Curriculum Structure and Evaluation Scheme for B. Tech. in Electronics and Telecommunication Engineering with Honor and Multidisciplinary Minor

(To be implemented for 2025-2029 Batch)

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ABBREVIATIONS

- **L:** Lecture
- **T:** Tutorial
- **P:** Practical
- **ISE1-** In Semester Evaluation 1
- **ISE2-** In Semester Evaluation 2
- **MSE:** Mid Semester Exam
- **ESE:** End Semester Exam
- **BSC -**Basic Science Courses
- **ESC:** Engineering Science Courses
- **AEC:** Ability Enhancement Courses
- **IKS:** Indian Knowledge System
- **VSEC:** Vocational and skill Enhancement Course
- **PCC**: Program Core Course
- **PEC**: Program Elective Course
- **CC:** Co-curricular Courses

Department: Department of Electronics and Telecommunication Engineering
Semester: III

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min. for Passing	
PCC	25ET301	Analog Electronics Circuit Design	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PCC	25ET302	Digital Design	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PCC	25ET303	Applied Mathematics	3	1	-	4	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
MDM	25ET304	Multidisciplinary Minor – I	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
Entre./ Econo./ Manag	25ET305	Professional Skill Development	2	-	-	2	ISE-I	25		
							ISE-II	25	20	
VEC	25ET306	Universal Human Values	2	-	-	2	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
CEP/ FP	25ET307	Mini Project - I	-	-	2	1	ISE-I	25	20	
							ISE-II	25		
PCC	25ET308	Analog Electronics Circuit Design Lab	-	-	2	1	ISE	50	40	
							ESE(POE)	50		
PCC	25ET309	Digital Design Lab	-	-	2	1	ISE	50	40	
							ESE(POE)	50		
	Total		**16**	**1**	**06**	**20**		**800**		
Total Contact Hours - 23							**Total Credits - 20**			

Department: Department of Electronics and Telecommunication Engineering
Semester: IV

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min for Passing	
PCC	25ET401	Signals and Systems	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PCC	25ET402	Microcontroller	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PCC	25ET403	Network Analysis	3	1	-	4	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
MDM	25ET404	Multidisciplinary Minor – II	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
OE	25ET405	Open Elective – I	2	-	-	2	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
Entre./ Econo./ Manag	25ET406	Entrepreneurship Development	1	-	-	1	ISE-I	25	20	
							ISE-II	25		
AEC	25ET407	Quantitative Aptitude and Logical Reasoning - I	1	-	-	1	ISE-I	25	20	
							ISE-II	25		
VEC	25ET408	Constitution of India	2	-	-	2	ISE-I	25	20	
							ISE-II	25		
VSEC	25ET409	Programming Technique	-	-	2	1	ISE-I	25	20	
							ISE-II	25		
PCC	25ET410	Signals and Systems Lab	-	-	2	1	ISE	50	40	
							ESE(POE)	50		
PCC	25ET411	Microcontroller Lab	-	-	2	1	ISE	50	40	
							ESE(POE)	50		
	Total		**18**	**1**	**06**	**22**		**900**		
Total Contact Hours- 25							**Total Credits- 22**			

Department: Department of Electronics and Telecommunication Engineering
Semester: V

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min for Passing	
PCC	25ET501	Principles of Communication	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PCC	25ET502	Linear Integrated Circuits	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PCC	25ET503	Electromagnetic Engineering	2	-	-	2	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PEC	25ET504	Program Elective - I	4	-	-	4	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
MDM	25ET505	Multidisciplinary Minor – III	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
OE	25ET506	Open Elective – II	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
AEC	25ET507	Quantitative Aptitude and Logical Reasoning - II	1	-	-	1	ISE-I	25	20	
							ISE-II	25		
CEP/ FP	25ET508	Mini Project - II	-	-	2	1	ISE-I	25	20	
							ISE-II	25		
PCC	25ET509	Principles of Communication Lab	-	-	2	1	ISE	50	40	
							ESE(POE)	50		
PCC	25ET510	Linear Integrated Circuits Lab	-	-	2	1	ISE	50	40	
							ESE(POE)	50		
	Total		**19**	**-**	**06**	**22**		**900**		
Total Contact Hours- 25							**Total Credits- 22**			

Department: Department of Electronics and Telecommunication Engineering
Semester: VI

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min for Passing	
PCC	25ET601	Digital Signal Processing	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PCC	25ET602	Control System	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PEC	25ET603	Program Elective - II	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PEC	25ET604	Program Elective - III	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
MDM	25ET605	Multidisciplinary Minor – IV	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
OE	25ET606	Open Elective – III	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PCC	25ET607	Control System Lab	-	-	2	1	ISE	50	40	
							ESE(POE)	50		
PEC	25ET608	Program Elective - II Lab	-	-	2	1	ISE-I	25	20	
							ISE-II	25		
VSEC	25ET609	Project Phase-I	-	-	4	2	ISE-I	25	20	
							ISE-II	25		
	Total		**18**	**-**	**08**	**22**		**800**		
Total Contact Hours- 26							**Total Credits- 22**			

Department: Department of Electronics and Telecommunication Engineering
Semester: VII

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min for Passing	
PCC	25ET701	Computer Network and Security	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PCC	25ET702	Antenna and Microwave Engineering	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PEC	25ET703	Program Elective - IV	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PEC	25ET704	Program Elective - V	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
MDM	25ET705	Multidisciplinary Minor – V	2	-	-	2	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PCC	25ET706	Computer Network and Security Lab	-	-	2	1	ISE	50	40	
							ESE(POE)	50		
PCC	25ET707	Antenna and Microwave Engineering Lab	-	-	2	1	ISE	50	40	
							ESE(POE)	50		
Project	25ET708	Project Phase-II	-	-	8	4	ISE	50	20	60
							ESE(OE)	100	40	
	Total		**14**	**-**	**12**	**20**		**850**		
Total Contact Hours- 26							**Total Credits- 20**			

Department: Department of Electronics and Telecommunication Engineering
Semester: VIII

Type of Course	Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min for Passing	
PCC	25EE801	Digital Image Processing	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
PEC	25EE802	Program Elective – VI	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
RM	25EE803	Research Methodology and IPR	4	-	-	4	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
Intern./ OJT	25EE804	Internship/On Job Training	-	-	-	12	ISE	100	40	80
							ESE	100	40	
	Total		**10**	**-**	**-**	**22**		**500**		
Total Contact Hours- 34							**Total Credits- 22**			

MULTIDISCIPLINARY MINOR (MDM) BASKET

Important Note:

1. Students should select **any one basket** for the award of Minor Degree of their interest from the table below.
2. The student must complete **all five courses under the selected MDM Basket** to qualify for the Minor.
3. The credits earned under the Multidisciplinary Minor shall form part of the total **172 Credits** required for award of the degree.

