



CURRICULUM R 2022 A
(in line with NEP 2020)
Course Category and Distribution

SALIENT FEATURES OF CURRICULUM 2022

1. Focus on implementing the salient features of NEP 2020
2. Inter department electives and Department electives to focus on practical sessions and hands on training
3. More emphasis on project-based learning for professional core courses
4. A course on case study / product study / Field study helps in enhancing experiential learning
5. A course on Industry support, where domain specific industry personnel will frame the syllabus content on cutting edge technology and deliver the content to the students. Helps in bridging the industry academia gap
6. Students are encouraged to take up two internships during their summer vacation to enhance their skill set with real-time hands-on learning
7. NCC and NSS and other outreach activities helps students to transform themselves to become responsible citizens of India with Empathy and sense of inclusiveness
8. Outreach activity enables the students to have 50 hours of field service to the needy and poor thereby realizing the importance of contributing to the betterment of society
9. Innovation and Fabrication lab helps the students to explore and innovate
10. A course on Fine arts to aid in holistic growth of the student
11. Design thinking course followed by three semesters on design project courses help in conceiving innovative ideas, design and development of products
12. A course on Entrepreneurship in the final year helps in learning the process and procedures for starting a business and promoting innovative products.
13. Final semester dedicated for project work helps students to connect to industry and take real time challenge issues and work on a project in collaboration with industry
14. Fourth year is focused on the research aspects of Engineering and a course on Research Methodology and Intellectual Property Rights, will instill the desire to carry out research work.
15. Communication, Personality development, Soft skills, Creative and Technical writing skills courses in every semester helps groom the students, to become professionals who will be industry ready

16. A course on regional language is essential to bring the connect to the mother land and desire to serve the community with societal responsibilities
17. Every student is encouraged to take up two noncredit courses on social work, proficiency certification, paper presentation and journal publication, patent filing, sports and cultural activities.
18. Mandatory non-credit courses are given in the second, third and fourth semesters to give the exposure in the areas of social relevance such as Women Empowerment, Law for Engineers, Business management and wellbeing.
19. In the first semester a course on Tamil Culture and Technology helps the students to cherish the richness of the regional culture and its contribution to the growth of technology.

Non – CGPA courses:

The student shall select **any two courses /activity** listed in Table 1 during the course of study. The student has to make his / her own efforts for earning the credits. The grades given will be Pass / Fail (P/F). The respective class teachers have to encourage, monitor and record the relevant activities of the students, based on the rules issued from time to time by the Institute and submit the End semester report to the Head of the Department.

Table 1. Non – CGPA Courses

S.No.	Course / Activity	Credits
1	Technical Certification Course	2
2	Sports	2
3	Art and Cultural activities	2
4	Foreign Languages	2
5	Publication in Conferences / Seminar	2
6	Indexed Journal Publications	2
7	Patent Publication	2
8	Start ups	2
9	Industrial Training	2
10	Proficiency Certification	2
11	Technical Certification	2
12	State / National Level Social activity to support gender equality and Inclusion	2

MANDATORY COURSES I

S.No	Course Code	Course Title	Periods Per week			Total Contact Periods	Credits
1		Introduction to Women and Gender Studies	3	0	0	3	0
2		Public and Personal Administration	3	0	0	3	0
3		Constitution of India	3	0	0	3	0
4		Law for Engineers	3	0	0	3	0
5		Indian Knowledge System (IKS)	3	0	0	3	0

MANDATORY COURSES II

S.No.	Course Code	Course Title	Periods Per week			Total Contact Periods	Credits
1		Wellbeing with Traditional Practices (Yoga, Ayurveda and Siddha)	3	0	0	3	0
2		History of Science and Technology in India	3	0	0	3	0
3		Political and Economic Thought for a Humane Society	3	0	0	3	0
4		State, Nation-Building and Politics in India	3	0	0	3	0
5		Industrial Safety	3	0	0	3	0

MANDATORY COURSES III

S.No.	Course Code	Course Title	Periods Per week			Total Contact Periods	Credits
1		Principles of Management	3	0	0	3	0
2		Human Resource Management	3	0	0	3	0
3		Green Technology	3	0	0	3	0
4		Industrial Management	3	0	0	3	0
5		Fintech and Financing new Business	3	0	0	3	0

Sl. No.	Course Title	Semester	Credit	Outcomes	Course Description
1	Communication Skills (Improving English communication skills.)	I / II	2	<ol style="list-style-type: none"> 1. Acquire the accuracy through the knowledge of Syntax. 2. Demonstrate the skill of using the vocabulary and use it in sentences appropriately. 3. Infer texts and improvise its usage. 4. Illustrate language acquisition skills through formal correspondence. 5. Analyze and transcode the data and interpret it in text format. 	This course is designed to improve the communication skills of students by teaching them how to listen, speak and understand grammar in real-world contexts. It also aims to help them communicate accurately, appropriately, and fluently in both professional and social situations.
2	Personality Development and Soft Skills (Enhancing the personality through English communication skills)	I / II	2	<ol style="list-style-type: none"> 1. Demonstrate the ability to construct the grammatically correct sentences with accuracy and syntax structures. 2. Integrating various components of English Language and determining it through reading and listening. 3. 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. 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. 	This course provides students with the skills and knowledge needed to effectively communicate in professional and social situations. It also prepares them for Cambridge Certification, which will add value to their profile and demonstrate their language proficiency.

3	Advanced Academic Writing (Developing essential writing skills for academic and professional settings)	III	1	<ol style="list-style-type: none"> 1. Understand the fundamentals of academic writing, including the purpose, structure, and conventions of different genres. 2. Construct clear, concise, and cohesive sentences and paragraphs. 3. Demonstrate the ability to edit and revise written work. 4. Produce accurate and well-structured documents. 5. Utilize a range of writing techniques to enhance clarity and coherence. 	Advanced Academic Writing is a course that focuses on developing writing skills for an academic setting. Students will write essays, research papers and take part in discussions on course topics. The course aims to help students understand the writing process, communicate their ideas more effectively and become more proficient in writing for academic purposes.
4	Professional Editing and Project Writing (Presenting the skills of creating professional documents and projects that are clear, concise, and effective)	IV	1	<ol style="list-style-type: none"> 1. Develop a comprehensive understanding of professional editing and project writing. 2. Effectively edit and revise documents for clarity, accuracy and consistency. 3. Demonstrate an understanding of the different types of content used in professional writing. 4. Construct coherent and well-structured documents for various audiences. 5. Gain experience in developing and delivering effective presentations. 	Professional Editing and Project Writing is a course to help students develop their editing and writing skills for professional purposes. Topics include document structure, editing for clarity and accuracy, content types and project management. Students will edit documents, prepare presentations and develop writing projects. The course aims to help students understand the writing process and become more proficient in editing and writing for professional purposes.

5	Public Speaking (Providing instruction and experience in preparation and delivery of speeches within a public setting and group discussion)	V	1	<ol style="list-style-type: none"> 1. Evaluate speeches based on a variety of verbal and non-verbal criteria; 2. Analyze the audience and design speeches to reflect the analysis 3. Organise the speech that informs, persuades, or fulfill the needs of a special occasion; 4. Apply the presentation aids to enhance the speech 5. Analyse meaningful research on a variety of topics 	<p>This course is an introduction to speech communication which emphasizes the practical skill of public speaking, including techniques to lessen speaker anxiety, and the use of visual aids to enhance speaker presentations. Civility and ethical speech-making are the foundations of this course. Its goal is to prepare students for success in typical public speaking situations and to provide them with the basic principles of organization and research needed for effective speeches.</p>
6	English for Competitive Examinations (Developing the necessary skills and knowledge to succeed in competitive exams)	VI	1	<ol style="list-style-type: none"> 1. Acquire knowledge of the structure and format of competitive examinations. 2. Improve vocabulary and grammar to increase success in competitive examinations. 3. Develop critical thinking and problem-solving skills to answer complex questions. 4. Analyse their vocabulary and communication ability to build the knowledge of idioms, phrasal verbs and commonly used expressions. For better productivity, job performance and to develop self-confidence. 5. Learn how to approach and solve comprehension and essay questions with confidence. 	<p>This course provides students with the skills and strategies needed to succeed in competitive exams, such as English grammar, vocabulary, reading and writing skills, listening comprehension, and critical thinking. It also helps them to understand the English language and exam structure better.</p>

7	Verbal Reasoning and Interview Skills (Enhancing the understanding of reasoning using concepts framed in words and equipping to succeed in interviews)	VII	1	<ol style="list-style-type: none"> 1. Illustrate verbal ability skill. 2. Develop verbal reasoning ability to improve logical reasoning skills. 3. Analyse language strategies and techniques for speaking in formal and informal professional contexts. 4. Enhance the ability to use linguistic structures and vocabulary in professional contexts. 5. Develop the ability to prepare and present a report in professional and academic contexts. 	<p>This course seeks to enhance their verbal thinking abilities and employment skills.</p> <p>In the course, students learn how to use their newly acquired speaking skills to compete in the outside world. Students who participate in this course will master the speaking techniques necessary to maximize their potential through practice with verbal reasoning.</p>
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A. Definition of Credit:

B. Range of Credits: In the light of the fact that a typical Model Four-year Under Graduate degree program in Engineering has about 160 credits, we have adopted 165 credits. In addition to this, Industry collaborated courses can amount to 12 credits out of which we have allotted 7 more credits to the courses of B. Tech CSE (AI & ML) and B. Tech CSE (Cyber Security) with a 172 credits.

