua Earnest (2013) Wind Power Technology, PHI learning Pvt. Ltd-New Delhi.         3.       Tony Burton, David Sharpe, Nick Jenkins, Ervin Bossanyi (2011) Wind Energy Wiley & Sons, Ltd , Second Edition.         E BOOKS	

COURSE	TITLE	HIGH	VOLTAGE ENGINEER	ING		CREDITS	3
COURSE	OURSE CODE EEC4267		COURSE CATEGO	DE	L-T-P-S	3-0-0-0	
Version	/ersion 1.0 Approval Details		23 ACM, 06.02.20	21	LEAR	NING LEVEL	BTL-3
ASSESSM	ENT SC	CHEME					
First	t	Second	Seminar/	Surp	orise Test	Attendance	ESE
Periodi	Periodical Periodical		Assignments/				ESE

Asses	sment		Asses	ssment	:	P	roject											
1	5%		1	5%			10%			5%		5%		50	%			
	urse iption	ic st th	lentifie tudent ie	es the e s for e	effect ffecti	of extr ve part	a high ticipati	voltag on in	ge on t	he envi	ronme	quid, ga nt. This Itage po	module	e will pr	epare			
electrical engineering environment.1.To estimate over voltage levels in various Electric power equipment basic design of protection devices2. To evaluate high voltage withstand of various insulating media.3. To evolve basic design of various HV test equipment 4. To apply various measuring principles in high voltage.5. To explain HV test requirements and evaluate insulation coordination																		
Course Outcon	ne	1 2 3 ar 4 in 5 ar	Upor Identi Descr Evalu d imp Con Dulse Des d circu	n comp ify caus ibe the ate an ulse cu npare curren cribe d uit brea	oletio ses ar e theo d cor rrent differ ts. liffere akers	n of thi nd prot ories be npare o rs. rent m ent test	s cours ection chind th differer ethods ting me	se, the methone bea nt methons for the ethods	e stude ods of ak dow thods measu	ents will switchi n of ga to gene ring AC	be abl ng and ses, liq erate A C, DC		ng over I solids. nd imp npulse	voltage ulse vo voltage	s Itages s and			
Prerequisites: EEB4316 - Power Electronics and Drives																		
CO, PO	1		l	1		T	Г Г Г											
со	PO 1	РО 2	PO 3	РО 4	PO 5	PO 6	PO 7	РО 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3			
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impu	Ilse generators	BTL-3
MO	DULE 4: : MEASUREMENT OF HIGH VOLTAGES AND CURRENTS	(9L)
digit	surement of High DC, AC, high frequency AC and impulse voltages and currents, al techniques in high voltage measurements gested Reading: Oscilloscope for impulse voltage and current measurements	CO-4 BTL-2
MOI	DULE 5: HIGH VOLTAGE TESTING AND INSULATION COORDINATION	(9L)
testi	voltage testing of electrical power apparatus- Power frequency AC, DC and impulse ng, international and national standards, insulation coordination gested Reading: Measurement of D.C Resistivity.	CO-5 BTL-2,3
TEXT	BOOKS	
1.	M.S. Naidu and V. Kamaraju (2013), 'High Voltage Engineering', Tata McGraw Hill, 5 $^{ m th}$	Edition.
REFE	RENCE BOOKS	
1.	E. Kuffel and W.S. Zaengl (1986), 'High Voltage Engineering Fundamentals', Per Oxford, London.	gamon press,
E BO	OKS	
1.	https://www.springer.com/gp/book/9783642119927	
2.	Heeps://www.elsevier.com/books/high-voltage-engineering/Hammond/978-0-08-02	4212-5
MOC	DC C	
1.	https://nptel.ac.in/courses/108/104/108104048/#	

COUR	_	POWE	R PLANT ENGINEERII	NG		CREDITS	3
COUR	-	EEC4268	COURSE CATEGO	RY	РС	L-T-P-S	3-0-0-1
Versio n	1.0	Approval Details	23 ACM, 06.02.20	BTL-4			
ASSESSIV	1ENT S	CHEME					
First Periodi Assessm	cal	Second Periodical Assessment	Seminar/ Assignments/ Project	Su	rprise Test / Quiz	Attendance	ESE
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Cours	se	This course contains		ntio			50% ergy sources
Course Objective	9	<ol> <li>To introduce stud</li> <li>To familiarize the</li> <li>To expose the stu</li> </ol>	students to the wor	king	of power pla	nts based on dif	
Course Outcome	2	Upon completion of 1. Describe and ar related to thermody operation. 2. Analyze the worl comprising the plant	alyze different typ mamics and various king and layout of s	es o terr	f sources a ms and facto n power pla	nd mathematic ors involved wit nts and the diff	h power plant

		3.	Comb	oine co	ncept	s of p	revious	sly lea	rnt co	urses	to defi	ne the	workin	ng princ	iple of
													with p	• •	•
		ty	pes.												
		4	. Desc	cribe t	he wo	orking	princi	iple a	nd ba	sic co	mpone	ents of	the n	uclear	power
		pla	ant and	d the e	conon	nic and	l safety	/ princ	iples ir	nvolved	d with i	it.			
		5.	Discu	ss the v	workir	ıg prin	ciple a	nd ba	sic con	nponei	nts of t	the hyd	lro-elect	tric plar	nts and
		th	e econ	iomic p	rincip	les anc	l safet	y preca	aution	s involv	ved wit	h it.			
	•			Electric	al Ma	chines	;								
CO, P(		PSO N	1	1		1	1		1	T	1	г			
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CO-2	3	3	3 2 2											-	1
CO-3	3	3	2	2	-	-	-	-	-	-	-	-	-	-	1
CO-4	3	3	2	2	-	-	-	-	-	-	-	-	-	-	1
CO-5	3	3	3	2	-	-	-	-	-	-	-	-	-	-	1
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MODI	JLE I :	THERM	MAL PO	OWER I	PLANT	S									(10L)
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							-					econon	nisers,	BT	'L-3
				oling to				precip	itators	s, air-pr	eheate	ers			()
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				nped st <b>OWER F</b>										DI	L-4
IVIODU				JVVER		3									(9L) D-3
								ar rea	ctors,	nuclea	r powe	er plant	S		'L-4
				IESEL P							_				(9L)
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-			-	inter	coolin	g and	reger	neratio	on, die	esel er	ngine	power	plant		L-4
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TEXT B			15) "	Power	Dlant	Engine	orin~"	Tata M	AcCre	м, Ц:Ш <del>т</del>	bird of	dition			
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REFER					(2047)	"		· .				<b>(</b> D)			
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			-
COURSE TITLE	INTERNET OF THINGS	CREDITS	3

COURSE	CODE		EEC	24269						РС		L-T-P	-S	3-0	-0-0
Version	1.0	Δ	pprov	al Det	ails			5.02.20	21	LEA	RNIN	IG LEVE	EL	BT	'L-3
ASSESSM	ENT S	CHEM	IE												
First Peri Assessn		Se		Period ssmen		Assi	eminar gnmen Project	nts/		urprise st / Qui	z	Attenda	ance	E	SE
15%	, b			.5%			10%			5%		5%			0%
Cours								•	ot of	Intern	et of	f Thing	s, IOT	sensor	s, IOT
Descrip	tion						d proje								
Course Objective		2. 3. m 4.	To fan To ap odule To lea	niliariz oply te to IOT rn the	e with chnol proje impo	n indus ogical cts rtant c	trial se advano	ensors a ces of ts of IO	and i wirel	applicat ntegrat ess sen velopm	ed IO sor s	T sensc tructur	e, RF n	nodule,	power
Course Outcome		2. 3. m 4.	Descri Apply Apply odule Descr	be the indust y tech to IOT ibe an	func trial s nolog proje d app	lament ensors ical ad cts	tals and and in lvances import	d appli itegrate s of w	catio ed IO virele:	lents wi ns of Io T sensc ss sens ts of IC	T ors or st	ructure		nodule, mples	power
Prerequis					bedde	ed Syst	ems, C	Progra	amm	ing					
CO, PO AN	ND PS PO	0 MA PO	PPING	PO	PO	РО	PO	РО	PO	PO	PO	PO	PSO	PSO	PSO
СО	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO-1	3	3	1	1	-	-	-	-	-	-	-	-	3	3	1
CO-2	3	3	1	1	-	-	-	-	-	-	-	-	3	3	1
CO-3	3	3	1	1	-	-	-	_	_			_	3	3	
CO-4	3	3	1	1	-	-			-	-	-	_	5	3	1
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		1: Weakly related, 2: Moderately related and 3: Strongly related												-	
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MODULE Internet o IoT– IoT M	f Thin Iap De	1: RODU gs Pro evice	Weak JCTIOI	k <b>ly rela</b> N —Defin	nition-	- Scope	e–Sens	ors for	· IoT /		rongly		3 3 ed	3 3 CC	1
Internet o IoT– IoT M Suggested	f Thin lap De <b>l Activ</b>	1: RODU gs Pro evice vice	Weak JCTIOI Omises	k <b>ly rela</b> N —Defin	nition-	- Scope	e–Sens	ors for	· IoT /		rongly		3 3 ed	3 3 CC	1 1 (9L) D-1 [L-3
Internet o IoT– IoT M Suggested MODULE	f Thin Iap De <b>I Activ 2: IOT</b>	1: RODU gs Pro evice vity: C SENS	Weak JCTIOI omises collect	<b>ly rela</b> N —Defin enviro	nition-	- Scope	e–Sens a usinį	ors for g sensc	· loT / ors.	Applica	rongl tions-	-Structi	3 3 ed	3 3 CC	1 1 (9L) D-1
Internet o IoT– IoT M Suggested MODULE Industrial Characteri Sensors &Characte Descriptio Suggested	f Thin lap De <b>I Activ</b> <b>2: IOT</b> senso stics– D eristics n & Cl <b>I Activ</b>	1: RODU gs Pro evice vity: C SENS Drs – Advar escrip s–Sens haract vity: A	Weak JCTIOI omises collect ORS Descr Descr otion sors' S teristic opply a	enviro -Defin enviro iption Genera & C warm cs-loT ( ppropi	nition- nmen & Cl ation charac – De Gener riate I	- Scope ital dat haracte – Des teristic scriptic ration l oT pro	e–Sens a using eristics criptio cs–Poly on & C Roadm	sors for g sensc —First n & C ytronic Charact	· loT / ors. Gene Chara s S terist	Applica eration cteristi ystems ics–Prir	tions-	-Structu escripti egrate Descri Electror	3 3 ed ure of on & d IoT iption nics –	3 3 CC BT	1 (9L) D-1 L-3 (9L) D-2 L-3
Internet o IoT– IoT M Suggested MODULE Industrial Characteri Sensors &Characte Descriptio	f Thin lap De <b>I Activ</b> <b>2: IOT</b> senso stics– D eristics n & Cl <b>I Activ</b>	1: RODU gs Pro evice vity: C SENS Drs – Advar escrip s–Sens haract vity: A	Weak JCTIOI omises collect ORS Descr Descr otion sors' S teristic opply a	enviro -Defin enviro iption Genera & C warm cs-loT ( ppropi	nition- nmen & Cl ation charac – De Gener riate I	- Scope ital dat haracte – Des teristic scriptic ration l oT pro	e–Sens a using eristics criptio cs–Poly on & C Roadm	sors for g sensc —First n & C ytronic Charact	· loT / ors. Gene Chara s S terist	Applica eration cteristi ystems ics–Prir	tions-	-Structu escripti egrate Descri Electror	3 3 ed ure of on & d IoT iption nics –	3 3 CC BT	1 (9L) 0-1 'L-3 (9L)