MDM Basket Name	Sr. No.	Course Code	Course Name	Semester	Offered by the Department
Data Analyst	1	25AM304A	Data Structure	III	**Artificial Intelligence & Machine Learning** (To all UG Programs except UG AIML, AIDS, CSE, E&C Engg.)
	2	25AM404A	R-programming	IV	
	3	25AM505A	DBMS	V	
	4	25AM605A	Big Data Technologies	VI	
	5	25AM705A	Introduction to Machine Learning	VII	
Prompt Engineering	1	25AM304B	R-programming	III	**Artificial Intelligence & Machine Learning** (To all UG Programs except UG AIML, AIDS, CSE, E&C Engg.)
	2	25AM404B	Introduction to AI and ML	IV	
	3	25AM505B	IOT	V	
	4	25AM605B	Introduction to Blockchain Technology	VI	
	5	25AM705B	Prompt Engineering	VII	
Intelligent Data Systems	1	25AD304A	Computer Organization Architecture	III	**Artificial Intelligence & Data Science** (To all UG Programs except UG AIDS, AIML CSE, E&C Engg.)
	2	25AD404A	R-programming	IV	
	3	25AD505A	Data Manipulation, Analysis and Visualization	V	
	4	25AD605A	DBMS	VI	
	5	25AD705A	Big Data Technologies	VII	
Cognitive Computing	1	25AD304B	Computer Organization Architecture	III	**Artificial Intelligence & Data Science**
	2	25AD404B	Introduction to Data	IV	

			Science		(To all UG Programs except UG AIDS, AIML CSE, E&C Engg.)
	3	25AD505B	Introduction to Machine Learning	V	
	4	25AD605B	Social Network Analysis	VI	
	5	25AD705B	Natural Language Processing	VII	
Essentials of Software Development	1	25CS304 A	Data Structures	III	**Computer Science & Engineering** (To all UG Programs except UG CSE, AIML, AIDS, E&C Engg.)
	2	25CS404 A	Python Programming	IV	
	3	25CS505 A	Computer Algorithms	V	
	4	25CS605 A	Database Management System	VI	
	5	25CS705 A	Software Engineering	VII	
Modern Computing Systems	1	25CS304 B	Data Structures	III	**Computer Science & Engineering** (To all UG Programs except UG CSE, AIML, AIDS, E&C Engg.)
	2	25CS404 B	Python Programming	IV	
	3	25CS505 B	Java Programming	V	
	4	25CS605 B	Artificial Intelligence & Machine Learning	VI	
	5	25CS705 B	Cloud Computing	VII	
Smart Energy Systems and Sustainability	1	25EE304A	Fundamentals of Energy Systems	III	**Electrical Engineering** (To all UG Programs except UG Electrical & E&TC Engg.)
	2	25EE404A	Solar and Wind Energy Technologies	IV	
	3	25EE505A	Fundamentals of Energy Management Systems	V	
	4	25EE605A	Energy Storage Systems	VI	
	5	25EE705A	Renewable Energy Integration in Smart Grids	VII	
Intelligent Electrical Systems	1	25EE304B	Introduction to Intelligent Electrical Systems	III	**Electrical Engineering** (To all UG Programs except UG Electrical & E&TC Engg.)
	2	25EE404B	IoT and IOV for Electrical Systems	IV	
	3	25EE505B	AI Applications in Electrical Systems	V	
	4	25EE605B	Automation and Control in Energy Systems	VI	

	5	25EE705B	Smart Grid and Intelligent Monitoring Systems	VII	
Communication System	1	25EC304A	Principles of Communication	III	**Electronics & Computer Engineering** (To all UG Programs except UG E&C, AIML, AIDS, CSE Engg.)
	2	25EC404A	Wireless and Mobile Communication	IV	
	3	25EC505A	Wireless Sensor Networks	V	
	4	25EC605A	Information theory and Coding	VI	
	5	25EC705A	Satellite and Radar Communication	VII	
Computing Solutions for Industry	1	25EC304B	Python programming	III	**Electronics & Computer Engineering** (To all UG Programs except UG E&C, AIML, AIDS, CSE Engg.)
	2	25EC404B	Industry Analytics	IV	
	3	25EC505B	Cloud Computing	V	
	4	25EC605B	Industrial Internet of Things (IIoT)	VI	
	5	25EC705B	Power BI	VII	
Internet of Things (IoT)	1	25ET304A	Fundamentals of IoT	III	**Electronics & Telecommunication Engineering** (To all UG Programs except UG E&TC & Electrical Engg.)
	2	25ET404A	Technologies Enabling IoT	IV	
	3	25ET505A	IoT System Design	V	
	4	25ET605A	Industrial IoT	VI	
	5	25ET705A	Capstone Project	VII	
Embedded Systems	1	25ET304B	Digital Design	III	**Electronics & Telecommunication Engineering** (To all UG Programs except UG E&TC & Electrical Engg.)
	2	25ET404B	Microcontroller & Interfacing Techniques	IV	
	3	25ET505B	Embedded Systems Design	V	
	4	25ET605B	Real-Time Operating Systems	VI	
	5	25ET705B	Advanced Embedded Systems & Product Development	VII	
Product Development	1	25ME304A	Design Thinking Approach	III	**Mechanical Engineering**

	2	25ME404A	Engineering Design Process	IV	(To all UG Programs except UG Mech Engg.)
	3	25ME505A	Rapid Prototyping and Testing	V	
	4	25ME605A	Product Development	VI	
	5	25ME705A	Commercialization and Sustainability	VII	
Refrigeration and Air Conditioning	1	25ME304B	Fundamentals of Refrigeration	III	**Mechanical Engineering** (To all UG Programs except UG Mech Engg.)
	2	25ME404B	Refrigeration Components and Low Temperature Cycles	IV	
	3	25ME505B	Psychrometry and Air Conditioning Process	V	
	4	25ME605B	HVAC Systems and Emerging Technologies	VI	
	5	25ME705B	Application Based System Design	VII	
Planning and Execution of Projects	1	25CE304A	Building Construction Materials	III	**Civil Engineering** (To all UG Programs except UG Civil Engg.)
	2	25CE404A	Engineering Management	IV	
	3	25CE505A	Resource Management	V	
	4	25CE605A	Optimization Technique	VI	
	5	25CE705A	Engineering Economics	VII	
Building Interior Design and Home Automation	1	25CE304B	Introduction to Buildings and Spaces	III	**Civil Engineering** (To all UG Programs except UG Civil Engg.)
	2	25CE404B	Basics of Interior Building Design	IV	
	3	25CE505B	Building Interior Materials and Finishes	V	
	4	25CE605B	Smart Devices and Sensors for Home Automation	VI	
	5	25CE705B	Recent Techniques for Home Automation	VII	

OPEN ELECTIVE COURSES

(Students have to select any one Open Elective course, for each applicable semester, of their interest (other than open electives offered by his/her Department) from the table below)

Open Elective – I

Sr. No.	Course Code	Course Name	Offered by Department
1	25AM405A	E Commerce	Artificial Intelligence & Machine Learning & Artificial Intelligence & Data Science
2	25CE405B	Environmental Science	Civil Engineering
3	25CS405C	Human Computer Interaction	Computer Science & Engineering
4	25EE405D	Electrical Safety & Standards	Electrical Engineering
5	25EC405E	Sensor Technology	Electronics & Computer Engineering & Electronics & Telecommunication
6	25ME405F	Project Management	Mechanical Engineering

Open Elective – II

Sr. No.	Course Code	Course Name	Offered by Department
1	25AM506A	Design Thinking	Artificial Intelligence & Machine Learning & Artificial Intelligence & Data Science
2	25CE506B	Disaster Management	Civil Engineering
3	25CS506C	Cyber Security	Computer Science & Engineering
4	25EE506D	Energy Audit	Electrical Engineering
5	25EC506E	Drone Technology	Electronics & Computer Engineering & Electronics & Telecommunication
6	25ME506F	Startup and Business Strategy	Mechanical Engineering

Open Elective – III

Sr. No.	Course Code	Course Name	Offered by Department
1	25AM606A	Recommender System	Artificial Intelligence & Machine Learning & Artificial Intelligence & Data Science
2	25CE606B	Environmental Impact	Civil Engineering
3	25CS606C	Cyber Laws	Computer Science & Engineering
4	25EE606D	E-Mobility	Electrical Engineering
5	25EC606E	Engineering Economics	Electronics & Computer Engineering & Electronics & Telecommunication
6	25ME606F	Industrial Automation	Mechanical Engineering

PROGRAM ELECTIVE CORE COURSES

(Students have to select any one Program Elective Core course out of 03, for each applicable semester, of their interest, offered by the Department from the table below)

Program Elective Core - I

Sr. No.	Course Code	Domain	Course Name	Semester
1	25ET504A	Embedded System	Computer Architecture and Organization	V
2	25ET504B	Communication Engg.	Information Theory and Coding	
3	25ET504C	VLSI Design	RTL Basics	