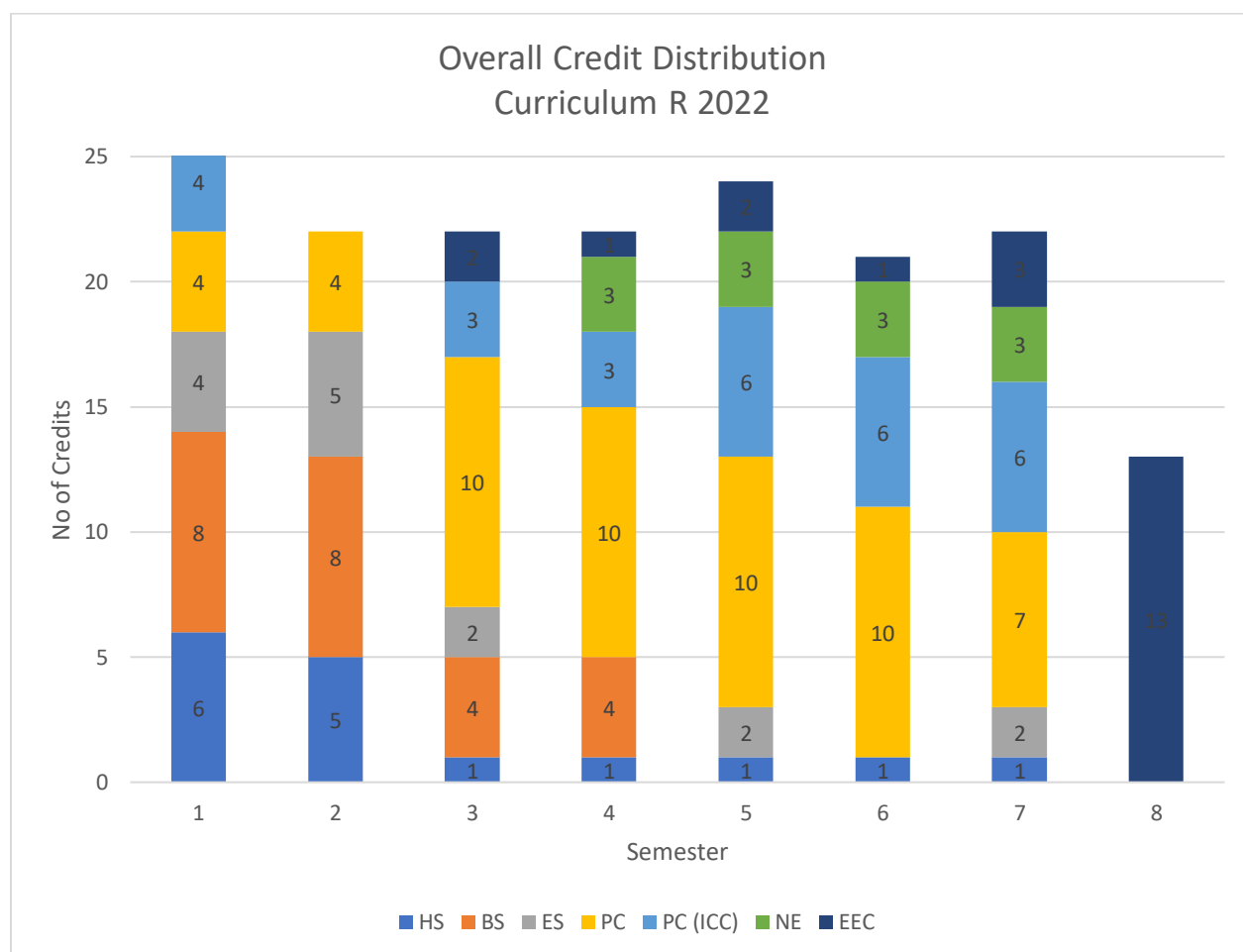
S. No.	Category Code	Category	Breakup of Credits
1.	HS	Humanities & Social Science Courses	16
2.	BS	Basic Science Courses	24
3.	ES	Engineering Science Courses	15
4.	PC	Program Core Courses (Branch specific)	54
5.	PC (ICC)	Industry Collaborated Courses (Branch specific)-Professional Core	29
6.	NE	Open Elective Courses (Cross Discipline Subjects) – Non-Department Elective	12
7.	EEC	Employment Enhancement Courses (Project/ Summer Internship/ Seminar)	22
TOTAL			172

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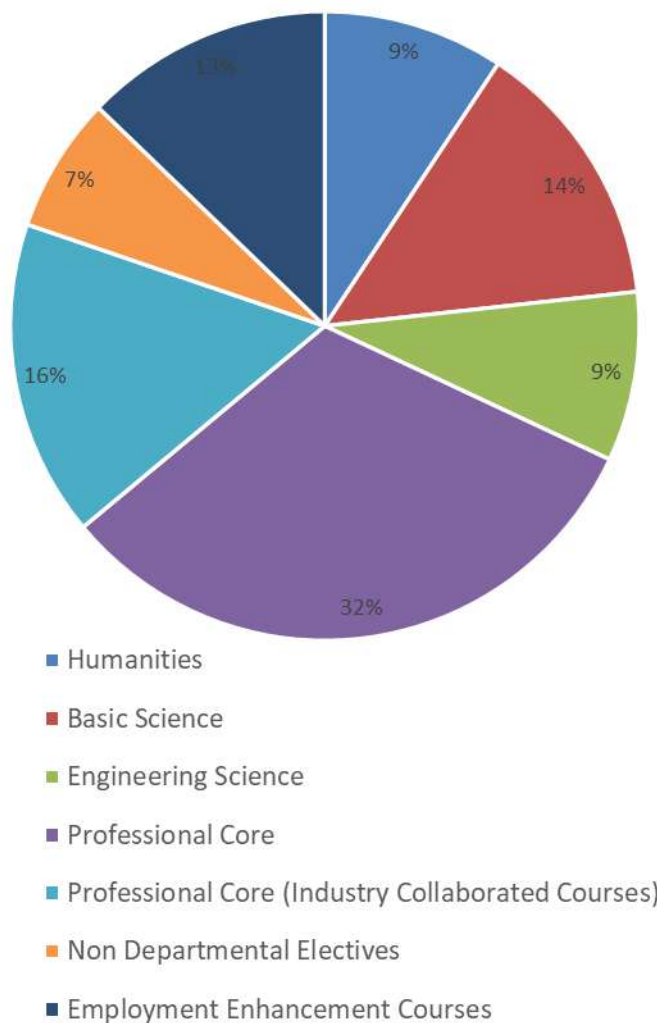
Total Courses	12	6	7	16	9	4	8	3	65
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CURRICULUM COURSE DISTRIBUTION (BASED ON CREDITS)

Semester	HS	BS	ES	PC	PC (ICC)	NE	EEC	Total Credits per semester
1	6	8	4	4	4			26
2	5	8	5	4				22
3	1	4	2	10	3		2	22
4	1	4		10	3	3	1	22
5	1		2	10	6	3	2	24
6	1			10	6	3	1	21
7	1		2	7	6	3	3	22
8							13	13
Total Credits	16	24	15	55	28	12	22	172



Overall Credit Distribution Curriculum R 2022
Percentage of Distribution



Category-wise Courses

HUMANITIES & SOCIAL SCIENCES COURSES [HS]