<u> </u>	ested Activity: Establish virtual sensor network.	
MOD	DULE 4: IOT DEVELOPMENT EXAMPLES	(9L)
ACOE	EM Eagle – EnOcean Push Button – NEST Sensor – Ninja Blocks -Focus on Wearable	CO-4
Electr	ronics	BTL-3
MOD	OULE 5: IOT	PROJECTS
(9L)		
Hardy reprevalue hardy Calcu Raspl settir curre <b>Sugg</b>	ting the sensor project - Preparing Raspberry Pi/ ARM Cortex - Clayster libraries - ware-Interacting with the hardware - Interfacing the hardware- Internal esentation of sensor values - Persisting data - External representation of sensor es –Exporting sensor data - Creating the actuator project- Hardware - Interfacing the ware -Creating a controller - Representing sensor values - Parsing sensor data – lating control states - Creating a camera - Hardware - Accessing the serial port on berryPi/ ARM Cortex - Interfacing the hardware - Creating persistent default ngs –Adding configurable properties - Persisting the settings - Working with the nt settings -Initializing the camera <b>ested Activity:</b> Interface RaspberryPi with sensors and actuators.	CO-5 BTL-4
REFE	RENCE BOOKS	
1.	Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier (2014), 'Technologies S Internet of Things Businesses & Market Trends 2014 -2024', Yole Development Copy	
2.	Peter Waher (2015), 'Learning Internet of Things', Packt Publishing.	
3.	Editors Ovidiu Vermesan Peter Friess (2017), Internet of Things – From Research a to Market.	and Innovation
4.	N. Ida, Sensors (2014), Actuators and Their Interfaces, Scitech Publishers.	
E BOC	)KS	
1.	https://consense.com.ua/en/lib/book/learning_internet_of_things	
2.	https://www.researchgate.net/publication/263970385_Internet_of_Things _From_Research_and_Innovation_to_Market_Deployment_Chapter_4 _Internet_of_Things_Global_StandardisationState_of_Play	
MOO	c	
1.	https://www.coursera.org/specializations/iot	
2.	https://www.coursera.org/specializations/internet-of-things	
3.	https://www.edx.org/course/introduction-to-the-internet-of-things-iot	
4.	https://onlinecourses.nptel.ac.in/noc21_cs17/preview	

CO	URSE TITLE	ALTERNATIVE	ALTERNATIVE SOURCES OF ENERGY							
CO	URSE CODE EEC4351		COURSE CATEGORY		DE	L-T-P-S	3:0:0:0			
Ve rsi on	1.0	Approval Details	23 ACM, 06.02	2.2021	LEA	ARNING LEVEL	BTL-3			
ASS	ESSMENT SCI	HEME								
	t Periodical sessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surp Test /		Attendance	ESE			
	15% 15%		10% 5%		5% 5%		50%			

Course		Enable the students to develop managerial skills to assess feasibility of alternative approaches and drive strategies regarding Alternative Sources of Energy													
Description		-													
													dustry/		
Course	2.	To k	now a	bout t	he oc	ean e	nergy	and t	he ap	plicat	ions ii	n indu	stry/ho	me.	
Objective	3.	To k	now t	he geo	othern	nal en	ergya	and pr	rocess	s to st	orage	•			
	4.	To k	now t	he imp	oortar	nce of	powe	r flow	ı man	agem	ent al	ong w	ith tecł	nniques	5.
		Upo	n com	pletio	n of tl	his co	urse, t	the stu	udent	s will	be ab	le to			
	1.	Des	cribe t	he bas	sic cor	ncepts	of al	ternat	ive sc	ources	ofen	ergy			
	2.	Faci	litate f	the co	ncept	. work	ing a	nd apr	olicati	ons o	f winc	d ener	gv		
Course	3.				-		-						or indu	istrv/h	hme
Outcome	4.				-		-						nal, tida	-	
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Suggested Readings:	
Biomass power generation technology and policy.	
MODULE 4: OTHER ALTERNATIVE SOURCES OF ENERGY	(6L+3L=9)
Other alternative sources of energy (Tidal, Geothermal, OTEC); Issues of intermittence storage and grid integration; alternative sources of energy projects <b>Practical component:</b> Range of different Tidal, Geothermal, and OTEC. <b>Suggested Readings:</b> Tidal, Geothermal, and OTEC, power generation technology and policy.	y, CO-4 BTL-3
MODULE 5: ENERGY MANAGEMENT	(6L+3L=9)
Energy economics, energy audit, energy conservation, cogeneration, waste heat recover concept of total energy system, combined cycle plant, energy management, scope alternate energy sources in India <b>Practical component:</b> Energy management in home or university. <b>Suggested Readings:</b> Case study on energy management in industries	-
Case study on energy management in industries TEXT BOOKS	
1.       Twidell J., Weir T. (2015). Renewable Energy Resources. Routledge. ISBN: 0415         Edition.       2.         2.       Kandpal T.C., Garg H.P. (2003). Financial Evaluation of Renewable Energy T. Macmillan Publishers India Limited. ISBN: 1403909520.         3.       N.K.Giri (2012) Alternate Energy (Sources, Applications and Technologies), Khann first Edition.	Fechnologies.
REFERENCE BOOKS	
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3. N K Bansal (2014). Non-Conventional Energy Resources, Vikas Publishing, second e	dition.
E BOOKS	
1. http://nptel.ac.in/courses/112104225/22	
<ol> <li>https://www.amazon.in/Integration-Alternative-Sources-Energy-Wiley-ebook/dp/BC</li> </ol>	00W3WIWI
MOOC	
1. http://nptel.ac.in/courses/108103009/34	
2. http://nptel.ac.in/courses/Webcourse-contents/IISc-BANG/notused/Non- Conventional%20Energy%20Systems-/Learning%20Materail%20-%20NCES.pdf	

COURSE TITLE		POWER QUALITY CREDITS 3									
COURSE CODE		EEC4352	COUR	SE CATEGORY	РС		L-T-P-S	3-0-0- 0			
Version	1.0 Approval Details			23 ACM, 06.0	2.2021	L	EARNING LEVEL	BTL-4			
ASSESSMENT SCHEME											

First Periodical Assessment	Se	econd Asse	Perio ssme			Assi	eminar gnmer Project	nts/		rprise t / Qui		Atter	ndance		ESE
15%		1	L5%				10%			5%		5	5%		50%
Course Description		y pro				-						•	•		e power e these
Course Objective	2. 3. 4. 5.	<ol> <li>To determine the various power quality issues.</li> <li>To explain concept of power and power factor in single-phase and three-phase systems supplying nonlinear loads.</li> <li>To examine the active compensation techniques used for reactive power compensation, load balancing, power factor correction, and load voltage regulation.</li> <li>To develop active filters for harmonics elimination.</li> <li>To explain power quality improvement in SMPS, drive systems, and renewable energy systems.</li> </ol>													
Course Outcome	1. 2. 3.	<ul> <li>Students will be able to</li> <li>1. Describe the power quality issues like Overloading, under voltage, sustained interruption; sags and swells; waveform distortion and Total Harmonic Distortion</li> <li>2. Evaluate the sources and effects of transient over voltages and the surge arresters</li> <li>3. Analyse the fundamental idea in harmonics and the associated protection schemes</li> <li>4. Analyse the effects of harmonics in the power system and grounding techniques</li> </ul>													
Prerequisites						-					-1	lity of p			
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CO-3	3	3	2	1	2	-	-	-	-	-	-	-	1	2	1
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SuggestedReading: https://www.wiley.com/en- us/Understanding+Power+Quality+Problems%3A+Voltage+Sags+and+Interruptions-p-															
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MODULE II: TRANSIENT OVERVOLTAGES (9L)															
Sources of						anaci+	or curi	tchin	σn	nagnifi	catio	on of	capacit		(9L) CO-2
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for over vol	Itage protection	: Surge				
		-	essors, isolation t	ransformers,	low pass filters	,
			lity surge arrest			
-	shielding, line ar					
	ges, cable protec					
Suggested R	Reading: Causes a	and Effects of Tr	ansient Voltages			
MODULE	111:		FUNDAMENTAL	s c	OF HA	RMONICS
(9L)						
		-	ent distortion, h			
			ds, locating harmo			e CO-3 BTL-4
			able protection an onics causes and e		ter scheme.	DIL-4
MODULE	IV:		HARMONINCS,	WIRING	AND GR	
(9L)			nativionites,	Winned		
· · ·	armonic distortio	on - harmonic	distortion evalua	tion, principle	es for controlling	g
			onic distortion –	• • •		-
induction fu	irnaces - IEEE st	andard 519-199	2 – over view of	EC standards	on harmonics	- CO-4
reasons for	grounding –	typical wiring a	and grounding pr	roblems – iso	olated ground -	- BTL-4
summary of	wiring and grour	nding solutions.				
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MODULE	V:	PO\	WER	QUALITY	MOI	NITORING
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			lications of expe magnetic compati		- power quality	BTL-4
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		n. Mark.F. McG	Granagham (2012)	. Electrical Po	ower Systems (	Duality, 3 <sup>rd</sup>
1.	Edition, McGra				oner eysterns (	<b>L</b> uancy) o
	,		A. S. Masoum (201	1). Power Qu	ality in Power Sy	stems and
2.			n, Academic Press.	•	, ,	
3.	Francisco C. D	e La Rosa (2006)	). Harmonics and I	Power System	os, 1 <sup>st</sup> Edition, CR	C Press.
REFERENCE I	BOOKS					
1.	Angelo Baggir	i (2008) <i>Handbo</i>	ok of Power Quali	ty. 1 <sup>st</sup> Edition	, John Wiley & S	ons.
2.			<i>ility,</i> 1 <sup>st</sup> Edition, Cl			
3.	P.S. Satnam P	.S. Kang (2008)	Power Capacitor ;	for Reactive <b>(</b>	Compensation,	1 <sup>st</sup> Edition,
	Dhanpat Rai &	Sons Publicatio	ns.			
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۷.	introduction-to-electric-power-systems-spring-2011/