Program Elective - II

Sr. No.	Course Code	Domain	Course Name	Semester
1	25ET603A	Embedded System	Embedded Processor	VI
2	25ET603B	Communication Engg.	Optical Fiber Communication	
3	25ET603C	VLSI Design	CMOS VLSI Design	
4	25ET609A	Embedded System	Embedded Processor Lab	VI
5	25ET609B	Communication Engg.	Optical Fiber Communication Lab	
6	25ET609C	VLSI Design	CMOS VLSI Design Lab	

Program Elective - III

Sr. No.	Course Code	Domain	Course Name	Semester
1	25ET604A	Embedded System	Embedded System Design	VI
2	25ET604B	Communication Engg.	Wireless Communication	
3	25ET604C	VLSI Design	Systen Verilog	

Program Elective – IV

Sr. No.	Course Code	Domain	Course Name	Semester
1	25ET703A	Embedded System	Industrial Automation	VII
2	25ET703B	Communication Engg.	Wireless Sensor Network	
3	25ET703C	VLSI Design	VLSI Testing and Verification	

Program Elective – V

Sr. No.	Course Code	Domain	Course Name	Semester
1	25ET704A	Embedded System	Soft Computing	VII
2	25ET704B	Communication Engg.	Advanced Mobile Communication	
3	25ET704C	VLSI Design	System-on-Chip	

Program Elective – VI

Sr. No.	Course Code	Domain	Course Name	Semester
1	25ET802A	Embedded System	Real Time Operating System	VIII
2	25ET802B	Communication Engg.	Satellite Communication	
3	25ET802C	VLSI Design	VLSI for Machine Learning	

Exit Courses
(After First Year)

The Candidate should pass following skill based courses to qualify for Certificate.

Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
		L	T	P	Cr	Components	Max	Min for Passing	
25ET222	Electronic Components and Testing Techniques	2	-	2	3	ISE-I	10		40
						MSE	30		
						ISE-II	10		
						ESE	50	20	
25ET223	PCB Design Fundamentals	1	-	4	3	ISE	50		40
						ESE(POE)	50	20	
25ET224	Electronic System Assembly and Maintenance	-	-	4	2	ISE	50		40
						ESE(POE)	50	20	
Total		**3**	**0**	**10**	**8**		**300**		
Total Contact Hours- 13					**Total Credits- 8**				

(After Second Year)

The Candidate should pass following skill based courses to qualify for Diploma.

Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
		L	T	P	Cr	Components	Max	Min for Passing	
25ET412	Arduino Programming	3	-	-	3	ISE-I	10		40
						MSE	30		
						ISE-II	10		
						ESE	50	20	
25ET413	Internet of Things	3	-	-	3	ISE-I	10		40
						MSE	30		
						ISE-II	10		
						ESE	50	20	
25ET414	Industrial Training	-	-	4	2	ISE	50		40
						ESE	50	20	
Total		**6**	**0**	**4**	**8**		**300**		
Total Contact Hours- 10					**Total Credits- 8**				

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Exit Courses
(After Third Year)

The Candidate should pass following skill based courses to qualify for B. Voc.

Course Code	Course Name	Teaching Scheme				Evaluation Scheme			
		L	T	P	Cr	Components	Max	Min for Passing	
25ET610	Computer Networks	3	-	-	3	ISE-I	10		40
						MSE	30		
						ISE-II	10		
						ESE	50	20	
25ET611	Embedded System	3	-	-	3	ISE-I	10		40
						MSE	30		
						ISE-II	10		
						ESE	50	20	
25ET612	Internship	-	-	4	2	ISE	50		40
						ESE	50	20	
Total		**6**	**0**	**4**	**8**		**300**		
Total Contact Hours- 10						**Total Credits- 8**			

General Instructions:

- **For Theory Courses:**
  1. Two components of **In Semester Evaluation** (ISE), one **Mid Semester Examination** (MSE) & one **End Semester Examination** (ESE).
  2. **ISE-I** & **ISE-II** is based on online objective type examination / Assignments / Mini Projects / Quiz & Technical Puzzles / Surprise Test / Oral / Presentation / Seminar / Innovative approach to problem solving.
  3. **MSE** will be conducted with **30%** weightage based on first **50%** syllabus.
  4. **ESE** will be conducted on 100% course content having 30% weightage on first 50% course content & 70% weightage for remaining 50% syllabus.

- **For Laboratory Courses:**
  1. **ISE** assessment contains weightage like 20% for practical performances, 40% for Journal & 40% for Group Presentation / Oral / Quiz.
  2. **ESE** assessment is based on oral examination / practical oral examination.

SHRI BALASAHEB MANE SHIKSHAN PRASARAK MANDAL'S ASHOKRAO MANE GROUP OF INSTITUTIONS Dept. of ETC Engg.

B.Tech. (Hons) in Computer Vision

Department: Electronics and Telecommunication Engineering

Course Code	Name of the Course	Credit
25ET3H	Data Structures and Algorithms	3
25ET4H	Computer Graphics	3
25ET5H	Fundamentals of Image Processing and Computer Vision	3
25ET6H	Machine Learning	3
25ET7H	Deep Learning for Computer Vision	3
25ET8H	Virtual Reality	3
	Total	**18**

Guidelines for Honor Certification Courses

1. Students are required to complete six courses (each carrying 3 credits) through an online platform to earn a total of 18 credits under the Honor Certification scheme.
2. All six courses must be completed starting from the Second Year First Semester (Semester III) to the Final Year Second Semester (Semester VIII).
3. The student has to obtain all 18 credits by the last semester of the program.
4. While selecting the course platform, first preference must be given to SWAYAM/NPTEL.
5. Registration on platforms such as Coursera or Udemy is permitted only under the following conditions:
   a. The SWAYAM/NPTEL course schedule does not align with the academic calendar.
   b. The subsequent course in the learning sequence is not available on SWAYAM/NPTEL.
   c. Any other unavoidable circumstances arise.
   d. About 80% of the contents of the course should match with the SWAYAM/NPTEL courses.
6. Course selection must strictly adhere to the recommendations of the Chairman of Board of Studies (BOS).
7. Credits for the respective Honor courses will be awarded under the following conditions:
   a. For NPTEL courses, students must complete all assignments on time, pass the examination, and obtain the certificate.

b. For Coursera or Udemy courses, students must obtain the course certificate and appear for the Online examination which will be conducted under the supervision of the Institute by Examination Cell

8. While selecting an online course, the following criteria must be ensured:
   a. The course should be of an advanced level, not basic or introductory.
   b. The course content must not overlap with subjects already included in the regular curriculum or listed under elective courses.
   c. The duration of each course must be:
      - Minimum 8/12 weeks for SWAYAM/NPTEL courses
      - At least 30+ hours for Coursera/Udemy courses