- (i) Number of Humanities & Social Science Courses: 12
(ii) Credits: 16

SL. NO	COURSE CATEGORY	SEMESTER	NAME OF THE COURSE	L	T	P	C
1	HS	1/2	English 1 - Communication Skills	1	0	2	2
2	HS	1/2	English 2 - Personality Development and Soft Skills	1	0	2	2

3	HS	1/2	Fine Arts, NCC, NSS & Others (Level -1)	0	0	2	1
4	HS	1/2	Fine Arts, NCC, NSS & Others (Level -2)	0	0	2	1
5	HS	1/2	Regional Language OR Foreign Language	2	0	0	2
6	HS	1/2	Universal Human Values	2	0	0	2
7	HS	1	Tamil Culture and Technology	1	0	0	1
8	HS	3	English 3 – Advanced Academic Writing	1	0	1	1
9	HS	4	English 4 - Professional Editing and Project Writing	1	0	1	1
10	HS	5	English 5 – Public Speaking	1	0	1	1
11	HS	6	English 6 - English for Competitive Examinations	1	0	1	1
12	HS	7	English 7 – Verbal Reasoning and Interview Skills	1	0	1	1

BASIC SCIENCE COURSES [BS]

- (i) Number of Basic Sciences Courses: 6
- (ii) Credits: 24

SL. NO	COURSE CATEGORY	SEMESTER	NAME OF THE COURSE	L	T	P	C
1	BS	1	Mathematics – 1	3	0	2	4
2	BS	1/2	Physics	3	0	2	4
3	BS	2	Mathematics – 2	3	0	2	4
4	BS	1/2	Chemistry	3	0	2	4
5	BS	3	Mathematics – 3	3	1	0	4
6	BS	4	Mathematics – 4	3	1	0	4

ENGINEERING SCIENCE COURSES [ES]

- (i) Number of Engineering Sciences Courses: 6
- (ii) Credits: 13

SL. NO	COURSE CATEGORY	SEMESTER	NAME OF THE COURSE	L	T	P	C
1	ES	1	Design Thinking	1	0	2	2
2	ES	1/2	Immersion Lab	1	0	2	2
3	ES	1/2	FAB lab	1	0	2	2
4	ES	2	Engineering Graphics and Computer-Aided Design	2	0	2	3
5	ES	3	Environmental Science and Sustainable Development	2	0	0	2
6	ES	5	Entrepreneurship	1	0	2	2
7	ES	7	Research Methodology & IPR	2	0	0	2

PROGRAM CORE COURSES [PC]

- (i) Number of Program Core Courses: 16
- (ii) Credits: 55

SL. NO	COURSE CATEGORY	SEMESTER	NAME OF THE COURSE	L	T	P	C
1	PC	1	Programming Fundamentals using C	3	0	2	4
2	PC	2	Object-Oriented Programming Using C++	3	0	2	4
3	PC	3	Data Structures	3	0	2	4
4	PC	3	Fundamentals of Python Programming	2	0	2	3
5	PC	3	Database Management Systems	3	0	2	3
6	PC	4	Operating Systems	3	0	2	4
7	PC	4	Design and Analysis of Algorithms	2	0	2	3
8	PC	4	Computer Networks	2	0	2	3
9	PC	5	Theory of Computation	3	0	2	4
10	PC	5	Computer Architecture	3	0	0	3
11	PC	5	Java Programming	2	0	2	3

12	PC	6	Principles of Compiler Design	3	0	2	4
13	PC	6	Artificial Intelligence and Expert Systems	3	0	0	3
14	PC	6	Web Programming	2	0	2	3
15	PC	7	Machine Learning Concepts	3	0	2	4
16	PC	7	Modern Software Engineering	2	0	2	3

DEPARTMENT ELECTIVE COURSES [DE] – PROFESSIONAL ELECTIVE COURSES

- (i) Number of Professional Industry Collaborated Courses: 9
(ii) Credits: 28

SL. NO	COURSE CATEGORY	SEMESTER	NAME OF THE COURSE	L	T	P	C
1	PC (ICC)	1	Information Security Fundamentals	3	1	0	4
2	PC (ICC)	3	IT System security	2	0	2	3
3	PC (ICC)	4	IT Data security	2	0	2	3
4	PC (ICC)	5	IT Application security	2	0	2	3
5	PC (ICC)	5	IT Network Security	2	0	2	3
7	PC (ICC)	6	Digital Forensics	2	0	2	3
6	PC (ICC)	6	Ethical Hacking and penetration Testing	2	0	2	3
8	PC (ICC)	7	Information security intelligence and management practices	2	0	2	3
9	PC (ICC)	7	IT security audit and monitoring	2	0	2	3

NON-DEPARTMENT ELECTIVE COURSES [DE] – OPEN ELECTIVE COURSES

The open elective courses in the curriculum are designed for a student to widen his knowledge from other areas of engineering, science or humanities. For these courses the student can take any institute wide courses being offered in programs other than host Program. In addition, the open elective courses are to be of the level as suitable for the level of the student. For example, the NE1 is slotted in the fifth semester (i.e.

third year) of the program of the student. He should be able to take any institute wide course which is slated for the third-year student of the corresponding department.

- (i) Number of Open Elective Courses: 4
(ii) Credits: 15

SL. NO	COURSE CATEGORY	SEMESTER	NAME OF THE COURSE	L	T	P	C
1	NE	4	NE 1 (May be lab integrated)	2	0	2	3
2	NE	5	NE 2 (May be lab integrated)	2	0	2	3
3	NE	6	NE 3 (May be lab integrated)	2	0	2	3
4	NE	7	NE 4 (May be lab integrated)	2	0	2	3

**EMPLOYMENT ENHANCEMENT COURSES [EEC]
PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY OR ELSEWHERE**

- (i) Number of EEC Courses: 8
(ii) Credits: 22

SL. NO	COURSE CATEGORY	SEMESTER	NAME OF THE COURSE	L	T	P	C
1	EEC	3	Design Project – 1	0	0	2	1
2	EEC	3	Internship -1 (To be carried out in summer after 2 nd semester and evaluated in 3 rd semester)	0	0	0	1
3	EEC	4	Design Project – 2	0	0	2	1
4	EEC	5	Design Project – 3	0	0	2	1
5	EEC	5	Internship -2 (to be evaluated in 5 th semester. To be carried out in summer after 4 th semester))	0	0	0	1
6	EEC	6	Design Project – 4	0	0	2	1
7	EEC	7	Project Phase 1	0	0	6	3
8	EEC	8	Project Phase 2	0	0	26	13

FRAMEWORK OF CURRICULUM 2022 (in line with NEP 2020)
SEMESTER – I

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TC H
1	BS		Mathematics – 1	3	0	2	4	2	5
2	BS		Physics	3	0	2	4	2	5
			Chemistry						
3	HS		English 1	2	0	1	2	1	3
			English 2						
4	PC		Programming Fundamentals using C OR Programming in Python	2	0	2	3	2	4
			Engineering Graphics and Computer Aided Design						
5	ES		Design Thinking	2	0	2	3	2	4
6	ES		Engineering Practices Lab	0	0	4	2	2	4
			Fab Lab						
7	HS		Outreach (NCC, NSS, Y's Men, Rotaract) – Level I	0	0	2	1	4	2
8	HS		Regional Language OR Foreign Language	2	0	0	2	2	2
			Universal Human Values						
9	HS		Tamil Culture and Technology	1	0	0	1	2	1
10	PC	ECY51001	Information Security Fundamentals	3	1	0	4	2	4
Total				18	1	15	26	21	34

SEMESTER – II

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TC H
1	BS		Mathematics – 2	3	0	2	4	2	5
2	BS		Physics	3	0	2	4	2	5
			Chemistry						
3	HS		English 1	2	0	1	2	1	3
			English 2						
4	PC		PC – 1 (Department specific)	3	0	2	4	2	5
5	ES		Programming Fundamentals using C OR Programming in Python	2	0	2	3	2	4
			Engineering Graphics and Computer Aided Design						
6	ES		Engineering Practices Lab	0	0	4	2	2	4
			Fab Lab						
7	HS		Outreach (NCC, NSS, Y's Men, Rotaract) – Level II	0	0	2	1	4	2
8	HS		Regional Language OR Foreign Language	2	0	0	2	2	2
			Universal Human Values						
9	MC		Mandatory Course #1 Mandatory Course I is a Non-credit course (Student shall select one course from the list given under Mandatory Course I)	3	0	0	0	2	3
Total				18	0	15	22	19	33