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Cou Descri		solvi anal feed	This course introduces students to recently developed and advanced technique solving complex control problems. The course presents theory and methodolog analysis and modeling of systems and signals, and methods for design and synthe seedback controllers.												
Course Objecti		syste	L. To provide a strong concept on the compensator design and on advanced control ystem analysis and design techniques 2. To analyse the behaviour of discrete time systems and nonlinear control systems.												
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MODU	LE 1: 9	STATE \	VARIA	BLE A	NALY	SIS								(6L	+3L=9)
Concept of state – State Variable and State Model – State models for linear and continuous time systems – Solution of state and output equation – controllability and observability - Pole Placement –State observer Design of Control Systems with observers.CO-1 BTL-3Suggested Reading: http://nptel.ac.in/courses/101108056/module9/lecture39.pdfCO-1 BTL-3															
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systems – Isocline method. Suggested Reading: Phase plane analysis MODULE 3: DESCRIBING FUNCTION ANALYSIS MODULE 3: DESCRIBING FUNCTION ANALYSIS MODULE 3: DESCRIBING FUNCTION ANALYSIS Basic concepts, derivation of describing functions for common non-linearities – Describing function analysis of non-linear systems – Conditions for stability – Stability – Stability analysis MODULE 4: STABILITY ANALYSIS (9L) Introduction – Liapunov's stability concept – Liapunov's direct method – Lure's transformation –Aizerman's and Kalman's conjecture – Popov's criterion – Circle criterion. Suggested Reading: Applications of stability analysis MODULE 5: OPTIMAL CONTROL (9L) Introduction - Decoupling - Time varying optimal control – LQR steady state optimal control – Optimal estimation – Multivariable control design. Suggested Reading: Adaptive control INtroduction - Decoupling - Time varying optimal control – LQR steady state optimal control – Optimal estimation – Multivariable control design. Suggested Reading: INTRODUE I		- Construction of phase portraits – Phase plane analysis of linear and non-linear	
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3	Dieter Uckelmann, Mark	Harrison, Florian Mich	ahelles (2011), —Architectir	ng the Inter	net of							
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	Inc.											
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		stems and the Internet	of Things (IoT) with the AR	M mbed (V	Vilev -							
1.	IEEE)				,							
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1.	https://nptel.ac.in/noc/c	ourses/noc20/SEM1/r	oc20-cs15/									
2.	https://nptel.ac.in/cours	es/108/108/10810809	8/									

COURSE	CREDITS	3											
COURSE	CODE	EEC4366	COURSE DE CATEGORY			L-T-P-S	3:0:0:0						
Version	1.0	Approval Details	23 ACM, 06.02.2	2021	LEA	RNING LEVEL	BTL-3						
ASSESSM	ASSESSMENT SCHEME												
First Periodical Assessment		Second Periodical Assessment	Seminar/ Assignments/ Project		prise / Quiz	Attendance	ESE						
159	%	15%	10%	5,	5%	5%	50%						
Cou	rse	This course covers all types of currently- Principles of Energy Conversion and											

Descrip	otion	a١	vailable	e ener	gy sto	orage	systen	ns, wł	nich ai	re, or	can k	be, use	ed in th	ne elec	tricity,
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			2. T	o expl	ain th	e ener	rgy me	asure	ment	systen	ns.				
Course			3. Т	o disc	uss th	e theo	ory of c	liffere	nt ene	ergy st	orage	devic	es.		
Objective							•				-		oriatene		st and
Objective									-	-		• • •	e applic		Je una
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		Upon completion of this course, the students will be able to 1. Examine the concept, and working of energy sources and conversion												ions	
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Course		2.													
Outcome		3.	6, 6												
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	· · ·	5.	Anal	yze th	e enei	gy sto	orage a	ррпса	itions.						
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Suggested				07											
Basic prin		-	rical er	ergy s	ource	s.									
MODULE	2: ENI	RGY	MEAS	JREM	ENT &	VERI	ICATI	ON						(6L-	+3L=9)
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Practical of	Jownbo	ment	•												

Range of different measurement system.       Suggested Readings:         Electrical, Thermal measurement system       STORAGE         (EL131-3)       Principles and applications, Sensible and Latent heat, Phase change materials; Energy and exergy analysis of thermal energy storage, solar energy and thermal energy storage, case studies.       CO-3         Flywheel and compressed air storage; Pumped hydro storage; Hydrogen energy storage, Capacitor and super capacitor, Electrochemical Double Layer Capacitor: Principles, performance and applications       CO-3         Practical component:       Range of different Biomass based power generation.       Suggested Readings:       STORAGE         MODULE       4:       ELECTROCHEMICAL       ENERGY       STORAGE         MODUL       4:       ELECTROCHEMICAL       ENERGY       STORAGE         Range of different Biomass based power generation.       Suggested Readings:       Storage       Storage         Battery - fundamentals and technologies, characteristics and performance comparison:       Lead-acid, Nickel-Metal hydride, Lithium lon; Battery system model, emerging trends in batteries.       Batteries.       CO-4 <td< th=""><th></th><th>of differer</th><th>nt measuren</th><th>nent systen</th><th>n</th><th></th><th></th><th></th><th></th><th></th></td<>		of differer	nt measuren	nent systen	n					
Electrical, Thermal measurement system       MODULE 3: THERMAL ENERGY AND FLYWHEEL AND COMPRESSED AIR STORAGE         MODULE 3: THERMAL ENERGY AND FLYWHEEL AND COMPRESSED AIR STORAGE       STORAGE         Principles and applications, Sensible and Latent heat, Phase change materials; Energy and exergy analysis of thermal energy storage, solar energy and thermal energy storage, case studies.       STORAGE         Flywheel and compressed air storage; Pumped hydro storage; Hydrogen energy storage, Capacitor: Principles, performance and applications       CO-3         Practical component:       Range of different Biomass based power generation.       SUggested Readings:         Thermal Energy and Flywheel and compressed air storages       MODULE       ENERGY       STORAGE         MODULE       4:       ELECTROCHEMICAL       ENERGY       CO-4         Battery – fundamentals and technologies, characteristics and performance comparison: lead-acid, Nickel-Metal hydride, Lithium lon; Battery system model, emerging trends in batteries.       Battery and Hydrogen energy storage; Battery and Hydrogen energy storage; Battery and Hydrogen energy storage.       CO-4         Battery and Hydrogen energy storage; Storage indenational publishes, New age international p				nent system						
MODULE       3: THERMAL       ENERGY       AND       FLYWHEEL       AND       COMPRESSED       AIR       STORAGE         (6L+31=9)       Principles and applications, Sensible and Latent heat, Phase change materials; Energy and exergy analysis of thermal energy storage, solar energy and thermal energy storage, case studies.       CO-3       STORAGE         Flywheel and compressed air storage; Pumped hydro storage; Hydrogen energy storage, Capacitor and super capacitor, Electrochemical Double Layer Capacitor: Principles, performance and applications       CO-3       BTL-3         Practical Component:       Range of different Biomass based power generation.       Suggested Readings:       StorAGE         MODULE       4:       ELECTROCHEMICAL       ENERGY       STORAGE         Battery - fundamentals and technologies, characteristics and performance comparison: Lead-acid, Nickel-Metal hydride, Lithium Ion; Battery system model, emerging trends in batteries.       Storage         Hydrogen as energy carrier and storage; Hydrogen resources and production; Basic principle of direct energy conversion using fuel cells; Thermodynamics of fuel cells       CO-4         BTL-3       Suggested Readings:       StorAGE         Battery and Hydrogen energy storage.       StorAGE         MODULE:SAPPLICATION       OF       ENERGY       STORAGE         Ford preservation, Waste heat recovery, Solar energy storage: Greenhouse heating; Drying and heating for process industries.       BTL-3			•	ment syster	n					
(61+31=9)         Principles and applications, Sensible and Latent heat, Phase change materials; Energy and exergy analysis of thermal energy storage, solar energy and thermal energy storage, case studies.         Flywheel and compressed air storage; Pumped hydro storage; Hydrogen energy storage, Capacitor and super capacitor, Electrochemical Double Layer Capacitor: Principles, performance and applications       CO-3         Practical component:       Range of different Biomass based power generation.       SUggested Readings:         Thermal Energy and Flywheel and compressed air storages       STORAGE         MODULE       4:       ELECTROCHEMICAL       ENERGY       STORAGE         (61+31=9)       Storages; Hydrogen resources and production; Basic principle of direct energy conversion using fuel cells; Thermodynamics of fuel cells       Firstical component:         Range of different battery's.       Suggested Readings:       StorAGE         Battery and Hydrogen energy storage.       CO-4       BTL-3         Practical component:       Range of different battery's.       Suggested Readings:         Range of different battery's.       Suggested Readings:       StorAGE         Battery and Hydrogen energy storage.       CO-4       BTL-3         Fractical component:       CO-4       BTL-3         Range of different battery's.       Suggested Readings:       CO-5         Battery applications in real time applications						FLYWHEEL	AND	COMPRESSED	AIR	STORAGE
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Flywheel and compressed air storage; Pumped hydro storage; Hydrogen energy storage; Capacitor and super capacitor, Electrochemical Double Layer Capacitor: Principles, performance and applications       CO-3         Practical component:       Range of different Biomass based power generation.       SUBSENTION SUBSENTIAL STORAGE       CO-4         Suggested Readings:       Thermal Energy and Flywheel and compressed air storages       FILE       ELECTROCHEMICAL       ENERGY       STORAGE         MODULE       4:       ELECTROCHEMICAL       ENERGY       STORAGE         Battery - fundamentals and technologies, characteristics and performance comparison: Lead-acid, Nickel-Metal hydride, Lithium Ion; Battery system model, emerging trends in batteries.       Battery and production; Basic principle of direct energy conversion using fuel cells; Thermodynamics of fuel cells       CO-4         Practical component:       Range of different battery's.       Suggested Readings:       StorAGE         Suggested Readings:       StorAGE       StorAGE       CO-5         Bort = 30       Free Systems       StorAGE       CO-5         Practical component:       Energy applications in real time applications.       StorAGE       CO-5         Suggested Readings:       Application of Energy Storage systems       StorAGE       CO-5         Practical component:       Application of Energy Storage systems       StorAGE       CO-5         Br	•	•	•				-			
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Lead-acid, Nickel-Metal hydride, Lithium Ion; Battery system model, emerging trends in batteries.       CO-4         Hydrogen as energy carrier and storage; Hydrogen resources and production; Basic principle of direct energy conversion using fuel cells; Thermodynamics of fuel cells       CO-4         Practical component:       Range of different battery's.       Suggested Readings:       Battery and Hydrogen energy storage.       Battery and Hydrogen energy storage.       StorAGE         MODULES:APPLICATION       OF       ENERGY       StorAGE         fold (fet-at battery's.       Suggested Readings:       StorAGE         Bottery and Hydrogen energy storage.       CO-5       StorAGE         MODULES:APPLICATION       OF       ENERGY       StorAGE         fold +31=9       CO-5       StorAGE       CO-5         Brill-3       Suggested Readings:       StorAGE       StorAGE         Applications in real time applications.       Suggested Readings:       StorAGE       StorAGE         Application of Energy Storage systems       TEXT BOVE       CO-5       BTI-3         1.       Rakosh das Begamudre (2000) Energy conversion systems, New age international publishers, New Delhi - 2000.       Storage: Systems and Applications, Wiley         4.       Huggins R. A. (2016) Energy Storage: Fundamentals, Materials and Applications, Springer International Publishing, second edition.       REFERENCE BOOKS										-
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<ul> <li>4. International Publishing, second edition.</li> <li>REFERENCE BOOKS         <ol> <li>O'Hayre R., Cha S., Colella W., and Prinz F. B. (2009) <i>Fuel Cell Fundamentals</i>, John Wiley &amp; Sons, Second Edition.</li> <li>Narayan R. and Viswanathan B. (2001) <i>C.hemical and Electrochemical Energy System</i>, Universities Press, Second Edition</li> <li>Rahn C. D. and Wang C. (2013) <i>Battery Systems Engineering</i>, First Edition, John Wiley &amp;</li> </ol> </li> </ul>	MODUI (6L+3L= Food p Drying a Practica Energy Suggest Applica 1. 1.	E5:APPL 9) reservation al compose application tion of Er OKS Rakosh New De John Ty	CATION on, Waste ng for proce nent: ons in real ti ngs: das Begamu das Begamu elhi - 2000. videll and T	heat recov ss industrie me applica e systems udre (2000) ony Weir (2	very, Sc es. tions. ) <i>Energy</i> 2004) <i>R</i>	v conversion enewable En	storage: systems ergy Res	Greenhouse h , New age intern	eating; ational , Fspon	CO-5 BTL-3 publishers, & Co
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1.O'Hayre R., Cha S., Colella W., and Prinz F. B. (2009) Fuel Cell Fundamentals, John Wiley & Sons, Second Edition.2.Narayan R. and Viswanathan B. (2001) C.hemical and Electrochemical Energy System, Universities Press, Second Edition3Rahn C. D. and Wang C. (2013) Battery Systems Engineering, First Edition, John Wiley &	MODUI (6L+3L= Food p Drying a Practica Energy Suggest Applica 1. 1. 2. 3.	E5:APPL 9) reservation and heating application tion of Er OKS Rakosh New De John Tv Dincer T Huggins	CATION on, Waste ng for proce nent: ons in real ti ngs: das Begame das Begame elhi - 2000. videll and T [., and Roser s R. A. (201	heat recov ss industrie me applica e systems udre (2000) ony Weir (2 n M. A. (20 16) <i>Energy</i>	very, Sc es. tions. ) Energy 2004) Ri 2004) Ri 5torage	y conversion enewable En ermal Energy e: Fundamen	storage: systems ergy Res Storage	Greenhouse h , New age intern <i>sources</i> , 2nd ed. <i>e: Systems and A</i>	eating; ational , Fspon <i>pplicati</i>	CO-5 BTL-3 publishers, & Co ons, Wiley
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4.	Moseley P. T., and Garche J. (2014) <i>Electrochemical Energy Storage for Renewable Sources and Grid Balancing</i> , Elsevier Science.
5.	Miller F. P., Vandome A. F., and John M. B. (2010) <i>Compressed Air Energy Storage</i> , VDM Publishing
E BOOH	KS
1.	https://www.elsevier.com/books/renewable-energy-conversion-systems/kamran/978-0-12- 823538-6
2.	https://www.kobo.com/us/en/ebook/solar-energy-conversion-systems
MOOC	
1.	https://www.fun-mooc.fr/en/courses/molecules-and-materials-energy-tomorrow- momentom/
2.	https://www.coursera.org/lecture/photovoltaic-solar-energy/6-survey-of-electricity- storage-technologies-jUpTG