Course Code	Name of the Course and SWAYAM/NPTEL Links	Credit
25ET3H	**Data Structures and Algorithms** 1.**NPTEL-** Data Structures and Algorithms Design ,By Prof. Nitin Saxena ,IIT Kanpur https://onlinecourses.nptel.ac.in/noc25_cs81/preview- 2. **Coursera** -Data Structures and Algorithms Specialization – UC San Diego https://www.coursera.org/specializations/data-structures-algorithms?action=enroll	3
25ET4H	**Computer Graphics** 1. **Coursera** - Interactive Computer Graphics by Takeo Igarashi https://www.coursera.org/learn/interactive-computer-graphics	3
25ET5H	**Fundamentals of Image Processing and Computer Vision** 1.**NPTEL-** Computer Vision And Image Processing - Fundamentals And Applications, By Prof. M. K. Bhuyan, IIT Guwahati https://onlinecourses.nptel.ac.in/noc26_ee31/preview	3
25ET6H	**Machine Learning** 1 **NPTEL-** Machine Learning, ML,By Prof. Carl Gustaf Jansson, KTH, The Royal Institute of Technology https://onlinecourses.nptel.ac.in/noc26_cs77/preview 2. **NPTEL-** Machine Learning for Engineering and science applications, By Prof. Balaji Srinivasan, Prof. Ganapathy Krishnamurthi , IIT Madras	3

	https://onlinecourses.nptel.ac.in/noc26_cs76/preview 3. **Udemy-** Machine Learning A-Z [2026]: AI, AWS, Python & R + LLM Prize created by Kirill Eremenko, Hadelin de Ponteves, https://www.udemy.com/course/machinelearning	
25ET7H	**Deep Learning for Computer Vision** 1. **NPTEL-** Deep Learning For Visual Computing, By Prof. Debdoot Sheet, IIT Kharagpur https://onlinecourses.nptel.ac.in/noc26_ee44/preview 2. **NPTEL-** Deep Learning, By Prof. Prabir Kumar Biswas, IIT Kharagpur https://onlinecourses.nptel.ac.in/noc26_ee53/preview	3
25ET8H	**Virtual Reality** 1.**Swayam-** Augmented & Virtual Reality – Foundations and Applications, By Dr. P. Malliga, National Institute of Technical Teachers Training https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr26_ed41 2. Introduction to Virtual Reality, By Dr. Ramesh C Sharma, | Dr. B R Ambedkar University Delhi, New Delhi https://onlinecourses.swayam2.ac.in/e-learning/preview/nou26_hs22 3. Foundation for Virtual and Augmented Reality Systems By Prof. Samit Bhattacharya, IIT Guwahati https://onlinecourses.nptel.ac.in/noc26_cs03/preview	3
	Total	**18**

Course Name: **Analog Electronics Circuit Design**	**L**	**T**	**P**	**Credits**
Course Code:**25ET301**	3	--	--	3
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	10	30	10	50

Pre-Requisite: Basic Electrical Engineering, Semiconductor Physics.

Course Objective: The course aims to:	
1	Understand the construction, working principles, and characteristics of BJTs, FETs and MOSFETs.
2	Analyze biasing techniques, amplifier configurations, frequency response, and stability aspects of electronic devices.
3	Apply concepts of power amplifiers, feedback amplifiers, oscillators, multivibrators, and wave shaping circuits.
4	Design and analyze linear power supply circuits and IC voltage regulators for practical applications.

Course Outcomes: At the end of the course, students will be able to:	
CO1	Explain the construction, working principles, characteristics, and operating regions of BJT, JFET, MOSFET, and CMOS devices.
CO2	Analyze BJT, FET, and MOSFET amplifier configurations using small-signal models.
CO3	Apply principles of oscillators, multivibrators, switching circuits, and wave shaping circuits
CO4	Design basic linear power supply circuits and voltage regulators using discrete components and IC regulators (78XX, 79XX, LM317).

CO-PO & PSO Mapping:														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	–	–	–	–	–	–	–	–	–	–	–	–
CO2	3	3	2	1	1	–	–	–	–	–	–	–	–	–
CO3	2	2	3	2	1	–	–	–	–	–	–	–	–	–
CO4	3	2	3	2	2	–	–	–	–	–	1	–	1	–

Course Content		
Unit No.	**Unit Title and Content**	**Hrs**
1	**Bipolar Junction Transistors** Introduction to BJT, Transistor Configurations and Comparison, Load line analysis, BJT switching. BJT Biasing - Need, Methods, Single Stage Amplifier, Two stage Amplifier, Effects of Bypass and Coupling Capacitors, Frequency Response of CE amplifier.	7
2	**Field Effect Transistors** MOSFETs - Construction and Characteristics of Enhancement MOSFET, Depletion-Enhancement MOSFET, MOSFET as an Amplifier and Switch, Biasing in MOSFET, MOSFET capacitances. CMOS devices,CMOS Inverter, Comparison of FET with MOSFET and BJT.	7
3	**Power Amplifiers** Introduction, Classification of Power amplifiers - A, B, AB, C and D, Transformer Coupled Class A amplifier, Class B Push Pull and Complementary Symmetry Amplifier, Efficiency, Power output, Power dissipation.	7
4	**Feedback Amplifiers and Oscillators** Classification of Amplifiers, Feedback Concept, Principle of Negative Feedback, Types of Negative feedback, Effect of Negative Feedback on Input and Output Impedances, Oscillators - Principle of Positive Feedback, Concept of Stability in Electronics Circuits, Barkhausen Criteria for Oscillation, LC oscillator, RC Phase Shift oscillator, Wein Bridge oscillator, Hartley Oscillator and Colpitts Oscillators.	7
5	**Multivibrators and Switching Circuits** Multivibrators - Bistable, Monostable, Astable, Wave shaping circuits: Clippers, Clampers, Applications.	7

6	**Linear Power Supplies** Need of Voltage Regulator, Design of Shunt regulator (using Zener diode & BJT), Emitter Follower Regulator, Series Voltage Regulator (using BJT), Series Voltage Regulator with Pre-regulator, Short circuit & Overload Protection circuit. IC regulators: Study of regulators using 78XX & 79XX, LM317	7

Text Books:

1. David A. Bell -Electronic Devices and Circuits , Oxford University Press.
2. Boylestad & Nashelsky - Electronic Devices and Circuit Theory, Pearson Publication

Reference Books:

1. B. J. Gupta -Analog Electronics (Basic Analog Electronics), S. K. Kataria & Sons Publishing Company Pvt. Ltd.
2. Jacob Millman (Author), Christos C Halkias , Satyabrata Jit -Electronic Devices and Circuits , McGraw Hill Education (India) Pvt. Ltd.

MOOC/NPTEL Platform:

1. Analog Electronic Circuit, IIT Delhi by Prof. Shouribrata chatterjee https://nptel.ac.in/courses/108102112
2. Analog Circuits, IIT Madras by Prof. Nagendra Krishnapura https://nptel.ac.in/courses/108106084

Course Name: **Digital Design**	**L**	**T**	**P**	**Credits**
Course Code: **25ET302**	3	--	--	3
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	10	30	10	50

Pre-Requisite: Basic knowledge of number systems, Binary Arithmetic, Boolean Algebra, Basic Electronics.

Course Objective: The course aims to:	
1	An understanding of logic design principles for simplifying and implementing digital circuits using universal gates and minimization techniques.
2	Knowledge of analysis and design methods for combinational logic circuits including arithmetic units, encoders, decoders, multiplexers, and display interfaces.
3	Understanding of the operation and design of sequential logic circuits including flip-flops, registers, and counters.
4	Study the characteristics, operation, and interfacing of different digital logic families such as TTL and CMOS.
5	Design and implement finite state machines and understand programmable logic devices, semiconductor memories, and basic VHDL concepts.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Design Boolean functions using Reduction Techniques as well as using universal gates.
CO2	Design combinational and sequential digital logic circuits.
CO3	Describe the classification, characteristics, and operation of digital logic families
CO4	Implement digital applications with appropriate state machines, PLA, PAL or PLDs

CO-PO & PSO Mapping:														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	–	–	–	–	–	–	1	3	–
CO2	3	3	3	2	2	–	–	–	–	–	–	2	3	–
CO3	2	2	2	1	2	–	–	–	–	–	–	2	2	–
CO4	3	3	2	3	3	–	–	–	–	–	1	2	3	–