FRAMEWORK OF CURRICULUM 2022 A (in line with NEP 2020)

SEMESTER – III

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	EMA51005	Discrete Mathematics	3	1	0	4	2	4
2	HS		Advanced Academic Writing	1	0	1	1	1	2
3	PC	ECS51004	Data Structures	3	0	2	4	2	5
4	PC	ECS51005	Fundamentals of Python Programming	2	0	2	3	2	4
5	PC	ECS51006	Database Management Systems	2	0	2	3	2	4
6	PC(ICC)	ECY51002	IT System security	2	0	2	3	2	4
7	ES		Environmental Science and Sustainable Development	2	0	0	2	2	2
8	EEC	ECS51800	Design Project – 1	0	0	2	1	6	2
9	EEC	ECS51801	Internship -1 (To be carried out in summer after 2 nd semester and evaluated in 3 rd semester)	0	0	0	1	2	0
10	MC		Mandatory Course #2 Mandatory Course I is a Non-credit course (Student shall select one course from the list given under Mandatory Course I)	3	0	0	0	2	3
Total				18	1	11	22	23	30

SEMESTER – IV

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	EMA51007	Probability and Statistics	3	0	2	4	2	5
2	HS		Professional Editing and Project Writing	1	0	1	1	1	2
3	PC	ECS51008	Operating Systems	3	0	2	4	2	5
4	PC	ECS51009	Design and Analysis of Algorithms	2	0	2	3	2	4
5	PC	ECS51010	Computer Networks	2	0	2	3	2	4
6	PC(ICC)	ECY51003	IT Data security	2	0	2	3	2	4
7	NE	E**51***	NE 1 (May be lab integrated)	2	0	2	3	2	4
8	EEC	ECS51802	Design Project – 2	0	0	2	1	6	2
9	MC		Mandatory Course #3 Mandatory Course I is a Non-credit course (Student shall select one course from the list given under Mandatory Course I)	3	0	0	0	2	3

			Total	18	0	15	22	21	33
FRAMEWORK OF CURRICULUM 2022 A (in line with NEP 2020)									
SEMESTER – V									
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	HS		Public Speaking	1	0	1	1	1	2
2	PC	ECS51011	Theory of Computation	3	0	2	4	2	5
3	PC	ECS51012	Computer Architecture	2	0	2	3	2	4
4	PC	ECS51013	Java Programming	2	0	2	3	2	4
5	PC(ICC)	ECY51004	IT Application security	2	0	2	3	2	4
6	NE	E**51***	NE 2 (May be lab integrated)	2	0	2	3	2	4
7	EEC	ECS51803	Design Project – 3	0	0	2	1	6	2
8	ES	EGE51002	Entrepreneurship	2	0	0	2	6	2
9	EEC	ECS51801	Internship -2 (to be evaluated in 5 th semester. To be carried out in summer after 4 th semester))	0	0	0	1	0	0
10	PC(ICC)	ECY51005	IT Network Security	2	0	2	3	2	4
Total				16	0	15	24	25	31
SEMESTER – VI									
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	HS		English for Competitive Examinations	1	0	1	1	1	2
2	PC	ECS51014	Principles of Compiler Design	3	0	2	4	2	5
3	PC	ECS51015	Artificial Intelligence and Expert Systems	3	0	0	3	2	3
4	PC	ECS51014	Web Programming	2	0	2	3	2	4
5	PC(ICC)	ECY51006	Digital Forensics	2	0	2	3	2	4
6	NE	E**51***	NE 3 (May be lab integrated)	2	0	2	3	2	4
7	PC(ICC)	ECY51007	Ethical Hacking and penetration Testing	2	0	2	3	2	4
8	EEC	ECS51805	Design Project – 4	0	0	2	1	6	2
Total				15	0	13	21	19	28

FRAMEWORK OF CURRICULUM 2022 A (in line with NEP 2020)									
SEMESTER – VII									
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	HS		Verbal Reasoning and Interview Skills	1	0	1	1	1	2
2	PC	ECS51018	Machine Learning Concepts	3	0	2	4	2	5
3	PC(ICC)	ECY51008	Information security intelligence and management practices	2	0	2	3	2	4
4	PC	ECS51020	Modern Software Engineering	2	0	2	3	2	4
5	PC(ICC)	ECY51009	IT security audit and monitoring	2	0	2	3	2	4
6	NE	E**51***	NE 4 (May be lab integrated)	2	0	2	3	2	4
7	ES	EGE51003	Research Methodology & IPR	2	0	0	2	2	2
8	EEC	ECS51806	Project Phase 1	0	0	6	3	6	6
Total				14	0	17	22	19	31
SEMESTER – VIII									
SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	EEC	ECS51807	Project Phase 2	0	0	26	13	10	24
Total				0	0	26	13	10	24
Total Credits for the Program							172		

CREDIT COUNT

Semester	Credit Count
1	26
2	22
3	22
4	22
5	24
6	21
7	22
8	13
	172

SEMESTER-III

COURSE TITLE	DISCRETE MATHEMATICS								CREDITS		4				
COURSE CODE	EMA51005			COURSE CATEGORY		BS			L-T-P-S		3-1-0-2				
Version	1.0			Approval Details					LEARNING LEVEL		BTL-3				
ASSESSMENT SCHEME															
CIA											ESE				
First Periodical Assessment	Second Periodical Assessment			Seminar/ Assignments/ Project		Surprise Test / Quiz etc., as approved by the Department Examination Committee “DEC”			Attendance*		End Semester Examination				
15%	15%			10%		5%			5%		50%				
Course Description	To make the student understand the basic analytical mathematical skills that is imperative for effective understanding of engineering subjects using MATLAB.														
Course Objective	1. To learn the concept of logics and proofs 2. To apply the concept of Combinatorics. 3. To know about the concepts of sets and functions. 4. To perform coding using the concept of algebraic systems. 5. To model the graph and classify the nature of graphs.														
Course Outcome	Upon completion of this course, the students will be able to 1. Form the truth table and validate the argument. 2. Apply generating functions to solve a variety of combinatorial problems. 3. Explain the concepts of sets and functions and prove some theorems. 4. Identify the various types of groups and apply the group coding concept. 5. Explain the basic terminology of a graph and classify the different types of graphs.														
Prerequisites: Basics in Algebra															
CO, PO, PSO MAPPING															
CO	PO -1	P O -2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO -8	PO -9	PO -10	PO- 11	PO- 12	PS O- 1	PS O- 2	PSO -3
CO-1	3	3	3	1	-	-	-	-	-	1	-	2	-	-	3
CO-2	3	3	3	1	-	-	-	-	-	1	-	2	-	-	3
CO-3	3	3	3	1	-	-	-	-	-	1	-	2	-	-	3

CO-4	3	3	3	1	-	-	-	-	-	1	-	2	-	-	3
CO-5	3	3	3	1	-	-	-	-	-	1	-	2	-	-	3
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: LOGICS AND PROOFS (9L+3T=12)															
Propositions – Logical connectives – Compound propositions – Conditional and bi-conditional propositions – Truth tables – Tautologies and contradictions – Contra positive – Logic equivalences and implications. Predicates – Statement function – Variables – Free and bound variables – Quantifiers – Universe of discourse – Logical equivalences and implications for quantified statements. Suggested Reading: Basics of logical operators													CO-1 BTL-3		
MODULE2: COMBINATORICS (9L+3T=12)															
Mathematical Induction-Strong induction and well ordering – the basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – inclusion and exclusion and applications. Suggested Reading: Basics of probability													CO-2 BTL-3		
MODULE 3: SETS AND FUNCTIONS (9L+3T=12)															
Sets: Relations on sets – Types of relations and their properties – Partitions – Equivalence relations – Partial ordering – Poset – Hasse diagram. Functions: Characteristic function of a set – Hashing functions – Recursive functions – Permutation functions. Suggested Reading: Basic concepts of sets and Functions													CO-3 BTL-3		
MODULE 4: ALGEBRAIC SYSTEMS (9L+3T=12)															
Groups, Cyclic Groups, Subgroups, Cosets, Lagrange’s theorem, Normal subgroups – Codes and group codes – Decodes. Suggested Reading: Basics of Groups													CO-4 BTL-3		
MODULE 5: GRAPHS (9L+3T=12)															
Graphs and graphs models – Graph terminology and special types of graphs – Representing graphs and graph isomorphism – connectivity – Euler and Hamilton paths. Suggested Reading: Basics of Graphs													CO-5 BTL-3		
TEXT BOOKS															
1.		A. Singaravelu and M. P. Jeyaraman (2013) Discrete Mathematics, Meenakshi Agency, India.													
2.		Kenneth H. Roshan (2011) Discrete Mathematics and its Applications, Tata McGraw Hill, New Delhi.													
REFERENCE BOOKS															
1.		J.P. Tremblay and R. Monohar (2003) Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, New Delhi.													
2.		Trivedi.K (2002) Probability and Statistics with Reliability, Queuing and Computer Science Applications, 2nd Edition, John Wiley and Sons, New Delhi.													
3.		J. A. Bondy and U.S.R Murty (2008) Graph Theory, Springer Publications, US.													
E BOOKS															
1.		https://open.umn.edu/opentextbooks/textbooks/394 https://www.freebookcentre.net/Mathematics/Discrete-Mathematics-Books.html													
MOOC															