COUR	-	ELECT	RICAL SYSTEM DESIG	iN		CREDITS	3								
COUR CODI	-	EEC4367	COURSE CATEGO	RY	DE	L-T-P-S	3:0:0:0								
Versio n	1.0	Approval Details	23 ACM, 06.02.2021		LEAR	NING LEVEL	BTL-5								
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First Periodi Assessm	cal	Second Periodical Assessment	ise Test Quiz	Attendance	ESE										
x15%	6	15%	10%	-	5%	5%	50%								
Cours Descrip		-	This course is designed to make the students conversant with the design of electrical ayouts, lighting, earthing, cable sizing and selection of protective devices.												
Course Objective	2	systems in 2. To impart know installations. 3. To give basic kn installations and	ware of the Acts a	of low v of distri	voltage a ibution t ormer sul	nd medium voltage ransformer substat ostations	e electrical								
Course Outcome	2	<ol> <li>Describe the bas</li> <li>Design the layou</li> <li>Calculate the ca</li> <li>Design the interselection.</li> </ol>	n of this course, the sic design and evalu ut of lighting system ble sizing and choos rnal electrification tection system of	ation of conside e betwe design	a power ering var een singl such as	system. ous entities. e and three phase. cable and protecti									
Prerequi	sites:	EEB4116 - Electro	magnetic Theory,	EEB411	7-Circuit	Theory, EEB420	1-Electrical								

Machines CO, PO AND PSO MAPPING															
CO, P		ND PS	SO MA	PPIN	G	1			1	1	1	1	T	T	Г
со	Р О 1	PO 2	PO 3	РО 4	PO 5	РО 6	PO 7	PO 8	РО 9	РО 10	PO 11	РО 12	PSO 1	PSO 2	PSO 3
CO-1	3	3	3	2	3	-	-	-	-	-	-	-	2	2	1
CO-2	3	3	3	2	2	-	-	-	-	-	-	-	2	2	1
CO-3	3	3	3	2	3	-	-	-	-	-	-	-	2	2	1
CO-4	3	3	3	2	2	-	-	-	-	-	-	-	2	2	1
CO-5	3	3	3	2	3	-	-	-	-	-	-	-	2	2	1
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: SYSTEM PLANNING AND COST ESTIMATES															
(5L+4L=9) Basic design considerations. Planning guide for the supply and distribution system. Power															
Basic design considerations, Planning guide for the supply and distribution system, Power system modernization and evaluation studies/programs, Voltage considerations, Voltage control in electric power systems, Voltage selection, Voltage ratings for low-voltage utilization equipment, Voltage drop considerations in locating the low-voltage/ high- voltage, Calculation of voltage drops. Preparing the cost estimate, Classes of estimates, Equipment and material costs, installation costs, Other costs <b>Suggested Readings:</b> Apparatus for High & Extra high voltages											ige ige gh-	CO-1 BTL-3			
MODL				ti u ingi	2:	uges			1	IGHTIN	IG			r	DESIGN
(5L+4L					۷.				-					L	
Different entities of illuminating systems Light sources: daylight, incandescent, electric discharge, fluorescent, arc lamp and Lasers Luminaries, wiring, switching & control circuits Laws of illumination; illumination from point, line and surface sources Photometry and spectrophotometry Interior lighting – industrial, residential, office departmental stores, indoor stadium, theater and hospitals. Exterior lighting- flood, street, aviation and transport lighting, lighting for displays and signaling- neon signs, LED-LCD displays beacons and lighting for surveillance Utility services for large building/office complex & layout of different meters and protection units Different type of loads and their individual protections. Prepare layout of Different type lights <b>Suggested Readings:</b>												nd es, nd ays a & ual	CO-2 BTL-5		
MODU			3:		C	CABLE			AND		Pł	IASE		SELE	CTION
(5L+4L		<u> </u>	1	0.1.1					с .	~					
Load Details Calculation Cable type and Construction features Site Installation Conditions Cable Selection Based on Current Rating of feeder Base Current Ratings of feeder Installed Current Ratings of Cable Cable Selection and Coordination with Protective Devices Feeders load detail Motors load detail Voltage Drop of cable Cable Impedances Maximum Permissible Voltage Drop by ANSI and IEC std. Calculating Maximum Cable Length due to Voltage Drop Short Circuit Temperature Rise calculation of cable selection Minimum Cable Size Due to Short Circuit Temperature Rise Initial and Final Conductor Temperatures withstand capability of cable. <b>Suggested Readings:</b> Types of conductors and cables, Classifications of cables based on voltage levels											led ces ces ble on	CO-3 BTL-5			
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Tempe Sugges	sted I of co	Readiı	ngs:			sificat			es base			e levels			

(6L+3	L=9)	
and S circui Circui <b>Sugg</b>	rical Layout in residential building using Auto CAD. Selection of house wiring. Sizing election of Conduit. Sizing and selection of Switch Socket. Calculation of load on t. Design of sub circuit (Lighting Circuit and Power Circuit).Distribution of Power t. Calculation of fan. Calculation of Earthing for residential buildings ested Readings: g systems	CO-4 BTL-5
MOD (6L+3		TECTION
Evalua Prote Select <b>Sugg</b>	od of Lightening protection Basic Consideration for Protection Calculations for ating the Need for Protection Calculation of Protective Angles And Zone Of ction For Various Forms of Air Termination Selection of lightening protection device cion of ESE type Lightening Protection ested Readings: ndex of lightning protection	CO-5 BTL-5
	BOOKS	
1	J. B. Gupta (2013). A Course in Electrical Installation Estimating and Costing, S.K. Sons, 2 <sup>nd</sup> edition.	Kataria &
2	K. B. Raina, S. K. Bhattacharya (2010) <i>Electrical Design Estimating Costing</i> , NE Reprint edition.	EW AGE;
3	M. K. Giridharan (2016) <i>Electrical Systems Design</i> , I K International Publishers, N 2nd edition.	ew Delhi,
REFER		
1.	IEC62504 General Lighting — LEDs and LED Modules —terms and definitions	
2	IEC 60598-2-3 Particular requirements – Luminaires for road and street lighting	
3	IEC 60502-2: Power cables with extruded insulation and their accessories for rated from 6kV up to 30Kv	l voltages
4	IS 1255:Code of practice for installation and maintenance of power cables up to and 33 kV rating	including
5	IEC 60364-5-52: election and erection of electrical equipment – Wiring systems	
6	IEC 60364-5-54:Selection and erection of electrical equipment –Earthing array protective conductors and protective bonding conductors	
7	IEC 60502-2: Power cables with extruded insulation and their accessories for rated from 6kV up to 30Kv	l voltages
E BOO	KS	
1	http://www.springer.com/la/book/9780442008741	
2	https://books.google.co.in/books/about/Electrical_Systems_Design.html?id=Tt6G60	zZF3cC
3	http://electrical-engineering-portal.com/download-center/books-and-guides/electriceengineering/lighting-electrical-systems-design	cal-
MOO		
1.	https://www.coursera.org/learn/electricity/lecture/UJ4FB/electric-system-basics-in-	buildings