Course Content		
Unit No.	**Unit Title and Content**	**Hrs**
1	**Logic Design and Simplification** Universal Gates, Simplification of Logical Functions using Karnaugh Map, Quine-McCluskey (QM) Method, Circuit Applications using Gates.	**6**
2	**Combinational Logic Design** Introduction to Combinational Circuits, Adder, Subtractor, BCD arithmetic, Arithmetic Logic Unit, Digital Comparators, Parity Generators/Checkers, Encoders, Decoders, BCD to 7-Segment Display Decode, Multiplexers, Demultiplexers.	**8**
3	**Sequential Logic Design** 1 Bit Memory Cell, Flip-flops - SR, JK, Master-Slave JK, D, T type, Conversion of flip-flops, Shift Registers, Bidirectional Shift Register, Universal Shift Register, Asynchronous and Synchronous Counters.	**8**
4	**Digital Logic Families** Classification of Logic Families, Characteristics of Digital ICs, TTL Logic Family, Operation of TTL NAND Gate, Active Pull-up, Open Collector Output, CMOS Logic Family - CMOS Inverter, NAND, NOR Gates. Interfacing CMOS and TTL.	**6**
5	**State Machines** State Diagram, State Table, State Reduction, State Assignment, Mealy and Moore Machines, Finite State Machine Implementation, Sequence Detector.	**6**
6	**Programmable Logic Devices and Semiconductor Memories** Programmable Logic Devices: PROM, PAL, PLA, Introduction to FPGA and CPLD, Semiconductor Memories: Introduction, Memory Organization and Operation, Expanding Memory Size, Classification and Characteristics of Memories, Introduction to VHDL Programming.	**8**

Text Books: 1. R.P. Jain - Modern Digital Electronics, McGraw-Hill Education. 2. M. Morris Mano - Digital Design, Pearson Education. 3. A. Anand Kumar - Fundamentals of Digital Circuits, PHI Learning Pvt. Ltd.
Reference Books: 1. Thomas L. Floyd - Digital Fundamentals, Pearson Education. 2. Donald D. Givone - Digital Principles and Design, McGraw-Hill Education. 3. John F. Wakerly - Digital Design: Principles and Practices, Pearson Education
MOOC/NPTEL Platform: 1. "Digital Electronic Circuits" by Prof. Goutam Saha (IIT Kharagpur) https://onlinecourses.nptel.ac.in/noc20_ee32/preview 2. "Digital Circuits" by Prof. Santanu Chattopadhyay (IIT Kharagpur) https://onlinecourses.nptel.ac.in/noc21_ee75/preview

Course Name: **Applied Mathematics**	**L**	**T**	**P**	**Credits**
Course Code: **25ETC303**	3	1	--	4
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	10	30	10	50

Pre-Requisite: Knowledge of differential and integral calculus, and elementary differential equations.

Course Objectives:	
1	To introduce the concept of Laplace Transform and the conditions for its existence.
2	To familiarize students with the concept and importance of inverse Laplace transforms.
3	To introduce the concept of integral transforms and Fourier integral theorem.
4	To study different methods of measuring correlation.
5	To understand the properties and significance of regression coefficients.

Course Outcomes: At the end of the course, students will be able to	
CO1	Apply Laplace Transform techniques to evaluate transforms of elementary functions and solve integrals and differential equations in engineering problems.
CO2	Apply inverse Laplace transform to solve linear and simultaneous differential equations with constant coefficients.
CO3	Analyze functions using Fourier integrals and Fourier transforms for applications in signal processing and heat conduction problems.
CO4	Evaluate the degree and nature of correlation between variables using Karl Pearson's correlation coefficient and Spearman's rank correlation to interpret real-world data.

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	1	-	-	-	-	-	1	-	-	-

Course Content		
Unit No.	**Unit Title and Content**	**Hrs**
1	**Laplace Transform** Definition – Laplace Transform, conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n property, scale change property, transforms of functions divided by t property, transforms of integral of functions property, transforms of derivatives ; Evaluation of integrals by using Laplace transform and Examples on Laplace Transformation Properties.	7
2	**Inverse Laplace Transform** Introductory remarks; Inverse transforms of some elementary functions; General methods of finding inverse transforms; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients and Examples.	7
3	**Fourier Integral** Definitions – Integral transforms; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals and Examples.	7
4	**Fourier Transform** Fourier sine and cosine transforms; Properties of Fourier transforms; Parseval's identity for Fourier transform and Examples.	7
5	**Correlation** Introduction to types of correlation, correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient and its examples, Spearman's rank correlation and its examples.	7
6	**Linear Regression Analysis** Introduction, Linear and non-linear regression, Lines of regression, Derivative of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression and its examples.	7

Text books:

1. Philip P. G. Dyke - An Introduction to Laplace Transforms and Fourier Series
2. J.K. Goyal & K.P. Gupta -Laplace Transform and Fourier Transform
3. Philip Bobko -Correlation and Regression: Principles and Applications.

4. Kutner, Nachtsheim, Neter & Li -Applied Linear Regression Models
Reference books: 1. Erwin Kreyszig, - Advanced Engineering Mathematics, Wiley Eastern Ltd., New Delhi. 2. B.S. Grewal,- Higher Engineering Mathematics, Khanna Publishers, New Delhi. 3. R.K. Jain and S.R.K. Iyengar,- Advanced Engineering Mathematics, Narosa Publishing House. 4. S.C. Gupta and V.K. Kapoor,- Fundamentals of Mathematical Statistics, Sultan Chand & Sons.
MOOC/NPTEL Platform: 1. Laplace properties, inverse transforms & applications- https://onlinecourses.nptel.ac.in/noc20_ma43/preview 2. Fourier sine/cosine transforms, properties, and Laplace- https://onlinecourses.nptel.ac.in/noc23_ma43/preview 3. Correlation & Regression Analysis - https://nptel.ac.in/courses/111105042 .

Course Name: **Professional Skill Development**	**L**	**T**	**P**	**Credits**
Course Code: **25ET305**	2	--	--	2
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	25	--	25	--

Pre-Requisite: Basic literacy or education, Willingness to learn.

Course Objective: The course aims to:	
1	Students learn to acknowledge themselves, develop confidence, and take action without fear.
2	Students understand that dreams are realized through process, not talent or luck.
3	Acquiring Practical Task Management Skills
4	Students learn how to break goals into tasks, manage time, and sustain effort.

Course Outcomes: At the end of the course, students will be able to:	
CO1	Explain the concepts of self-esteem, inner dialogue, and self-awareness using reflective writing techniques.
CO2	Apply value clarification, visualization, and self-awareness tools to design a clear long-term personal vision.
CO3	Formulate SMART goals and convert personal aspirations into structured action plans and weekly schedules.
CO4	Analyze progress through reflection, peer feedback, and outcome evaluation to improve decision-making and resilience.
CO5	Create and present a personal growth portfolio demonstrating continuous improvement using the PDCA cycle.

CO-PO & PSO Mapping:														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	–	–	–	–	–	2	–	3	–	2	–	–	–	–
CO2	–	2	3	–	–	2	–	2	–	–	2	–	–	–
CO3	–	3	3	–	–	–	–	–	–	–	3	–	–	–
CO4	–	3	2	2	–	–	–	–	3	2	–	–	–	–
CO5	–	2	3	–	2	–	–	2	2	3	2	–	–	–

Course Content		
Unit No.	**Unit Title and Content**	**Hrs**
1	**Self-Esteem and Inner Dialogue** • What is self-esteem, and why does it matter? • The power of writing and reflection (core philosophy of KAMI-MEMO) • Self-awareness and value clarification exercises	**5**
2	**Visualizing the Future** • Designing a personal vision (5-year / 10-year future) • Turning abstract dreams into concrete descriptions	**5**
3	**Goal Setting and Task Breakdown** • Translating dreams into goals • SMART goals and milestone design • Weekly planning and prioritization	**5**
4	**Execution and Reflection** • Monitoring progress through written reflection • Understanding success and failure as data • Peer feedback and discussion	**5**
5	**Process Improvement** • Reviewing and redesigning action plans • Strengthening problem-solving and resilience • Creating a personal improvement cycle (PDCA)	**5**
6	**Final Presentation** • Presentation of personal growth portfolio • Reflection on mindset, behaviour, and outcomes	**5**

Text Books:

1. Kunio Hara, KAMI-MEMO: Successful Future Will Be Ahead for You with the Method of Writing Notes on a Piece of Paper, English Edition, Kindle Edition.