1.	http://nptel.ac.in/courses/106106094/
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COURSE TITLE	DATA STRUCTURES			CREDITS	4
COURSE CODE	ECS51004	COURSE CATEGORY	PC	L-T-P-S	3- 0- 2- 2
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

CIA					ESE	
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee "DEC"	Attendance*	Theory	Practical
15%	15%	10%	5%	5%	25%	25%

Course Description	This is a course suitable for B. Tech students. It deals with basic data structures, arrays, heaps etc. This course develops the knowledge in the graphs, algorithm, creation, deletion, insertion. Also gives an idea about developing the projects in the data structures.
Course Objective	<ol style="list-style-type: none"> 1. To develop the knowledge in the basic designing of algorithms 2. To apply the concept of algorithms for the creation, insertion, deletion, searching, and sorting of each data structure. 3. To learn the concept of Sort, arrays, linked lists etc. 4. To define the idea of graphs and its traversal. 5. To develop the implementation knowledge in the projects.
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Compute and analyse the algorithms for efficiency using Asymptotic Notations. 2. Develop knowledge of basic data structures such as arrays, linked lists, binary trees, heaps, and hash tables for storage and retrieval of ordered or unordered data. 3. Solve problems by applying suitable data structures with the algorithms for the creation, insertion, deletion, searching, and sorting of each data structure. 4. Define graphs and illustrate graph traversals. 5. Design and develop projects requiring the implementation of the data structures.

Prerequisites: C Programming Language

CO, PO AND PSO MAPPING

CO	PO - 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO- 10	PO- 11	PO- 12	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	-	2	-	-	-	3	2	-	2	1	1	1
CO-2	3	3	1	-	2	-	-	-	3	2	-	2	1	1	1
CO-3	3	3	1	-	2	-	-	-	3	2	-	2	1	1	1
CO-4	3	3	1	-	2	-	-	-	3	2	-	2	1	1	1
CO-5	3	3	1	-	2	-	-	-	3	2	-	2	1	1	1
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: LINEAR DATA STRUCTURES													(9L+3P=12)		
<p>Introduction to Data Structures – Fundamental Elements – Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis: Definition and an example -Arrays and its representations – Stacks and Queues – Linked lists - Singly Linked List - Doubly linked list - Linked list-based implementation of Stacks and Queues – Evaluation of Expressions.</p> <p>Lab Experiment:</p> <ol style="list-style-type: none"> 1. Write a c program to implement the various operations of stack using Pointer/Array 2. Implement the functions of Queue 3. Develop the source code to implement the linked list operations 4. Write a c program to convert the infix expression to postfix expression <p>Software Required: GCC</p>													<p>CO-1</p> <p>BTL-2</p>		
MODULE 2: NON-LINEAR DATA STRUCTURES													(9L+3P=12)		
<p>Trees: Introduction to Trees – Basic concepts - Binary Trees – Binary tree representations (Array and list) and Traversals Techniques (Preorder, Inorder, Postorder) – Binary Search Trees – AVL Trees – Splay Trees-Priority Queues – Heaps implementations – Binary Heap.</p> <p>Lab Experiment:</p> <ol style="list-style-type: none"> 1. Write a program to traverse the tree in inorder, preorder and post order. 2. Implement the Binary Search Tree to perform the various operations. 3. Write a Program to simulate the functions of Min heap/Max heap <p>Software Required: GCC</p>													<p>CO-2</p> <p>BTL-2</p>		
MODULE 3: GRAPHS													(9L+3P=12)		
<p>Graphs: Definitions, Terminologies, Matrix and Adjacency List Representation Of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search-Topological sort – Shortest path problems-Spanning Tree, Connected Components.</p> <p>Lab Experiment:</p> <ol style="list-style-type: none"> 1. Implement the BFS Traversing 2. Write a program to implement the DFS Traversing 													<p>CO-3</p> <p>BTL-3</p>		

3. Develop the source code to find the shortest path in the given Graph		
Software Required: GCC		
MODULE 4: SORTING AND SEARCHING		(9L+3P=12)
Sorting Algorithms: Basic concepts - Bubble Sort - Insertion Sort - Selection Sort - Quick Sort – Shell sort - Heap Sort - Merge Sort - External Sorting. Searching: Linear Search, Binary Search. Lab Experiment: 1. Write a program to implement the Bubble sort and Quick Sort 2. Implement Linear Search and Binary Search algorithms Software Required: GCC		CO-4 BTL-3
MODULE 5: INDEXING AND DISJOINT SETS		(9L+3P=12)
Indexing: Hashing - Hash Functions – Separate Chaining – Open Addressing: Linear Probing- Quadratic Probing- Double Hashing- Rehashing – Extendible Hashing. Disjoint Sets: Basic data structure - Smart Union Algorithms - Path Compression. Lab Experiment: 1.Hash table implementation in c using arrays 2.Implement the various operations of Set Software Required: GCC		CO-5 BTL-3
TEXT BOOKS		
1.	Ellis Horowitz, S. Sahni, Freed. (2015). <i>Fundamentals of Data Structures in C</i> , 2nd edition.	
2.	D.S.Kushwaha and A.K.Misra(2022),”Data structures A Programming Approach with C”, PHI.	
3.	Puntambekar, A. A., and Dr. M. Sambath. <i>Data Structures</i> . First Edition: May 2023, Technical Publications.	
REFERENCE BOOKS		
1.	Langsam, Y., Augenstein, M. J. And Tanenbaum A. M. (2004). <i>Data Structures using C</i> , Pearson Education Asia.	
2	R.F.GilbergAndB.A.Forouzan (2022),”Data structures: A Pseudo code Approach with C”, 2nd edition,, Cengage Learning.	
3	M.A.Weiss(2022),”Data structures and Algorithm Analysis in C”, 2nd edition,, Pearson.	
E BOOKS		
1.	https://www.cs.bham.ac.uk/~jxb/DSA/dsa.pdf	
2.	https://courses.csail.mit.edu/6.851/spring12/scribe/lec12.pdf	
3.	http://lib.mdp.ac.id/ebook/Karya%20Uмум/Dsa.pdf	
MOOC		
1.	https://www.mooc-list.com/tags/data-structures	
2.	https://nptel.ac.in/courses/106102064/	
3.	https://www.udemy.com/algorithm/	