COURSE TITLE	SPECIAL	ELECTRICAL MACHIN	CREDITS	3	
COURSE CODE	EEC4368	COURSE CATEGORY	DE	L-T-P-S	3-0-0-1

Versio	n 1.	0	Approv	al Deta	ails		23 AC	-		LEAF	NIN	G LEVEL		ВТ	L-3	
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Objecti										less D.C						
			•		•			0					eration	. contro	ol and	
4. To impart knowledge on the Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors.																
	5. To impart knowledge on the Construction, principle of operation and															
	performance of synchronous reluctance motors															
		Upon completion of this course, the students will be able to														
		ibe	ibe the construction, principle of operation, control and performance characteristics													
		ppi	ng mo	tors an	d its a	applica	tions.									
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		ror	nous re	luctan	ce mo	otors.										
Prereq	uisites	: Elec	trical N	/lachine	es, Po	wer Ele	ectron	ics.								
CO, P	O ANI	D PSC	) MAP	PING				r						1		
со	РО 1	РО 2	PO 3	РО 4	PO	PO	РО 7	PO 8	РО 9	PO 10	PO	PO 12	PSO 1	PSO 2	PSO 3	
CO-1	3	2	3	<b>4</b> 3	5 2	6	-	- -	-	-	11	-	1	2	2	
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CO-3	3	3	3	3	2	-	-	-	-	-	-	-	-	2	2	
CO-4	3	3	3	3	2	-	-	-	-	-	-	-	-	2	2	
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circuit f	•					•		• •	-		N <i>A</i> ^ <del>+</del>			BT	L-2	
Suggested Reading: Closed loop speed control of stepper motor using MATLAB.       (9L)         MODULE II: SWITCHED RELUCTANCE MOTORS       (9L)																
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Sugge	ested Reading: Ma	athematical Model	ling of Switche	d Reluctance Moto	or using	
MATL	_AB and Sensorless o	peration of Switch	ed Reluctance N	lotor Drives.		
MOD	ULE III:	PERMANENT	MAGNET	BRUSHLESS	DC	MOTORS
(9L)						
Comn	nutation in DC moto	ors, Difference betw	veen mechanical	and electronic comm	nutators,	
Hall s	sensors, Optical ser	nsors, Multiphase	Brushless moto	r, Square wave pe	rmanent	<b>60 3</b>
magn	et brushless motor	drives, Torque and	emf equations,	Torque-speed charac	teristics,	CO-3 BTL-3
Contr	rollers-Microprocess	or based controller				DIE-3
Sugge	ested Reading: Close	ed loop speed contr	rol of BLDC moto	or using MATLAB		
MOD	ULE IV: PERMANEN	T MAGNET SYNCH	RONOUS MOTO	RS		(9L)
Princi	iple of operation, EN	/IF, power input and	d torque express	sions, Phasor diagran	n, Power	
contr	ollers, Torque speed	d characteristics, S	elf-control, Vec	tor control, Current	control	CO-4
schen	nes.					BTL-3
	ested Reading: Vec		<u> </u>	IATLAB		
MOD	ULE V: SYNCHRONC	OUS RELUCTANCE N	IOTORS		1	(9L)
Const	tructional features:	axial and radial air	gap Motors. Op	erating principle, re	luctance	
torqu	ie - phasor diagram,	motor characterist	ics.			CO-5
	-	nsient stability anal	ysis of a sensor	less synchronous re	luctance	BTL-2
	or using MATLAB.					
1 <b>EXI</b>	BOOKS K Venkataratnam (	2008) Special Flect	trical Machines	University Press, Hy	derabad	
		, <b>1</b>		and Reluctance Mo		Clarendon
2	Press, Oxford, sec		maneni magnei	and Relacionee me	nor Drives	. Charchdoli
3			l Their Micropro	ocessor Controls. Cla	rendon Pre	ess London.
REFE	RENCE BOOKS					
1.		kira Sugawara (200	06) Stepping Me	otors and Their Mic	croprocess	or Controls.
1.	Clarendon Press.					
2.	E.G. Janardanan (	2014). Special elect	trical machines,	PHI learning Private	Limited, I	Delhi.
2	Kenjo,T and Naga	nori,S (2011) Pern	anent Magnet a	and brushless DC mo	otors, Clare	endon Press,
3.	Oxford.					
4.		12) Stepping Motor	rs: A Guide to Th	heory and Practice, I	ET.	
E BOC	OKS					
1.		kitab.com/Special-	Electrical-Machi	ines-by-E-G-Janardar	nan	
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1.	https://onlinecou	rses.nptel.ac.in/noo	20_ee38/previe	2W		
2.	https://www.cou	sera.org/learn/mo	tors-circuits-des	ign		

COURS			INDUSTRIAL IOT		CREDITS	3
COUR		EEC4370	COURSE CATEGORY	DE	L-T-P-S	3-0-0-0
Versio	1.0	Approval Details	23 ACM, 06.02.2021	LEARN	ING LEVEL	BTL-4

n															
ASSES	SSMEI	NT SC	HEME												
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	5.To design proper system for industrial applications         Upon completion of this course, the students will be able to         1.Apply Sensor network to smart systems.         2. Develop various systems using sensor networks         3. Integrate Physical system development of IOT devices.         4. Integrate Industrial Automation and IOT to various systems.         5.Apply IOT to Real time systems.         Prerequisites: ESB4304 Sensor and sensor networks														
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CO- 2	3	3	2	2	3	-	-	-	-	-	-	-	1	2	1
CO- 3	3	3	2	2	3	-	-	-	-	-	-	-	1	2	1
CO- 4	3	3	2	2	3	-	-	-	-	-	-	-	1	2	1
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	BOOKS		0,					
1.	Giorda Springe	no, S., Fazio, er Internation	, M., Somov, A	A., Vieriu,	RL.(2015),	Internet o	of Things. Ic	ally, S., Badra, M., oT Infrastructures, Paperback – 2015,
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COURSE TITLE	IOT APPLICATION DEVELOPMENT USING MOBILE	CREDITS	2
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Characte Embedde Suggeste 1. The 80	Characteristics of an Embedded System– Basic Structure of an Embedded System- Embedded System Architecture- Embedded System Tools and Peripherals. Suggested Readings: 1. The 8051 Microcontroller and Embedded Systems: CO-1 2. Overview of Embedded OS BTL-3														
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Environmental aspects of electric energy conversion: impacts of renewable energy<br/>generation on environment (cost-GHG Emission) - Qualitative study of differentCO-1BTL-2

systems and hybrid renewable energy systems. Suggested Reading: Operation of power plants MODULE II: ELECTRICAL MACHINES FOR RENEWABLEENERGY CONVERSION (9L) Review of reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG. Suggested Reading: DC & AC Machines MODULE III: POWER CONVERTERS (9L) Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters/inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing Wind: three phase AC voltage controllers-AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters. Suggested Reading: semiconductor devices characters MODULE IV: ANALYSIS OF WIND AND PV SYSTEMS (9L) Standalone operation of fixed and variable speed wind energy conversion systems and solar system Grid Connection Issues -Grid integrated PMSG and SCIG Based WECS-Grid Integrated solar system MODULE V: HYBRID RENEWABLE ENERGY SYSTEMS (9L) Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind- PV-Maximum Power Point Tracking (MPP). Suggested Reading: rid systems TEXE BOOKS I. Raishid. M. H (2001) Power electronical Hand book, Academic press, 2001. 4. Ramesh R, Kumar K.U. (2017) Renewable Energy Technologies, Narosa Publishing Hous New Delhi. REFERENCE BOOKS I. Analysis. B.H.Khan (2012) Non-conventional Energy sources, Tata McGraw-hill Publishing Compan New Delhi. REFERENCE BOOKS I. Analysis. S. Heir (2002). Grid Integration of WECS, John Wiley & Sons 3. Jon Boldea (2006) Variable speed generators, Taylor & Francis group. E BOOK I. https://books.google.co.in/books?isbn=01251521137 I. https://books.google.co.in/books?isbn=01251521137 I. https://www.mooc-list.com/course/wind-resources-renewable-energies-coursera I. https://www.mooc-list.com/course/wind-resources-renewable-energies-coursera I. https://www.mooc-list.com/course/wind-resources-renewable-energies-coursera I. https://www.mooc-list.com/course/wind-resources-renew	renewable energy recourses Color wind econy Diamons Fuel cell Undresses energy	
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1. To Understand the Automation process in IndustriesCourse Objective2. To Able to make program for real time situations3. To Able to control the process from remote places															
	Upon completion of this course, the students will be able to						s and								
Course	e Outo	3.	<ol> <li>Familiarize with various types of process control concepts.</li> <li>Formulate and design a process control equipment housing various se used in the process industry.</li> </ol>									sensors			
<ul><li>4. Apply standard industrial safety &amp; precautions.</li><li>5. Apply the International Industrial Acts and standards.</li></ul>															
Prerequisites: EEB4101 -Introduction to digital systems															
CO, P	[	D PSO				<b>DO</b>	<b>DO</b>	20			50		DCO.	DC O	
СО	РО 1	РО 2	PO 3	РО 4	РО 5	PO 6	РО 7	PO 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	3	3	3	1	-	-	-	-	-	-	-	1	3	1
CO-2	3	3	3	3	1	-	-	-	-	-	-	-	1	3	1
CO-3	3	3	3	3	1	-	-	-	-	-	-	-	1	3	1
CO-4	2	3	3	1	1	-	-	-	-	-	-	-	1	2	3
CO-5	2	3	3	1	1	-	<u> </u>	-		-	-	-	1	2	3
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: INTRODUCTION TO INDUSTRIAL AUTOMATION     (9L)															
Introduction to Industrial Automation & Control. Role & benefits of Automation in Industry. Common Process variables. Common Process Measurements. Architecture of Industrial Automation Systems. Temperature, Pressure and Force, Displacement and speed															
Practical component:       BTL-2         Architecture of Industrial Automation Systems       BTL-2         Suggested Readings:       Evolution of Industrial Automation							CO-1 BTL-2								
		INTROE										(12L)			
Impler	nentat	Contr ion of I ol Strue	PID Co	ntrolle	ers. Sp	pecial	Contro	l Struc	tures:F	eed fo	rward	and Ra	ntio Co	-	CO-2 BTL-2