Reference Books:

1. Nathaniel Branden, The Six Pillars of Self-Esteem, Bantam Books.
2. Carol S. Dweck, Mindset: The New Psychology of Success, Ballantine Books.

Course Name: **Universal Human Values**	**L**	**T**	**P**	**Credits**
Course Code: **25ET306**	2	--	--	2
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	10	30	10	50

Pre-Requisite: Basic knowledge of management, Communication Skill

Course Objective: The course aims to:	
1	Develop clarity of human values to enable students to understand harmony at individual, family, society, and nature levels.
2	Help students identify their aspirations related to happiness and prosperity.
3	Enable students to evaluate ethical and moral issues in personal and professional life.
4	Promote responsible behavior, social commitment and holistic development among engineering students.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Understand the concept of human values and the need for value-based education.
CO2	Analyze the relationship between self, family, society, and nature for achieving harmony.
CO3	Apply universal human values in personal, social, and professional decision-making.
CO4	Demonstrate ethical conduct, social responsibility, and sustainable thinking as an engineer.

CO-PO & PSO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	-	-	-	2	-	2	-	1	2	-	-	2
CO2	-	2	-	-	-	3	2	2	1	1	2	1	2	3
CO3	-	-	-	-	-	3	-	3	2	2	3	2	2	3
CO4	-	-	-	-	-	3	3	3	1	1	3	-	1	3

Course Content		
Unit No.	**Unit Title and Content**	**Hrs**
1	**Introduction to Universal Human Values** Introduction to Value Education, Need and Importance of Universal Human Values, Self-Exploration and Self-Awareness, Natural Acceptance, Right Understanding, Relationship between Values, Skills, and Knowledge.	**5**
2	**Understanding Happiness and Prosperity** Concept of Happiness and Prosperity, Difference between Happiness and Pleasure, Short-term vs long-term Happiness, Continuous Happiness and Prosperity, Role of Values in Achieving Sustainable Happiness.	**5**
3	**Harmony in the Individual (Self)** Human Aspirations, Co-existence of Self and Body, Understanding Needs of Self and Body, Right Utilization of Physical Facilities, Holistic Development of Individual.	**5**
4	**Harmony in Family and Society** Family as a Basic Unit of Society, Values in Family: Trust, Respect, Affection, Care, Guidance, Reverence, Social Harmony, Justice, Equality, and Mutual Cooperation, Ethical Human Conduct.	**5**
5	**Harmony in Nature and Existence** Relationship between Human Beings and Nature, Mutual Enrichment, Sustainable Development, Environmental Responsibility, Concept of Co-existence, Role of Engineers in Environmental Protection.	**5**
6	**Professional Ethics and Value-Based Engineering** Ethical Responsibilities of Engineers, Professional Ethics, Social Accountability, Case Studies Related to Ethical Dilemmas in Engineering Practice, Value-based Decision Making.	**5**

Text Books:

1. Gaur, R. R., Sangal, R., and Bagaria, G. P.,-A Foundation Course in Human Values and Professional Ethics, Excel Books, New Delhi.
2. Tripathi, A. N., - Human Values, New Age International Publishers.

Reference Books:

1. Universal Human Values, AICTE Model Curriculum
2. Mike Martin and Roland Schinzinger -Ethics in Engineering, McGraw Hill.
3. R. Subramanian -Professional Ethics and Human Values, Oxford University Press.

MOOC/NPTELPlatform:

1. "Exploring Human Values: Visions of Happiness and Perfect Society" by Sharma, A. K., IIT Kanpur. https://nptel.ac.in/courses/109104068

2. "Applied Ethics", by Kapur, N. S., and Sreesailam, V., SWAYAM. https://onlinecourses.swayam2.ac.in/nou26_ge38/preview
3. " Essential Values and Ethics: Cultivating Professional Excellence and Career Advancement", by Pandey, A., SWAYAM. https://onlinecourses.swayam2.ac.in/imb26_mg88/preview

Course Name: Mini Project-I **Course Code:** 25ET307	**L**	**T**	**P**	**Credits**
	--	--	2	1
Evaluation Scheme:	ISE 1	MSE	ISE 2	ESE
Marks:	25	–	25	–

Pre-Requisite: Awareness of social, community or environmental issues relevant to engineering solutions.

Course Objectives: The course aims:

1. To develop awareness of social responsibility and community challenges.
2. To enable students to identify real-life problems and design practical solutions.
3. To promote teamwork, leadership, and communication skills.
4. To enhance ethical conduct and professional documentation practices.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Identify community needs through interaction and field surveys.
CO2	Analyze societal problems and design feasible intervention strategies.
CO3	Implement community-based projects using participatory methods.
CO4	Evaluate project outcomes and prepare professional technical documentation.

CO-PO & PSO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	1	2	1	1	–	3	2	2	1	2	–	–	–	–
CO2	1	3	3	2	1	2	2	2	2	2	1	–	–	–
CO3	–	2	3	2	2	3	3	2	3	3	2	–	–	–
CO4	–	2	2	2	1	2	2	3	2	3	3	–	–	–

Course Overview: The Mini Project-I course is designed to instill social responsibility among students and strengthen the connection between academic institutions and local communities. The project encourages students to apply their academic knowledge to solve real-life societal challenges and contribute towards sustainable development.

- The guiding motto of this course is: **"Campus to Community"**
- Students are expected to identify socially relevant issues under the guidance of faculty mentors and propose or implement practical solutions. These projects promote collaboration, empathy, leadership skills, and civic responsibility, enabling students to gain real-world experience while benefiting society.
- A group of students (max. 4 and min. 2) could be assigned with a project guide.

The topics for the course may cover the following diverse sectors (but not limited to):

- **Health**: Free health check-up camps, mental health awareness programs.
- **Livelihood**: Skill development workshops, micro-entrepreneurship support.
- **Education**: Digital literacy programs, mobile libraries, career guidance camps.
- **Environment**: Rainwater harvesting awareness, solar lighting initiatives.
- **Cultural Heritage**: Documentation of local history, cultural exchange programs.

Through such initiatives, communities become active partners in development, creating a more inclusive and resilient society.

Sr. No.	Guidelines
1	**Project Overview:** Students will engage with a local community or a specific group within the community, such as schools, women's groups, farmers, etc. to identify challenges and collaboratively develop solutions. This hands-on project allows students to apply their knowledge and skills while fostering social responsibility. **Key Components of the Project:** **1. Community Selection & Understanding:** • **Community Identification:** Choose a community in need of support, whether it's based on location (urban, rural) or a demographic group (youth, elderly, marginalized populations). • **Problem Identification:** Engage with community members to identify pressing issues or challenges, such as education, health, environment, or livelihoods. • **Cultural Sensitivity:** Understand the cultural, social, and economic background of the community before engaging.

2. Engagement Approach:

- **Participatory Method:**
  Involve the community at every stage—from identifying problems to developing and implementing solutions.
- **Partnership with Local Leaders:**
  Collaborate with community leaders, NGOs, or local government representatives to ensure the project's effectiveness.
- **Capacity Building:**
  Focus on empowering community members with knowledge and skills that promote self-reliance.

3. Community Engagement Methodology:

A. Pre-Engagement Research:
Conduct preliminary research on the community to understand its demographics, socio-economic conditions and existing services or infrastructure.
Review similar case studies or projects to gain insights into best practices.

B. Initial Field Visits:
Arrange field visits to meet with key stakeholders and community members. Hold informal meetings to build rapport and trust.

C. Needs Assessment:
Use surveys, interviews or focus group discussions to gather information about the community's needs.
Assess both short-term and long-term needs related to areas such as education, healthcare, sanitation, livelihoods and environment.

D. Project Design:
Based on the findings from the needs assessment, propose actionable solutions.
Ensure that the proposed interventions are feasible, sustainable and culturally appropriate.
Examples of interventions could include awareness campaigns, skill development workshops, environmental conservation activities or infrastructure improvements.