COURSE TITLE		FUNDAMENTALS OF PYTHON PROGRAMMING						CRED ITS		3						
COURSE CODE		ECS51005		COURSE CATEGORY		PC				L-T-P-S		2-0-2-2				
Version		1.0		Approval Details						LEARNING LEVEL		BTL-3				
ASSESSMENT SCHEME																
CIA													ESE			
First Periodical Assessment (Theory)		Second Periodical Assessment (Theory)		Practical Assessments		Observation / lab records as approved by the Department Examination Committee “DEC”				Attendance*		THEORY		PRACTICAL		
15%		15%		10%		5%				5%		25%		25%		
Course Description		Students are introduced to core programming concepts like data structures, conditionals, loops, variables, and functions. This course includes an overview of the various tools available for writing and running Python, and gets students coding quickly.														
Course Objective		<div>1. To identify and execute basic syntax and programs in Python.</div> <div>2. To solve problems using Python built-in data types and their methods.</div> <div>3. To create user-defined functions, modules and packages.</div> <div>4. To implement exception and file handling operations.</div> <div>5. To design an application using OOP concept in Python.</div>														
Course Outcome		Upon completion of this course, the students will be able to <div>1. Identify and execute basic syntax and programs in Python.</div> <div>2. Solve problems using Python built-in data types and their methods.</div> <div>3. Create user-defined functions, modules and packages.</div> <div>4. Implement exception and file handling operations.</div> <div>5. Design an application using OOP concept in Python.</div>														
CO, PO AND PSO MAPPING																
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	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
CO-5	3	3	3	3	3	-	-	-	3	3	3	3	3	3	3
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: INTRODUCTION (6L+ 3P)															
Python Introduction- History and features of Python, Python Installation- Running Simple Programs, Python Identifiers, Reserved words, Indentation, Comments, assigning values to the variables, Standard data types, Type Conversion, Operators, Decision Making, Looping, Loop Control statement, Mathematical functions and constants- Random number function. Lab Experiment: Python programming – Standard operations Software: PyCharm Suggested Readings: Apply decision and looping statements to solve any given problem.													CO-1 BTL-3		
MODULE 2: SEQUENCES & DICTIONARY (6L+ 3P)															
Strings- Introduction, String operations, Built-in-String methods, Lists- Introduction, List Operations-Indexing, slicing, Built -in List methods and Functions, Matrices, Tuples- introduction, Tuple Operations, Built -in Tuple methods and functions, Dictionary- Introduction, Dictionary Operations, Built -in Dictionary methods and functions. Lab Experiment: Working with python sequences and dictionary Software: PyCharm Suggested Readings: Use a suitable data type and its built-in methods for handling any problem.													CO-2 BTL-3		
MODULE 3: FUNCTIONS, MODULES AND PACKAGE (6L+ 3P)															
Functions - User defined functions, function arguments & its types - Time and Calendar module functions –Import statements - User defined Modules and Packages in Python. Lab Experiment: Working with python functions, modules and packages Software: PyCharm Suggested Readings: Create user-defined functions, modules and packages.													CO-3 BTL-3		
MODULE 4: FILE AND EXCEPTION HANDLING (6L+ 3P)															
Files- Opening and closing files, file manipulations, Directories in Python, File and Directory related methods. Exception - Handling Exceptions, try-finally, Raising an Exception. Lab Experiment: Working with python files and exception handling Software: PyCharm Suggested Readings: Copy the contents from one file to another and handle exceptions simultaneously.													CO-4 BTL-3		
MODULE 5: OBJECT ORIENTED PROGRAMMING (6L+ 3P)															

OOPs Concepts -Class and Objects, Constructors and Inheritance. Lab Experiment: Working with python OOPs concepts Software: PyCharm Suggested Readings: Apply the concept of inheritance for any given application		CO-5 BTL -3
TEXT BOOKS		
1.	Y. Daniel Liang, “Introduction to Programming using Python”, Pearson,2012.	
2.	Wesley J. Chun, “Core Python Programming”, Prentice Hall,2006.	
REFERENCE BOOKS		
1	Mark Lutz, “Learning Python”, O’Reilly, 4th Edition, 2009	
E RESOURCES FOR REFERENCE		
1.	https://www.cs.uky.edu/~keen/115/Haltermanpythonbook.pdf	
MOOC		
1.	https://www.edx.org/learn/python	
2.	https://www.coursera.org/learn/python	

COURSE TITLE	DATABASE MANAGEMENT SYSTEMS			CREDITS	3	
COURSE CODE	ECS51006	COURSE CATEGORY	PC	L-T-P-S	2-0-2-2	
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3	
ASSESSMENT SCHEME						
CIA					ESE	
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee “DEC”	Attendance*	Theory	Practical
15%	15%	10%	5%	5%	25%	25%
Course Description	Focuses on concepts and structures necessary to design and implement a database management system. Various modern data models, data security and integrity, and concurrency are discussed. An SQL database system is designed and implemented as a group project.					

Course Objective	1. To learn the basic concepts of DB systems. 2. To know about SQL Queries. 3. To Apply the concept of relational DB theory and to write relational algebra expressions for queries. 4. To be able to demonstrate the Transaction Processing and Concurrency Control. 5. To be aware about Object Oriented DB, Distributed DB, Data Warehousing and Mobile databases.														
Course Outcome	Upon completion of this course, the students will be able to 1. Recall the basic concepts of database systems. 2. Identify the SQL Queries for a given scenario. 3. Illustrate relational database theory, and be able to write relational algebra expressions for queries. 4. Demonstrate transaction processing and concurrency control. 5. Explain Object oriented dB, Distributed dB, Data Warehousing and Mobile databases.														
Prerequisites: Nil															
CO, PO AND PSO MAPPING															
CO	PO - 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	P O- 7	PO- 8	PO-9	PO - 10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO- 3
CO-1	2	3	2	3	3	-	-	-	-	-	3	-	1	3	3
CO-2	2	3	2	3	3	-	-	-	-	-	3	-	1	3	3
CO-3	2	3	2	3	3	-	-	-	-	-	3	-	1	3	3
CO-4	2	3	2	3	3	-	-	-	-	-	3	-	1	3	3
CO-5	2	3	2	3	3	-	-	-	-	-	3	-	1	3	3
1: Weakly related, 2: Moderately related, and 3: Strongly related															
MODULE 1: CONCEPTUAL MODELING AND SQL													(6L+3P)		
Introduction to File and Database Systems- Database system structure – Data Models – Introduction to Network and Hierarchical Models – ER model – Relational Model – Relational Algebra and Calculus- SQL – Data definition- Queries in SQL Suggested reading: http://nptel.ac.in/courses/106106093/1 Lab Experiment: 1. To study and execute Basic SQL commands (create table, use, drop, insert). Software Required: Oracle 9i													CO-1 BTL-2		
MODULE 2: RELATIONAL MODEL													(6L+3P)		
SQL Updates- Views – Compound Conditions-Aggregate Functions-Grouping-Integrity and Security – Relational Database design – Functional dependencies and Normalization for Relational Databases (up to BCNF) Suggested reading: http://nptel.ac.in/courses/106106093/4 Lab Experiment: 1. To execute the viewing commands (select, update)													CO-2 BTL-3		

2. To execute the commands to modify the structure of table (alter, delete) and to execute 3. To execute the commands that involve compound conditions (and, or, in, not in, between, not between, like, not like) 4. To execute the aggregate functions (sum, count, max, min, average) 5. To execute the grouping commands (group by, order by) Software Required: Oracle 9i	
MODULE 3: DATA STORAGE AND QUERY PROCESSING	
Record storage and Primary file organization- Secondary storage Devices- Operations on Files- Heap File- Sorted Files- Hashing Techniques – Index Structure for files –Different types of Indexes- B-Tree - B+ Tree – Query Processing. Suggested reading: http://nptel.ac.in/courses/106106093/11 Lab Experiment: 1. To execute the commands involving data constraints. 2. To execute the commands for joins (cross join, inner join, outer join). 3. To execute the various set operations. 4. To execute the various scalar functions and string functions (power, square, substring, reverse, upper, lower, concatenation). 5. To study and execute procedures and triggers in PL-SQL. Software Required: Oracle 9i	CO-3 BTL-3
MODULE 4: TRANSACTION MANAGEMENT	
Transaction Processing – Introduction- Need for Concurrency control- Desirable properties of Transaction- Schedule and Recoverability- Serializability and Schedules – Concurrency Control – Types of Locks- Two Phases locking- Deadlock- Recovery Techniques. Suggested reading: http://nptel.ac.in/courses/106106093/18 Lab Experiment: 1. To study and execute the commands involving indexes 2. To study and execute the conditional controls and case statement in PL-SQL Software Required: Oracle 9i	CO-4 BTL-3
MODULE5: OBJECT ORIENTED DB AND WAREHOUSING	
Object Oriented Databases- Need for Complex Data types- OO data Model -ETL-Metadata- Enterprise warehouse (EWD)-Data mart- Virtual Warehouse- Operational Data Store (ODS)- OLAP-OLTP- Distributed databases- Distributed data Storage-Mobile Databases. Suggested reading: http://nptel.ac.in/courses/106106093/31 Lab Experiment: 1. Experiment the features of WEKA tool kit such as Explorer, Knowledge flow interface, Experimenter, command-line interface and navigate the options of select attributes panel, reprocess panel, classify panel, cluster panel, associate panel and visualize) 2. Load a data set (ex. Weather dataset, Iris dataset, etc.) and Perform data pre-processing tasks and demonstrate pre-processing operations on data sets. Software Required: Oracle 9i	CO-5 BTL-3
TEXT BOOKS	