Suggested Readings:       BTL-2         Personal safety & Safety Equipment's schemes       BTL-2         MODULE 5: INTERNATIONAL ACTS AND STANDARDS       (6L)         Occupational Safety and Health act of USA (The Williames -Steiger Act of 11270) – Health and safety work act (HASAWA 11274, UK) – OSHAS 18000 – ISO 14000 – American National Standards Institute (ANSI).       CO-5         Suggested Readings:       International standards and recommended practices       BTL-2         1.       Singh, S. K. (2009). Process Control: Concepts Dynamics and Applications. India: Prentice Hall Of India Pvt. Limited.       Frentice         REFERENCE BOOKS       Support Suport Sup	Introd		
Practical component:       1)       Develop an adplication using On-Delay timer         3)       Develop an application using OFD Delay timer         3)       Develop an application using OFD Delay Timer         4)       Develop an application using UP/DOWN counter         PID Simulator       https://instrumentationtools.com/pid-simulator-download/         Suggested Readings:       Advances in Process control Techniques, and Applications         MODUL 3: MEASUREMENT OF PARAMETRES       (121)         Voltage & Current Transducers, Frequency Transducers, Temperature, Pressure & Flow Measurements, Power Transducers, Implementation of transducer measurements & Calibration. Solenoid Valves. Control valves. Introduction to Actuators. Pumps & Motors.         Electrical Drives Relays & Contactors       Practical component:         Matlab Simulink & tools.       BTL-3         Mutlab Simulink & tools.       BTL-3         Suggested Readings:       Best practices for implementation of sensor based control system.         MODULE 4: INDUSTRIAL SAFETY & PRECAUTIONS       (6L)         Objective of industrial safety. Personal safety & Safety Equipments Electrical Safety Gas safety.       C0-4         Suggested Readings:       BTL-3         Personal safety & Safety Equipment's schemes       MODULE 3: INTERNATIONAL ACTS AND STANDARDS       (6L)         Occupational Safety and Health act of USA (The Williames -Steiger Act of 11270) – Health a			
1)       Develop a ladder program for DOL starter         2)       Develop an application using OF-Delay Timer         3)       Develop an application using OF-Delay Timer         4)       Develop an application using UP/DOWN counter         PID Simulator       https://instrumentationtools.com/pid-simulator-download/         Suggested Readings:       Advances in Process control Techniques, and Applications         Advances in Process control Techniques, and Application to Actuators. Pressure & Flow         Measurements, Power Transducers, Implementation of transducer measurements & calibration. Solenoid Valves. Control valves. Introduction to Actuators. Pumps & Motors.         Electrical Drives Relays & Contactors       CO-3         Practical component:       MoDUL 4: INDUSTRIAL SAFETY & PRECAUTIONS       Gel.         Objective of industrial safety. Personal safety & Safety Equipments Electrical Safety Gas safety.       Fire safety. Work Discipline. Maintenance of Registers & Log Books       CO-4         Suggested Readings:       BTL-3         Personal safety & Safety Equipment's schemes       BTL-3         MODUL 5: INTERNATIONAL ACTS AND STADNARDS       (6L)         Occupational Safety and Health act of USA (The Williames -Steiger Act of 11270) – Health and safety work act (HASAWA 11274, UK) – OSHAS 18000 – ISO 14000 – American National Standards and recommended practices       BTL-3         Standards Institute (ANSI).       Suggested Readings:		-	
2)       Develop an application using On-Delay timer         3)       Develop an application using OFF Delay Timer         4)       Develop an application using UF/DOWN counter         PID Simulator       https://instrumentationtools.com/pid-simulator-download/         Suggested Readings:       Advances in Process control Techniques, and Applications         MODULE 3: MEASUREMENT OF PARAMETERS       (121)         Voltage & Current Transducers, Frequency Transducers, Temperature, Pressure & Flow         Measurements, Power Transducers, Implementation of transducer measurements & calibration. Solenoid Valves. Control valves. Introduction to Actuators. Pumps & Motors.         Electrical Drives Relays & Contactors       Practical component:         Matlab Simulink & tools.       https://www.mathworks.com/help/physmod/hydro/valves-hyd.html         Suggested Readings:       Best practices for implementation of sensor based control system.         MODULE 4: INDUSTRIAL SAFETY & PRECAUTIONS       (6L)         Objective of industrial safety. Personal safety & Safety Equipments Electrical Safety Gas safety.       CO-3         Suggested Readings:       Personal safety & Safety Equipment's schemes       CO-4         MODULE 4: INDUSTRIAL SAFETY & PREAUTIONS       (6L)       Occupational Safety and Health act of USA (The Williames -Steiger Act of 11270) – Health and safety work act (HASAWA 11274, UK) – OSHAS 18000 – ISO 14000 – American National Satendards Institute (ANSI).       Suggested Reading		•	
<ul> <li>3) Develop an application using OFF Delay Timer</li> <li>4) Develop an application using UP/DOWN counter</li> <li>PID Simulator</li> <li>https://instrumentationtools.com/pid-simulator-download/</li> <li>Suggested Readings:</li> <li>Advances in Process control Techniques, and Applications</li> <li>MODULE 3: MEASUREMENT OF PARAMETERS</li> <li>Voltage &amp; Current Transducers, Frequency Transducers, Temperature, Pressure &amp; Flow</li> <li>Measurements, Power Transducers. Implementation of transducer measurements &amp; calibration. Solenoid Valves. Control valves. Introduction to Actuators. Pumps &amp; Motors.</li> <li>Electrical Drives Relays &amp; Contactors</li> <li>Practical component:</li> <li>Matlab Simulink &amp; tools.</li> <li>https://www.mathworks.com/help/physmod/hydro/valves-hyd.html</li> <li>Suggested Readings:</li> <li>Best practices for implementation of sensor based control system.</li> <li>MODULE 4: INDUSTRIAL SAFETY &amp; PRECAUTIONS</li> <li>         Objective of industrial safety. Personal safety &amp; Safety Equipments Electrical Safety Gas safety.</li> <li>Fire safety. Work Discipline. Maintenance of Registers &amp; Log Books</li> <li>Suggested Readings:</li> <li>Personal Safety &amp; Safety Equipment's schemes</li> <li>MODULE 5: INTERNATIONAL ACTS AND STANDARDS</li> <li>(61)</li> <li>Occupational Safety and Health act of USA (The Williames -Steiger Act of 11270) – Health and safety work act (HASAWA 11274, UK) – OSHAS 18000 – ISO 14000 – American National Standards institute (ANSI).</li> <li>Suggested Readings:</li> <li>International standards and recommended practices</li> <li>TEXT EVOCS</li> <li>International Colling. Process Control: Concepts Dynamics and Applications. India: Prentice Hall Of India Pvt. Limited.</li> <li>REFERENCE BOOKS</li> <li>Internation. (2018). United Kingdom: CRC Press.</li> <li>Orakhelashvili, A. (2008). The Interpretation of Acts and Rules in Public Internationa Optimization.</li></ul>	1)	Develop a ladder program for DOL starter	
4) Develop an application using UP/DOWN counter         PID Simulator         https://instrumentationtools.com/pid-simulator-download/         Suggested Readings:         Advances in Process control Techniques, and Applications         MODULE 3: MEASUREMENT OF PARAMETERS         (211)         Voltage & Current Transducers, Frequency Transducers, Temperature, Pressure & Flow         Measurements, Power Transducers. Implementation of transducer measurements & calibration. Solenoid Valves. Control valves. Introduction to Actuators. Pumps & Motors.         Electrical Drives Relays & Contactors         Practical component:         Matiba Simulink & tools.         https://www.mathworks.com/help/physmod/hydro/valves-hyd.html         Suggested Readings:         Best practices for implementation of sensor based control system.         MODULE 4: INDUSTRIAL SAFETY & PRECAUTIONS         Objective of industrial safety. Personal safety & Safety Equipments Electrical Safety Gas safety.         Fire safety. Work Discipline. Maintenance of Registers & Log Books         Suggested Readings:         Personal safety & Safety Equipment's schemes         MODULE 5: INTERNATIONAL ACTS AND STANDARDS         (6L)         Occupational Safety and Health act of USA (The Williames -Steiger Act of 11270) – Health and safety work act (HASAWA 11274, UK) – OSHAS 18000 – ISO 14000 – American National Standards and recommended practices	2)	Develop an application using On-Delay timer	
PID Simulator       https://instrumentationtools.com/pid-simulator-download/         Suggested Readings:       Advances       (121)         Voltage & Current Transducers, Frequency Transducers, Temperature, Pressure & Flow       Measurements, Power Transducers, Implementation of transducer measurements & calibration. Solenoid Valves. Control valves. Introduction to Actuators. Pumps & Motors.         Electrical Drives Relays & Contactors       Practical component:       Matab Simulink & tools.         Mtatbs Simulink & tools.       https://www.mathworks.com/help/physmod/hydro/valves-hyd.html       Suggested Readings:         Best practices for implementation of sensor based control system.       (6L)       Objective of industrial safety. Personal safety & Safety Equipments Electrical Safety Gas safety.       CO-4         Suggested Readings:       Best practical Safety Safety Equipment's schemes       BTL-3         MODULE 5: INTERNATIONAL ACTS AND STANDARDS       (6L)       Occupational Safety and Health act of USA (The Williames -Steiger Act of 11270) – Health and safety work act (HASAWA 11274, UK) – OSHAS 18000 – ISO 14000 – American National Standards Institute (ANSI).       CO-5         Suggested Readings:       Instrument Engineers' Handbook, Volume Two: Process Control and Optimization. (2018). United Kingdom: CRC Press.       Co-1         1.       Instrument Engineers' Handbook, Volume Two: Process Control and Optimization. (2018). United Kingdom: CRC Press.       Control and Optimization. (2018). United Kingdom: CRC Press.       Control and Optinmization. (201	3)	Develop an application using OFF Delay Timer	
https://instrumentationtools.com/pid-simulator-download/         Suggested Readings:         Advances in Process control Techniques, and Applications         MODULE 3: MEASUREMENT OF PARAMETERS       (121)         Voltage & Current Transducers, Frequency Transducers, Temperature, Pressure & Flow         Measurements, Power Transducers. Implementation of transducer measurements & calibration. Solenoid Valves. Control valves. Introduction to Actuators. Pumps & Motors.         Electrical Drives Relays & Contactors       CO-3         Practical component:       BTL-3         Matba Simulink & tools.       https://www.mathworks.com/help/physmod/hydro/valves-hyd.html         Suggested Readings:       Best practices for implementation of sensor based control system.         MODULE 4: INDUSTRIAL SAFETY & PRECAUTIONS       (61)         Objective of industrial safety. Personal safety Restery Equipments Electrical Safety Gas safety.       Fire safety.         Fire safety. Work Discipline. Maintenance of Registers & Log Books       CO-4         Suggested Readings:       BTL-2         Personal safety & Safety Equipment's schemes       BTL-2         Suggested Readings:       BTL-2         Suggest	4)	Develop an application using UP/DOWN counter	
Suggested Readings:       Advances in Process control Techniques, and Applications         MODULE 3: MEASUREMENT OF PARAMETERS       (121)         Voltage & Current Transducers, Frequency Transducers, Temperature, Pressure & Flow       Measurements, Power Transducers. Implementation of transducer measurements & calibration. Solenoid Valves. Control valves. Introduction to Actuators. Pumps & Motors.         Electrical Drives Relays & Contactors       Practical component:       GO-3         Matlab Simulink & tools.       https://www.mathworks.com/help/physmod/hydro/valves-hyd.html       Suggested Readings:         Best practices for implementation of sensor based control system.       (61)         Objective of industrial safety. Personal safety & Safety Equipments Electrical Safety Gas safety. Fire safety. Work Discipline. Maintenance of Registers & Log Books       CO-4         Suggested Readings:       Personal safety & Safety Equipment's schemes       BTL-2         MODULE 5: INTERNATIONAL ACTS AND STANDARDS       (61)       CO-5         Occupational Safety and Health act of USA (The Williames -Steiger Act of 11270) – Health and safety work act (HASAWA 11274, UK) – OSHAS 18000 – ISO 14000 – American National Standards Institute (ANSI).       Standards Institute (ANSI).       BTL-2         Suggested Readings:       Instrument Engineers' Handbook, Volume Two: Process Control and Optimization. (2018). United Kingdom: CRC Press.       Control and Applications. India: Prentice Hall Of India Pvt. Limited.         REFERENCE BOOKS       Instrument En	PII	D Simulator	
Advances in Process control Techniques, and Applications       (121)         MODULE 3: MEASUREMENT OF PARAMETERS       (121)         Voltage & Current Transducers, Irrequency Transducers, Temperature, Pressure & Flow Measurements, Power Transducers. Implementation of transducer measurements & calibration. Solenoid Valves. Control valves. Introduction to Actuators. Pumps & Motors.         Electrical Drives Relays & Contactors       Practical component:       BTL:         Matlab Simulink & tools.       https://www.mathworks.com/help/physmod/hydro/valves-hyd.html       Suggested Readings:         Best practices for implementation of sensor based control system.       (6L)         Objective of industrial safety. Personal safety & Safety Equipments Electrical Safety Gas safety. Fire safety. Work Discipline. Maintenance of Registers & Log Books       CO-4         Suggested Readings:       Personal safety & Safety Equipment's schemes       BTL:         MODULE 5: INTERNATIONAL ACTS AND STANDARDS       (6L)       CO-5         Occupational Safety and Health act of USA (The Williames -Steiger Act of 11270) – Health and safety work act (HASAWA 11274, UK) – OSHAS 18000 – ISO 14000 – American National       Standards institute (ANSI).         Suggested Readings:       Instrument Engineers' Handbook, Volume Two: Process Control and Optimization. (2018). United Kingdom: CRC Press.       Orakbelashvil, A. (2008). The Interpretation of Acts and Rules in Public International Law. United Kingdom: OUP Oxford.       Date Process Tourol Control and Distentervationana Law. United Kingdom: OUP Oxford.	http	os://instrumentationtools.com/pid-simulator-download/	