4. Implementation Plan:

A. Action Plan:

- **Timeline:** Create a clear timeline for implementing the project, with specific milestones.
- **Roles & Responsibilities:** Assign specific tasks to team members and involve community members in the implementation process.

- **Resource Management:** Identify the resources (financial, material, human) needed to implement the project and create a budget.

B. Pilot Project (if applicable):

- Consider implementing a pilot phase to test the intervention on a smaller scale and make necessary adjustments before full-scale implementation.

C. Community Participation:

- Encourage community ownership by involving them in the execution phase (e.g., labor, materials, decision-making).
- Provide opportunities for community members to gain skills during the implementation, such as through training sessions or workshops.

5. Monitoring & Evaluation:

A. Monitoring Progress:

- Regularly assess the progress of the project against the action plan.
- Identify any challenges or delays and address them promptly in collaboration with the community.

B. Evaluation:

- Measure the impact of the project by comparing pre-project and post-project conditions.
- Use both qualitative and quantitative methods to evaluate success (e.g., improvements in literacy rates, health outcomes, or income levels).

D. Community Feedback:

- Gather feedback from the community on the effectiveness of the intervention.
- Hold feedback sessions with community leaders and participants to assess whether the project has met their expectations and addressed their needs.

6. Reporting & Documentation:

B. Final Report:

- Prepare a comprehensive report documenting the entire project process, from the initial engagement to implementation and evaluation.
- Include sections on:
  - Introduction and community background
  - Needs assessment findings
  - Project design and implementation strategy
  - Challenges and lessons learned
  - Outcomes and impact analysis
  - Recommendations for future engagement

C. Visual Documentation:

- Include photographs, videos or other visual media to document the

process and outcomes.
- Create info graphics or presentations that highlight key results and impact.

7. Reflection and Learning:

B. Team Reflection:
- Hold a reflection session with your project team to discuss the experiences, challenges, and personal growth resulting from the project.
- Identify what worked well and what could be improved for future community engagement efforts.

C. Community Reflection:
- Engage the community in a reflective discussion about their experience with the project and the changes they have observed or experienced.

8. Ethical Considerations:

A. Informed Consent:
- Ensure that community members give informed consent before participating in the project, especially in data collection activities (e.g., interviews, surveys).
- Maintain transparency about the project's goals and the expected outcomes.

C. Respect for Cultural Norms:
- Respect the community's cultural practices, beliefs, and social norms throughout the project.
- Avoid imposing external solutions that may not align with the community's values.

D. Confidentiality:
- Ensure confidentiality and privacy when dealing with sensitive information, especially personal or demographic data.

9. Submission Guidelines:

A. Final Report:
- Submit a well-organized report that includes all phases of the project.

B. Presentation:
- Prepare a final presentation summarizing the project, including key results, challenges and recommendations.
- Use visual aids, such as photos, videos or maps to illustrate the community engagement process and outcomes.

10. Evaluation Criteria:

	• **Community Involvement (25%):** Extent of community participation in the project. • **Problem-Solution Match (25%):** Appropriateness of the solution developed for the identified community needs. • **Implementation Effectiveness (20%):** How effectively the project was executed, including timeliness and resource use. • **Impact (20%):** Tangible improvements or changes in the community. • **Reflection and Learning (10%):** Depth of insight gained through reflection on the process and outcomes. **11. Timeline:** • Week 1-2: Community research and selection. • Week 3-4: Field visits and needs assessment. • Week 5-6: Project design and planning. • Week 7-10: Implementation and monitoring. • Week 11-12: Evaluation and reporting.
2	**Deliverables** • Mini Project Proposal (Hard copy and Soft copy – before implementation) • Weekly Progress Logbook duly signed by the project guide • Final Project Report (Hard copy and PDF) • Working Model / Simulation Output (As applicable) • Presentation Slides (PPT) • Final Viva-Voce • Source Code / Design Files (Pen Drive / Cloud Link) if any.

Title of the Course Name: **Analog Electronics Circuit Design Laboratory** Course Code:**25ET308**	**L**	**T**	**P**	**Credits**
	--	--	02	1
Evaluation Scheme:	**ISE**	-	-	**ESE**
Marks:	50			50

Pre-Requisite: Basic Electronics

Course Objective: The course aims to:	
1	Understand the operation and characteristics of BJT, JFET/MOSFET amplifiers
2	Design and test amplifier and oscillator circuits using active devices..
3	Analyze frequency response, efficiency, and performance parameters of electronic circuits using simulation and hardware implementation..
4	Design and implement regulated power supply circuits using diode and IC regulators.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Design and test BJT and MOSFET amplifiers
CO2	Analyze frequency response and performance of RC coupled and power amplifiers using hardware and simulation tools.
CO3	Design and verify the oscillators
CO4	Design and implement wave shaping circuits, regulated DC power supplies and IC regulators

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	-	2	-	2	-	-	-	1	–	–	1	3	–
CO2	3	-	3	-	2	-	-	-	1	–	–	1	3	–
CO3	3	-	3	-	2	-	-	-	1	–	–	1	3	–
CO4	3	-	3	-	2	-	-	-	1	–	–	1	3	–

Course Content		
Experiment No.	**Experiment Title and Contents**	**Hrs**
1	Design and test single-stage BJT CE amplifier.	2
2	Plot and analyze frequency response of RC Coupled CE amplifier using simulation tools.	2
3	Design and test JFET/MOSFET common-source amplifier.	2
4	Design and test Class-A power amplifier.	2
5	Simulate Class-B/AB power amplifier.	2
6	Design and verify Colpitts oscillator.	2
7	Design and verify Hartley oscillator.	2
8	Design and test diode clipper circuits.	2
9	Design and test diode clamper circuits.	2
10	Design and test Zener as Voltage regulator	2
11	Design and test three terminal IC voltage Regulator-78XX and 79XX	2
12	Design of DC Power Supply	2

Note: *Minimum 10 experiments to be performed.

Course Name: **Digital Design Lab**	**L**	**T**	**P**	**Credits**
Course Code: **25ET309**	–	--	2	1
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	25	--	25	50

Pre-Requisite: Basic Electronics Components, Basic Logic Gates, Fundamentals of Basic Electronics.

Course Objective: The course aims to:	
1	Understand and verify the operation of basic and universal logic gates through practical implementation and truth table validation.
2	Design and implement combinational logic circuits such as adders, subtractors, code converters, multiplexers, demultiplexers, and comparators.
3	Design and analyze digital circuits using universal gates (NAND and NOR) and evaluate their functional equivalence to basic logic gates.
4	Design, implement, and verify sequential circuits including flip-flops and shift registers using hardware and simulation tools.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Verify basic and universal logic gate circuits, and their truth tables.
CO2	Implement combinational arithmetic circuits
CO3	Design combinational logic circuits such as Multiplexers, Demultiplexers, and Comparators for digital system applications.
CO4	Perform sequential circuits including Flip Flop and Shift Registers.

CO-PO & PSO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	3	3	–	–	–	1	–	–	1	3	1
CO2	3	3	3	2	3	–	–	–	1	–	–	1	3	2
CO3	3	3	3	2	2	–	–	–	1	–	–	1	3	2
CO4	3	3	3	3	3	–	–	–	1	–	–	1	3	1

Course Content		
Experiment No.	**Experiment Title and Contents**	**Hrs**
1	To verify the truth tables of basic logic gates (AND, OR, NOT, NAND, NOR, XOR)	2
2	To design and implement the basic logic gates (AND, OR, NOT) using only NAND gates and verify their truth tables.	2
3	To design and implement the basic logic gates (AND, OR, NOT) using only NOR gates and verify their truth tables.	2
4	To design and implement Half Adder and Full Adder circuits and verify their outputs using truth tables.	2
5	To design and implement Half Subtractor and Full Subtractor circuits and verify their outputs using truth tables.	2
6	To design and implement a Binary to Gray code converter and verify the output for all input combinations.	2
7	To design and implement a Gray to Binary code converter.	2
8	To implement a 4:1 Multiplexer using logic gates and verify its operation using a truth table.	2
9	To design and implement a 1:4 Demultiplexer and verify its functionality.	2
10	To design and implement a 2-bit digital comparator and verify the comparison outputs.	2
11	To verify the truth table and operation of a J-K Flip Flop.	2
12	To design and simulate 4-bit right shift and left shift register using D-flip flop	2

Note: *Minimum 10 experiments to be performed.