1.	Abraham Silberschatz, Henry F. Korth and S. Sudarshan- —Database System Concepts]], Sixth Edition, McGraw-Hill, 2011.
2.	Puntambekar, A. A., and Dr. M. Muthukumaran. Database Management Systems. First Edition: May 2023, Technical Publications.
REFERENCE BOOKS	
1.	Ramez Elmasri and Shamkant B. Navathe, —Fundamental Database Systems]], Seventh Edition, Pearson Education, 2016.
2.	Raghu Ramakrishnan, —Database Management System, Tata McGraw-Hill Publishing Company, Third Edition, 2014.
3.	Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition. 2022
4.	Jiawei Han, Micheline Kamber, Jian Pei -Data Mining Concepts and Techniques, Morgan Kaufmann, Third Edition, 2012.
E BOOKS	
1.	https://inspirit.net.in/books/database/Database%20System%20Concepts.pdf
MOOC	
1.	https://www.udemy.com/database-management-system/
2.	https://www.edx.org/course/database-systems-concepts-design-gtx-cs6400x-1

COURSE TITLE	ENVIRONMENTAL SCIENCE AND SUSTAINABLE DEVELOPMENT			CREDITS	2
COURSE CODE	ECT51002	COURSE CATEGORY	ES	L-T-P-S	2-0-0-2
Version	1.0	Approval Details		LEARNING LEVEL	BTL-3
ASSESSMENT SCHEME					
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz etc., as approved by the Department Examination Committee “DEC”	Attendance	ESE
15%	15%	10%	5%	5%	50%
Course Description	To expose the students to the basics of environmental science and sustainable development.				

Course Objective	<ol style="list-style-type: none">1. To make the students aware of the natural resources and to educate them to learn the need for preserving the resources.2. To provide knowledge on the various aspects of environmental pollution and issues.3. To provide basic knowledge and concepts of sustainability.4. To educate the students about the concepts of sustainable habitat.5. To give a broad knowledge on environmental management system.														
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none">1. Recognise the effects of over exploitation of natural resources and their impact on day-to-day life on earth.2. Apply sustainable solutions for environmental pollution and issues.3. Implement the concepts of sustainability in the product development.4. Use appropriate methods for designing green house and maintaining sustainable cities, transport system, industries, etc.5. Manage the environment for sustainable product development.														
Prerequisites: NIL															
CO, PO AND PSO MAPPING															
CO	PO - 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO - 10	PO- 11	PO- 12	PSO- 1	PSO- 2	PSO-3
CO-1	2	2	2	-	-	1	3	-	-	-	-	2	-	-	-
CO-2	2	2	2	-	-	1	3	-	-	-	-	2	-	-	-
CO-3	2	2	2	-	-	1	3	-	-	-	-	2	-	-	-
CO-4	2	2	2	-	-	1	3	-	-	-	-	2	-	-	-
CO-5	2	2	2	-	-	1	3	-	-	-	-	2	-	-	-
1: Weakly related, 2: Moderately related and 3: Strongly related															
MODULE 1: NATURAL RESOURCES (6L)															
Introduction - Forest resources: Use and over-exploitation – Water resources: Use and over-utilization – Mineral resources: Use and exploitation – Food resources: World food problems, effects of modern agriculture – Energy resources: conventional and nonconventional, solar energy, fuel cells, wind energy, hydro plants, bio-fuels, Energy derived from oceans, geothermal energy – Land resources: Use and over-exploitation – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study – Documentation of nearby environmental assets – river / forest / grassland / hill / mountain.														CO-1 BTL-3	
MODULE 2: ENVIRONMENTAL POLLUTION AND ISSUES (6L)															
Air pollution, effects of air pollutions; Water pollution – sources, sustainable wastewater treatment; Solid waste – sources, impacts, zero waste concept, 3R concept, Global environmental issues – Resource degradation, climate change, global warming, ozone layer depletion – Regional and local environmental issues – Carbon credits and carbon trading, carbon foot print. Field Study - Observe a pond nearby and analyze the different measures that can be adopted for														CO-2 BTL-3	

its conservation.		
MODULE 3: SUSTAINABILITY		(6L)
Introduction, need of sustainability – Social, environmental and economic sustainability concepts – sustainable development, Nexus between technology and sustainable development, challenges for sustainable development – multilateral environmental agreements and protocols – clean development mechanism (CDM) – Environmental legislations in India – water act, air act. Field Study - Assessment of sustainability in your neighbourhood in education / housing / water resources / energy resources / food supplies/ land use / environmental protection, etc.		CO-3 BTL-3
MODULE 4: CONCEPTS OF SUSTAINABLE HABITAT		(6L)
Green buildings: material for sustainable design, green building certification, methods for increasing energy efficiency of buildings – sustainable urbanisation - sustainable transport – Industrialisation and poverty reduction – Industrial processes: material selection, pollution prevention, industrial ecology, industrial symbiosis. Assignment – Explore the different methods that can be adopted for maintaining a sustainable transport system in your city.		CO-4 BTL-3
MODULE 5: ENVIRONMENTAL MANAGEMENT		(6L)
Environmental management: Principles and strategies, Indicators of environmental quality – economic valuation - environmental cost-benefit analysis – Fiscal incentives in pollution control and management – Environmental management system: ISO 14000, Life Cycle Analysis (LCA) – scope and goal, bio-mimicking – Environmental Impact Assessment (EIA) – Procedures of EIA in India. Assignment – Conducting an EIA study of a small project (example, construction of house, road, bridge, etc.) in your local area.		CO-5 BTL-3
TEXT BOOKS		
1.	Basu, M., Savarimuthu, X. (2017). <i>Fundamentals of Environmental Studies</i> , Cambridge University Press, 1 st Edition.	
2.	Bhavik R. Bakshi (2019). <i>Sustainable Engineering: Principles and Practice</i> , Cambridge University Press, 1 st Edition.	
REFERENCE BOOKS		
1.	Wasewar, K. L., Rao, S. N. (2022). <i>Sustainable Engineering, Energy, and the Environment Challenges and Opportunities</i> , CRC Press, 1 st Edition.	
2.	Singh, J.S., Singh, S.P., Gupta, S. R. (2017). <i>Ecology, Environmental Science and Conservation</i> . S. Chand Publishing Company, New Delhi,	

3.	Mulligan, C. (2020). <i>Sustainable Engineering: Principles and Implementation</i> , CRC Press, 1 st Edition.
E BOOKS	
1.	https://www.hzu.edu.in/bed/E%20V%20S.pdf
2.	https://library.oapen.org/handle/20.500.12657/33379
MOOC	
1.	https://www.my-mooc.com/en/categorie/environmental-science
2.	https://www.coursera.org/specializations/sustainable-cities

COURSE TITLE	IT SYSTEMS SECURITY			CREDITS	3	
COURSE CODE	ECY51002	COURSE CATEGORY	PC	L-T-P-S	2-0-2-2	
VERSION	1.0	APPROVAL DETAILS		LEARNING LEVEL	BTL-3	
ASSESSMENT SCHEME						
CIA					ESE	
First Periodical Assessment (Theory)	Second Periodical Assessment (Theory)	Practical Assessments	Observation / lab records as approved by the Department Examination Committee “DEC”	Attendance	Theory	Practical
15%	15%	10%	5%	5%	25%	25%
Course Description	This course provides the foundation for understanding the key issues associated with protecting information assets, determining the levels of protection and response to security incidents, and designing a consistent, reasonable information security system, with appropriate intrusion detection and reporting features.					