MODULE 3: MEASUREMENT OF PARAMETERS       (121)         Voltage & Current Transducers, Frequency Transducers, Temperature, Pressure & Flow       Measurements, Power Transducers, Implementation of transducer measurements & calibration. Solenoid Valves. Control valves. Introduction to Actuators. Pumps & Motors.         Electrical Drives Relays & Contactors       Practical component:       BTL-3         Matlab Simulink & tools.       https://www.mathworks.com/help/physmod/hydro/valves-hyd.html       Suggested Readings:         Best practices for implementation of sensor based control system.       (61)         Objective of industrial safety. Personal safety & Safety Equipments Electrical Safety Gas safety.       CO-4         Suggested Readings:       BTL-2         Personal safety & Safety Equipment's schemes       BTL-2         MODULE 5: INTERNATIONAL ACTS AND STANDARDS       (61)         Occupational Safety and Health act of USA (The Williames -Steiger Act of 11270) – Health and safety work act (HASAWA 11274, UK) – OSHAS 18000 – ISO 14000 – American National Standards Institute (ANSI).       CO-5         Suggested Readings:       International standards and recommended practices       BTL-2         International standards and recommended practices       Instrument Engineers' Handbook, Volume Two: Process Control and Optimization. (2018). United Kingdom: CRC Press.       Co-tot and Optimization. (2018). United Kingdom: CRC Press.         1       Instrument Engineers' Handbook, Volume Two: Process Control and Optimization. (2018	Sugges	sted Readings:	
Voltage & Current Transducers, Frequency Transducers, Temperature, Pressure & Flow         Measurements, Power Transducers. Implementation of transducer measurements &         Collardian Control valves. Control valves. Introduction to Actuators. Pumps & Motors.         Electrical Drives Relays & Contactors         Practical component:         Matlab Simulink & tools.         https://www.mathworks.com/help/physmod/hydro/valves-hyd.html         Suggested Readings:         Best practices for implementation of sensor based control system.         MODULE 4: INDUSTRIAL SAFETY & PRECAUTIONS         Objective of industrial safety. Personal safety & Safety Equipments Electrical Safety Gas safety.         Fire safety. Work Discipline. Maintenance of Registers & Log Books         Suggested Readings:         Personal safety & Safety Equipment's schemes         MODULE 5: INTERNATIONAL ACTS AND STANDARDS         MODULE 5: INTERNATIONAL ACTS AND STANDARDS         MODULE 5: INTERNATIONAL ACTS AND STANDARDS         Standards Institute (ANSI).         Suggested Readings:         International standards and recommended practices         TEXT BOOKS         1.       Instrument Engineers' Handbook, Volume Two: Process Control and Optimization. (2018). United Kingdom: CRC Press.         2.       Orakhelashvil, A. (2008). The Interpretation of Acts and Rules in Public Internationa Law. United Kingdom: CUP Oxford. <td>Advan</td> <td>ces in Process control Techniques, and Applications</td> <td></td>	Advan	ces in Process control Techniques, and Applications	
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Electrical Drives Relays & Contactors       CO-3         Practical component:       BTL-3         Matlab Simulink & tools.       https://www.mathworks.com/help/physmod/hydro/valves-hyd.html       BTL-3         Suggested Readings:       Best practices for implementation of sensor based control system.       CO-4         MODULE 4: INDUSTRIAL SAFETY & PRECAUTIONS       (6L)       CO-4         Objective of industrial safety. Personal safety & Safety Equipments Electrical Safety Gas safety.       Fire safety. Work Discipline. Maintenance of Registers & Log Books       CO-4         Suggested Readings:       Personal safety & Safety Equipment's schemes       BTL-2         Personal safety and Health act of USA (The Williames -Steiger Act of 11270) – Health and safety work act (HASAWA 11274, UK) – OSHAS 18000 – ISO 14000 – American National Standards Institute (ANSI).       CO-5         Suggested Readings:       Intermational standards and recommended practices       BTL-2         Intermational standards and recommended practices       BTL-2       BTL-2         REFERENCE BOOKS       Instrument Engineers' Handbook, Volume Two: Process Control and Applications. India: Prentice Application. (2018). United Kingdom: CRC Press.       Co-threat and Rules in Public International Law. United Kingdom: CRC Press.         2.       Orakhelashvili, A. (2008). The Interpretation of Acts and Rules in Public International Law. United Kingdom: CRC Press.       Process Control       and Dptimization. (2018). United Kingdom: CRC Press	Measu	rements, Power Transducers. Implementation of transducer measurements &	
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Matiab Simulink & tools.       https://www.mathworks.com/help/physmod/hydro/valves-hyd.html         Suggested Readings:       Eest practices for implementation of sensor based control system.         MODULE 4: INDUSTRIAL SAFETY & PRECAUTIONS       (6L)         Objective of industrial safety. Personal safety & Safety Equipments Electrical Safety Gas safety.       (6L)         Objective of industrial safety. Personal safety & Safety Equipments Electrical Safety Gas safety.       (6L)         Suggested Readings:       Personal safety & Safety Equipment's schemes       BTL-2         Personal safety & Safety Equipment's schemes       (6L)       (6L)         Occupational Safety and Health act of USA (The Williames -Steiger Act of 11270) – Health and safety work act (HASAWA 11274, UK) – OSHAS 18000 – ISO 14000 – American National Standards Institute (ANSI).       Suggested Readings:       (CO-5         Suggested Readings:       International standards and recommended practices       BTL-2         1.       Singh, S. K. (2009). Process Control: Concepts Dynamics and Applications. India: Prentice Hall Of India Pvt. Limited.       Process Control and Optimization. (2018). United Kingdom: CRC Press.         2.       Orakhelashvil, A. (2008). The Interpretation of Acts and Rules in Public International Law. United Kingdom: CRC Press.       Process Control and Dptimization. (2018). United Kingdom: CRC Press.         1.       https://www.ee.iitb.ac.in/web/academics/courses#EE302       MODU         4.       https	Practio	cal component:	
Suggested Readings:       Image: Control system.       Image: Control system.         MODULE 4: INDUSTRIAL SAFETY & PRECAUTIONS       (6L)         Objective of industrial safety. Personal safety & Safety Equipments Electrical Safety Gas safety.       CO-4         Fire safety. Work Discipline. Maintenance of Registers & Log Books       CO-4         Suggested Readings:       Personal safety & Safety Equipment's schemes       BTL-2         MODULE 5: INTERNATIONAL ACTS AND STANDARDS       (6L)         Occupational Safety and Health act of USA (The Williames -Steiger Act of 11270) – Health and safety work act (HASAWA 11274, UK) – OSHAS 18000 – ISO 14000 – American National Standards Institute (ANSI).       BTL-2         Suggested Readings:       International standards and recommended practices       BTL-2         TEXT BOOKS       Image: Concepts Dynamics and Applications. India: Prentice Hall Of India Pvt. Limited.       Process Control: Concepts Dynamics and Applications. India: Prentice Hall Of India Pvt. Limited.         REFERENCE BOOKS       Imstrument Engineers' Handbook, Volume Two: Process Control and Optimization. (2018). United Kingdom: CRC Press.       Image: Concepts Dynamics and Rules in Public International Law. United Kingdom: OUP Oxford.         E BOOKS       Image: Concepts Dynamics and Rules in Public International Law. United Kingdom: OUP Oxford.       Image: Concept Concep	Matla	o Simulink & tools.	BIT-3
Best practices for implementation of sensor based control system.       (6L)         MODULE 4: INDUSTRIAL SAFETY & PRECAUTIONS       (6L)         Objective of industrial safety. Personal safety & Safety Equipments Electrical Safety Gas safety.       CO-4         Fire safety. Work Discipline. Maintenance of Registers & Log Books       BTL-2         Suggested Readings:       BTL-2         Personal safety & Safety Equipment's schemes       (6L)         Occupational Safety and Health act of USA (The Williames -Steiger Act of 11270) – Health and safety work act (HASAWA 11274, UK) – OSHAS 18000 – ISO 14000 – American National Standards Institute (ANSI).       CO-5         Suggested Readings:       International standards and recommended practices       BTL-2         1.       Singh, S. K. (2009). Process Control: Concepts Dynamics and Applications. India: Prentice Hall Of India Pvt. Limited.       Process Control and Optimization. (2018). United Kingdom: CRC Press.         2.       Orakhelashvili, A. (2008). The Interpretation of Acts and Rules in Public International Law. United Kingdom: OUP Oxford.       E         E BOOKS       1.       https://www.ee.iitb.ac.in/web/academics/courses#EE302       MOOC         1.       https://coep.vlab.co.in/?sub=33&brch=97       2.       https://instrumentationtools.com/pid-simulator-download/	https:/	//www.mathworks.com/help/physmod/hydro/valves-hyd.html	
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COURSE TITLEDISTRIBUTED GENERATION AND MICRO-GRIDSCREDITS3								CRO-G	RIDS	C	CREDIT	S		3
COURSE CODE		EEC4	454		COURSE CATEGORY DE						L-T	-P-S	3-	-0-0-0
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ASSESSMENT SO	HEME													
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Course	Enab	Enable the students to develop skills to assess performance of distributed								ibuted				
Description	gener	generation and its impact on the grid.												
Course Objective Course Outcome	<ol> <li>To assess the need of DG sources and their appropriate placement in the power system.</li> <li>To make a comprehensive study about different types of renewable sources as DGs</li> <li>To understand the concepts of grid integration ,interfaces and impact of DG upon power system.</li> <li>To know the importance of power quality and reliability in DER.</li> <li>To evaluate energy storage and control techniques for DER integration.</li> <li>Upon completion of this course, the students will be able to</li> <li>Comment about the current scenario of Distributed Generation and the need to implement DG sources.</li> <li>Investigate the different types of RES as DGs.</li> <li>Appraise the grid integration ,interfaces and technical impacts of DGs upon transmission and distribution systems</li> <li>Analyze the aspects of Power Quality and Reliability.</li> <li>Choose different types of Storage systems based on application.</li> </ol>													
Prerequisites: T														
CO, PO AND F					, , ,									
CO P -1	D PO	PO -3	PO -4	РО -5	PO -6	РО -7	PO -8	PO -9	PO -10	PO -11	PO -12	PSO -1	PSO -2	PSO -3
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CO-2	3 3	3	2	-	-	-	-	-	-	-	1	1	1	3
CO-3	3 3	3	2	-	-	-	-	-	-	-	1	1	1	3
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	via in Distributed Constantion Planning of DCs. Siting and sizing of DCs. antimal						
	rio in Distributed Generation, Planning of DGs – Siting and sizing of DGs – optimal nent of DG sources in distribution systems.	BTL-3					
•	ested Reading: Detailed study of Renewable Energy Sources, Siting and Sizing of DGs						
using							
	ULE 2: RENEWABLE ENERGY SOURCES	(9L)					
	Power-Photovoltaic and Thermo-solar power-Biomass Power, Fuel cells types, types of						
	power generation schemes, mini and micro hydro power schemes.	CO-2					
	ested Reading: Micro turbines for DG, bulb and tubular turbines-	BTL-2					
	ULE 3: GRID INTEGRATION, INTERFACES AND IMPACTS OF DGS	(9L)					
Grid i	ntegration of DGs – Different types of interfaces - Inverter based DGs - Aggregation of						
multip	ble DG units. – Transmission systems, Distribution systems, De-regulation – Impact of	CO-3					
DGs u	pon protective relaying	BTL-3					
Sugge	ested Reading: Rotating machine based interfaces						
MOD	ULE 4: POWER QUALITY AND RELIABILITY IN DER (9L)						
Volta	ge control techniques, Reactive power control, Harmonics, Power quality issues.	CO-4					
Reliab	ility of DG based systems – Steady-state and Dynamic analysis.	BTL-3					
Sugge	ested Reading: Various aspects of Operations	DIL-3					
MOD	ULE 5: ENERGY STORAGE AND CONTROL TECHNIQUES (9L)						
Energ	y Storage for use with Distributed Generation-Battery Storage, Capacitor Storage,						
ultra-	capacitors and Mechanical Storage: Flywheels, Pumped and Compressed Fluids. Control						
Techniques for DER integration systems- Standards and codes for interconnection- future							
	ure of grid.	BTL-3					
	ested Reading: Various aspects such as Market Management Retailing, Trading and						
	ary Services						
TEXT I	BOOKS						
1.	H. Lee Willis & Walter G. Scott (2000). Distributed Power Generation, Planning & E	valuation,.					
	CRC Press Taylor & Francis Group.						
2.	Godfrey Boyle (2004), Renewable energy power for a sustainable future, Oxford Unive	rsity Press					
	in association with the Open university.						
3.	Godoy Simoes, Felix A.Farret (2004), 'Renewable Energy Systems - Design and And	alysis with					
5.	Induction Generators ', CRC press.						
REFER	ENCE BOOKS						
1.	Z. Ye, R. Walling, N. Miller, P. Du, K. Nelson(2005) 'Facility Microgrids', Subcontrac	t report.					
2.	Mohammad Shahid ehpour, M. Alomoush, (2001) Restructured Electrical Power	Systems:					
۷.	Operation: Trading, and Volatility, CRC Press.						
3.	N. Jenkins, J.B. Ekanayake and G. Strbac, (2010) Distributed Generation, The Institution of						
	Engineering and Technology.						
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2.	https://digital-library.theiet.org/content/books/po/pbrn006e						
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2.	https://onlinecourses.nptel.ac.in/noc19_ee64/preview						
3.	https://www.edx.org/course/solar-energy-integration-of-photovoltaic-systems-i						
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Course ObjectiveThis course provides knowledge about 1. Smart electric power grids, including definition, design criteria, tech loT. 2. Information processing and communications to the power grid. Un the development of the smart grid, 3.Smart grid design, implementation, evaluation and managemen electricity infrastructure.								Inders	tanding						
Course Outcom			1. Se 2. S strue 3.Ap GIS 1 4. Ap 5. A Lear	elect su Select ctures oply Int to mon oply M oply ning to	iitable appro for sm elliger itor Sr ulti-ag IoT a Smar	e techn opriate nart gri nt Mor mart G gent te gent te rchiteo	ologie sma d. nitoring rid chnolc cture, applic	s for si rt sei g Devi ogy for Data	mart g nsors, ces, W Smart	comm lide Are : Grid o	nunica ea mo perat	ntion t nitoring	g syster I contro	n, SCA	etwork DA and Iachine
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CO-2	3	3	2	2	3	-	-	-	-	-	-	-	-	1	3