Course Objective	<p>The course aims to:</p> <ol style="list-style-type: none"> 1. Provide with the theoretical knowledge, competencies, and practical skills IT System security. 2. Prepare students to be qualified examination of safe systems and software in institutions and companies. 3. Enabling students to adapt to the rapid future developments by providing them with solid foundations in its basic concepts, principles, methods, and methodologies. 4. Enable the students have knowledge on application sever security. 5. Develop practical knowledge on Database security and it processes.
Course Outcome	<p>After successful completion of the course, the learners would be able to</p> <ol style="list-style-type: none"> 1. Learn about the importance of IT security. 2. Provide insights on the Operating System Security. 3. Analyse various end point Security features. 4. Describe application server security. 5. Perform scan and analysis report on database security and its processes.
MODULE 1: INTRODUCTION TO IT SYSTEM SECURITY (6L+3P)	
<p>IT system security- Threats to IT systems, technical controls in IT system security, System security coverage, System security risk management, Case study: Context setting; Case Study: Analysis of IT Department's System; Case study: Threat analysis; Case study: Security measures in place; Case study: Vulnerability analysis; Case study: Vulnerability mitigation.</p> <p>Lab Experiment: Exercise 1: Installation Steps of Microsoft Baseline Security Analyzer Exercise 2: How to use (scan a computer by Name) Exercise 3: How to scan a computer by IP address Software Required: Microsoft Baseline Security Analyzer</p>	CO-1 BTL-2
MODULE 2: OPERATING SYSTEM SECURITY (6L+3P)	
<p>Operating System & Changing Threats, Why OS is Hard to Secure? Securing Operating Systems, Key Security Features, Operating system history, Security in Ordinary Operating Systems UNIX, Security in Ordinary Operating Systems Windows, Server Operating System Security Guidelines, Workstation Operating System Security Guidelines, Mobile Operating Systems, Threats of Mobile Operating Systems, Tripwire Secure Cheq - Installation, Starting the Scan, About the tool window, Secure Cheq Summary Report, System aspects covered in scan, Secure Cheq Test Report.</p> <p>Lab Experiment: Exercise 4: How to scan multiple computers by IP Address Exercise 5: How to scan multiple computers by Domain. Exercise 6: How to View existing security scan reports. Software Required: Microsoft Baseline Security Analyzer</p>	CO-1 BTL-2
MODULE 3: ENDPOINT SECURITY (6L+3P)	
<p>Endpoint Security- Pillars of Endpoint Security, Endpoint Security in BYOD, Endpoint Encryption, Driver influence endpoint security, Challenges of Endpoint Security, Endpoint Security Solutions, Gartner's Magic Quadrant, Quadrant Descriptions, Evaluation Criteria Definitions, Vendor Strengths and Limitations, Case Study 1: Palo Alto Networks; Case Study 2: Trend Micro.</p> <p>Lab Experiment: Exercise 7: Installation Steps of Tripwire Exercise 8: How to Start the Secure check scanning</p>	CO-3 BTL-3

Software Required: Tripwire		
MODULE 4: APPLICATION SERVER SECURITY		(6L+3P)
<p>Application Server Security Overview, SSL Keys and Certificates, Need of Security, Introduction to Oracle Application Server, Security architecture of oracle application server, Oracle HTTP Server Security, Oracle application server portal security, Oracle Application Server Security Best Practices, Web Application Server Security best practices, Introduction of mobile application server security, Introduction to OWASP, Mobile Application Security Testing, Identifying and protecting, Formidable App, Security Testing Tools, Real-Time Examples.</p> <p>Lab Experiment: Exercise 9: About the tool window Exercise 10: SecureCheq Summary Report Software Required: Windows Tool- SecureCheq</p>		CO-4 BTL-2
MODULE 5: DATA BASE SERVER SECURITY/IT SYSTEM SECURITY PROCESSES		(6L+3P)
<p>Introduction to Database Server Security, Architecture for Database Systems, Database attacks, security & lifecycle, Need of Database Server Security, Database Server threats & countermeasures, Acquiring Database and Server Security, Securing Open-Source Databases, Steps for Securing Database Server, Best Practices to secure database server, Security checklist, Database Security Assessment, Database Security Program Design.</p> <p>Identification of risk, Organizational Assets Used in Systems, Identifying assets, Threat Identification, Prioritizing System Vulnerabilities, Prepare for Selecting Security Controls, Initial Security Control Baseline, Apply Scoping Guidance, Analysing System Environment, Planning for security in the system lifecycle, Applying Operational Controls, Contingency Planning, Maintenance controls, Data integrity/validation controls, Documentation, Implementing Security Policy, Security considerations, Important security considerations.</p> <p>Lab Experiment: Exercise 11: How System Aspects covered in Scan Exercise 12: SecureCheq Test Report Software Required: Windows Tool- SecureCheq</p>		CO-5 BTL-2
TEXT BOOKS		
1.	IT System Security (IBM ICE Publications).	

COURSE TITLE	Design Project- I			CREDITS	1
COURSE CODE	ECS51800	COURSE CATEGORY	PC	L-T-P-S	0-0-2-6

Version	1.0	Approval Details					LEARNING LEVEL	BTL-4							
ASSESSMENT SCHEME															
CIA													Project report and Viva – Voce (ESE)		
First Review				Second Review				Third Review							
20%				20%				10%				50%			
Course Description	This course is mainly focused on team building and product development as it will make them industry ready. To apply the concepts, principles and algorithms learnt in the field of computer science and build products/tools/applications addressing the needs of real-world societal issues.														
Course Objective	<div><div></div><div>1. To analyse, design and develop products/tools/applications to solve the issues related to real world problems.</div><div>2. To apply the concepts, principles and algorithms learnt in the field of computer science.</div><div>3. To exercise the lifecycle of project development by following the principles of software engineering.</div><div>4. To inculcate the qualities of team building and develop the skills of technical document writing.</div><div>5. To examine the various algorithms of study and thus to evaluate and compare the output generated.</div></div>														
Course Outcome	<div>Upon completion of this course, the students will be able to</div> <div><div></div><div>1. Analyse, design and develop products/tools/applications to address the societal needs.</div><div>2. Design, develop and test program segments that constitute a software/hardware product</div><div>3. Demonstrate the software engineering principles and improve the project management skills</div><div>4. Appraise the hardware/software product developed in the form of technical presentations, demonstrations and report generation through team work.</div><div>5. Examine and make a comparative analysis of the algorithms involved in the course of the project work.</div></div>														
CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
1: Weakly related, 2: Moderately related and 3: Strongly related															
Note															

<ul style="list-style-type: none"> • The students in convenient groups of not more than 3 members have to identify a product for design and fabrication. • Every project work shall have a guide who is the member of the faculty of the Department. • Design, develop, test and implement a hardware/software system that is demonstrable with required data set. • Assessment is based on creativity, applicability to the society, project development skills, team work. • Technical communication, presentation and report writing skills form an essential component in assessment. 	CO1, CO2, CO3, CO4, CO5 /BTL4
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COURSE TITLE	INTERNSHIP- I			CREDITS	1
COURSE CODE	ECS51801	COURSE CATEGORY	PC/DE/NE	L-T-P-S	0-0-0-2
Version	1.0	Approval Details	XX	LEARNING LEVEL	BTL-3
ASSESSMENT SCHEME					
CIA					ESE
Technical report/ Certificate		Presentation and Viva- voce			
30%		70%			
					—
Course Description	This course is mainly focused on providing links to classroom learning with industry. To apply the concepts, principles and algorithms learnt in the field of computer science and build products/tools/applications addressing the needs of real-world societal issues.				
Course Objective	<div>1. To analyse, design and develop products/tools/applications to solve the issues related to real world problems.</div> <div>2. To learn critical thinking and problem-solving knowledge in an applied work setting</div> <div>3. To get professional behaviour and knowledge.</div> <div>4. To develop the skills of technical document writing and presentation.</div> <div>5. To develop communication skills and technical knowledge.</div>				
Course Outcome	<div>Upon completion of this course, the students will be able to</div> <div>1. Analyse, design and develop products/tools/applications to address the societal needs.</div> <div>2. Design, develop and test program segments that constitute a software/hardware product</div> <div>3. Demonstrate the software engineering principles and improve the project management skills</div> <div>4. Appraise the hardware/software product developed in the form of technical presentations, demonstrations and report generation through team work.</div> <div>5. Display his communication skills and elaborate on his skillset achieved.</div>				

CO, PO AND PSO MAPPING															
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
CO-2	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
CO-3	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
CO-4	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
CO-5	3	3	3	3	3	3	3	3	3	3	3	1	3	3	3
1: Weakly related, 2: Moderately related and 3: Strongly related															
Note															
<ul style="list-style-type: none"> A student has to compulsorily attend Summer / Winter internship during 3rd year for a minimum period of one month. In lieu of Summer / Winter internship, the student is permitted to register for undertaking case study / project work under an engineering faculty of the Institute and carry out the project for minimum period of one month. In both the cases, the internship report in the prescribed format duly certified by the faculty in-charge shall be submitted to the HoD. Assessment is based on creativity, applicability to the society, project development skills, team work. Technical communication, presentation and report writing skills form an essential component in assessment. 													CO1, CO2, CO3, CO4, CO5 /BTL3		