CO-3       3       3       2       2       3       -       1       3         CO-5       3       3       2       2       3       -       -       -       -       -       1       1       3         CO-5       3       3       2       2       3       -       -       -       -       -       1       1       3         CO-6       3       3       3       2       2       3       -       -       -       -       -       1       1       3         CO-5       3       3       3       2       3       -       -       -       -       -       1       1       3         Smart Grids: Smart grid landscape and its characteristics; smart grid architecture; Smart grid       Smart GRID TECHNOLOGIES       (9L+11)       Theomain advanced metering infrastructure (AMI)       (9L+11)       Theomain advanced metering infrastructure (AMI)       (9L+11)       Theomain advanced metering infrast							
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1: Weakly related, 2: Moderately related and 3: Strongly related           Module I:- INTRODUCTION TO SMART GRID (91+17)           Smart Grids: Smart grid landscape and its characteristics; smart grid architecture; Smart grid scenario in Indian power sector         CO-1 BTL-3           Module II:- SMART GRID TECHNOLOGIES (91+17)         CO-2 Information and Communication Technology: Smart sensors, Wired and wireless communication Technology, Network Structures (HAN, LAN, NAN, WAN); Smart sensors, Smart Metering and advanced metering infrastructure (AMI)         (91+11)           Intelligent Electronic Devices (IED), wide-area monitoring system (WAMS), SCADA, Phasor Measurement Units s, Geographical Information System; Penetration of Clean Energy Technologies; Storage Technology, Power electronics and power quality in Smart grid         CO-3 BTL-4           Module IV:- COMMUNICATION TECHNOLOGIES IN SMART GRII (91+11)         SMART GRID         CO-4 BTL-4           Multi-agent technology in Smart grid; Superconducting Technologies- Superconducting power cables, Wireless Power Transmission technology; Smart grid operation & control, self- healing, Resilience, E-Commerce of Electricity, Case study on substation automation; Micror grid. Integration of distributed energy sources, operation, automation, Micror grid, Overview of generation, transmission and distribution automation.         (91+11)           Io Architecture and its application; introduction to cloud computing and edge computing application in smart grid, Standards for Information Exchange - Data Security methods; Embedded web servers, Energy Data Analytics in the Smart Grid-Sources , Characteristics, Need, Tools, and Challenges; Artificial Intelligence, Machine Learning and M2M applications							
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scenario in Indian power sector       C0-1 BTI-3         Module II:- SMART GRID TECHNOLOGIES (9L+1T)       Information and Communication Technology: Smart sensors, Wired and wireless communication Technology, Network Structures (HAN, LAN, NAN, WAN); Smart sensors, Smart Metering and advanced metering infrastructure (AMI)       C0-2 BTI-4         Module III:- MONITORING SMART GRID       (9L+1T)         Intelligent Electronic Devices (IED), wide-area monitoring system (WAMS), SCADA, Phasor Measurement Units s, Geographical Information System; Penetration of Clean Energy Technologies; Storage Technology, Geomagnetic Storms as Generators, Near space power generation, Electric Vehicle Technology ; Power electronics and power quality in Smart grid       C0-3 BTL-4         Module       IV:-       COMMUNICATION       TECHNOLOGIES       IN       SMART         Multi-agent technology in Smart grid; Superconducting Technologies- Superconducting power cables, Wireless Power Transmission technology; Smart grid operation & control, self- healing, Resilience, E-Commerce of Electricity, Case study on substation automation; Micro grid; Integration of distributed energy sources, operation, control and protection of Micro grid; Overview of generation, transmission and distribution automation.       C0-4 BTL-4         Module V: IOT IN SMART GRID       (9L+1T)         IoT Architecture and its application; Introduction to cloud computing and edge computing application in smart grid, Standards for Information Exchange - Data Security methods; Embedded web servers, Energy Data Analytics in the Smart Grid-Sources , Characteristics, Need, Tools, and Challenges; Artificial Intelligence, Machine Learning and M2M applications							
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Smart Metering and advanced metering infrastructure (AMI)       B1L4         Module III:- MONITORING SMART GRID       (9L+1T)         Intelligent Electronic Devices (IED), wide-area monitoring system (WAMS), SCADA, Phasor       CO-3         Measurement Units s, Geographical Information System; Penetration of Clean Energy       CO-3         generation, Electric Vehicle Technology, Geomagnetic Storms as Generators, Near space power       BTL-4         Module       IV:-       COMMUNICATION       TECHNOLOGIES       IN       SMART       GRID         Modul-       IV:-       COMMUNICATION       TECHNOLOGIES       IN       SMART       GRID         Multi-agent technology in Smart grid; Superconducting Technologies- Superconducting power cables, Wireless Power Transmission technology; Smart grid operation & control, self-healing, Resilience, E-Commerce of Electricity, Case study on substation automation; Micro grid; Integration of distributed energy sources, operation, control and protection of Micro grid, Overview of generation; Introduction to cloud computing and edge computing application in smart grid, Standards for Information Exchange - Data Security methods; Embedded web servers, Energy Data Analytics in the Smart Grid-Sources, Characteristics, Need, Tools, and Challenges; Artificial Intelligence, Machine Learning and M2M applications in Smart grid applications       CO-5         1.       Ali Keyhani (2016), "Design of Smart Power Grid Renewable Energy Systems", John Wiley & Sons IEEE Press.       James Momoh (2012), "Smart Grid - Fundamentals of Design and Analysis", John Wiley & Sons IEEE Press.							
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1	NPTEL :: Electrical Engineering - NOC:Introduction to Smart Grid
2	https://onlinecourses.nptel.ac.in/noc21_cs17/

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<ol> <li>Compare the performance and characteristics of hybrid and electric vehicles.</li> <li>Analyze the concepts, topologies and power flow control of electric tractic systems.</li> <li>Choose the appropriate drive system for the control of various hybrid electric vehicles</li> <li>Select appropriate power train electronic system and chasis control system</li> <li>Design control area network for Electric Vehicles.</li> </ol>					action lectric										
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