Course Name: **Signals and Systems**	**L**	**T**	**P**	**Credits**
Course Code: **25ET401**	3	--	--	3
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	10	30	10	50

Pre-Requisite: Basic Electronics, Basic Physics

Course Objective: The course aims to:	
1	Introduce fundamental concepts of continuous-time and discrete-time signals and systems.
2	Analyze properties and behavior of Linear Time Invariant (LTI) systems using convolution techniques.
3	Understand sampling theory and its significance in signal processing.
4	Apply Fourier, Laplace, and Z-transforms for analysis of signals and systems.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Classify continuous-time and discrete-time signals and systems and perform basic signal operations.
CO2	Analyze LTI systems using convolution, impulse response, and system properties.
CO3	Apply sampling theorem and Fourier transform techniques for frequency domain analysis of signals.
CO4	Resolve the signals in the complex frequency domain using the Laplace Transform and Z-transform

CO-PO & PSO Mapping:													
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	–	–	1	–	–	–	–	–	1	–	–	2
CO2	3	2	–	1	–	–	–	–	–	–	1	–	–	2
CO3	3	3	2	2	1	–	–	–	–	–	2	–	–	2
CO4	3	3	2	2	1	–	–	–	–	–	2	–	–	2

Course Content		
Unit No.	**Contents**	**Hrs**
1	**Introduction to Signals** Representation of Standard signals, Classification of signals: Continuous-time and discrete-time signals, Periodic Signals and non-periodic, Power and energy signals, Causal signals and Non-causal signals. Operations on signals: Time shifting, Time reversal, Time scaling, Amplitude scaling, Signal addition, Subtraction, Signal multiplication.	**8**
2	**Introduction to System** Classification of Systems: Continuous-time and Discrete-time systems, Linear and Non-Linear systems, Time variant and Time-invariant systems, Stable and Unstable systems, Causal systems, and non-causal systems.	**7**
3	**Linear time invariant Systems** The representation of signals in term of impulses, convolution sum, convolution integral, computation of convolution integral using graphical method, Computation of convolution sum. Properties of convolution, properties of the system based on impulse response, step response in terms of impulse response.	**7**
4	**Sampling** Representation of continuous time signals by it's samples, The sampling theorem, Reconstruction of signals from its samples using interpolation, The effect of under sampling, aliasing, Discrete time processing of continuous time signals, Sampling in the frequency domain.	**7**

5	**Fourier Transform** Complex exponential form of Fourier series, Fourier Transform (FT) representation of aperiodic continuous time (CT) signals, Dirichlet condition for existence of Fourier transform, evaluation of magnitude and phase response, FT of standard CT signals, Properties and their significance, Application of Fourier transform	7
6	**Laplace and Z-Transform** Definition of Laplace Transform (LT), Limitations of Fourier transform and need of Laplace transform, ROC and its properties, properties of Laplace transform, Inverse Laplace transform based on partial fraction expansion, Application of Laplace transforms to the LTI system analysis. Introduction to Z-transform, and its properties, Inverse Z-transform, different methods of inverse Z-transform, Z transform for discrete time system LTI analysis.	6

Text Books:

1. A.V. Oppenheim, A.S. Willsky —Signals and systems‖, Prentice-Hall signal processing series.
2. A. Nagoor Kanni —Signals and Systems‖, McGraw Hill.
3. P.Ramesh Babu —Signals and Systems‖, Scitech Publications(India).

Reference Books:

1. B P Lathi —Linear Systems and Signals, Oxford University Press.
2. Simon Haykins and Barry Van Veen —Signals and Systems‖, Wiley India.

MOOC/NPTEL Platform:

1. "Signals and Systems" by Prof. Hitesh Shrimali, Prof. Kushal K. Shah (IIT Mandi, IISER Bhopal). https://onlinecourses.nptel.ac.in/noc23_ee14/preview
2. " Principles of Signals and Systems" by Prof. Aditya Jagannatham (IIT Kanpur). https://onlinecourses.nptel.ac.in/noc23_ee14/preview

Title of the Course Name: Microcontroller	**L**	**T**	**P**	**Credits**
Course Code: 25ET402	3	--	--	3
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	10	30	10	50

Pre-Requisite: Digital Electronics

Course Objective: The course aims to:	
1	Understand the fundamentals of microprocessors and microcontrollers with emphasis on 8085 and 8051 architectures.
2	Analyze instruction sets, addressing modes, timing diagrams, and interrupt mechanisms of 8085 and 8051
3	Develop assembly language programs and embedded C programs for 8051-based applications.
4	Design and implement basic interfacing circuits using 8051 with peripherals such as displays, sensors, motors, and serial communication modules.

Course Outcomes: At the end of the course, students will be able to:

CO	**Course Outcomes**
CO1	Explain the architecture, pin configuration, instruction cycles, and interrupt structure of the 8085 microprocessor.
CO2	Describe the architecture, memory organization, instruction set, and interrupt system of the 8051 microcontroller.
CO3	Write and debug assembly language and Embedded C programs for data transfer, arithmetic, timing, and serial communication.
CO4	Interface 8051 with external devices such as LEDs, LCDs, keypads, ADC/DAC, and motors for real-time embedded applications.

CO-PO & PSO Mapping:													
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	-	2	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	2	-
CO3	2	3	3	-	-	-	-	-	-	-	-	-	2	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-	2	-

Course Content		
Unit No.	**Contents**	**Hrs**
1	**Fundamentals of Microprocessor** 8085 architecture, programming model: Addressing modes, Instruction set, Assembly language programming, pin functions, Timing diagram and instruction cycles, State transition diagram, Single machine cycle execution, stack and subroutines, Interrupt structure and classification.	7
2	**8051 Microcontroller** Microprocessor Vs Microcontroller, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.	7
3	**8051 Instruction Set** 8051 Instruction Set: Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions	7
4	**Timers, Counters and Interrupts** Timers and Counters in 8051, Timer modes and configuration, Interrupts in 8051, Types of interrupts, Interrupt vector table, Enabling/disabling interrupts	7

5	**Interfacing with 8051** Interfacing Basics: I/O ports and data transfer, Interfacing with LEDs, Switches, 7-Segment Displays, Interfacing with LCD (16x2), Interfacing with Keypad, Interfacing with ADC and DAC, Stepper Motor and DC Motor control	7
6	**Serial Communication and Applications** Basics of Serial Communication, RS232 Protocol, 8051 Serial Communication: SBUF, SCON Registers, Modes of serial communication, Programming for data transmission and reception, Introduction to Embedded C for 8051.	7

Text Books:

1. Muhammad Ali Mazidi et al-The 8051 Microcontroller and Embedded Systems: Using Assembly and C
2. Kenneth J. Ayala -The 8051 Microcontroller: Architecture, Programming, and Applications
3. Subrata Ghoshal -8051 Microcontroller–Internals, Instructions, Programming & Interfacing

Reference Books:

1. Ajay V. Deshmukh -Microcontrollers: Theory and Applications, Tata McGraw-Hill
2. K.V.K.K. Prasad -Embedded Systems with 8051 Microcontroller, Dreamtech Press .
3. -Myke Predko -Programming and Customizing the 8051 Microcontroller, McGraw-Hill Education

MOOC/NPTEL Platform:

1. https://onlinecourses.nptel.ac.in/noc26_ee58/preview

Course Name: **Network Analysis** Course Code: **25ET403**	**L**	**T**	**P**	**Credits**
	3	1	--	4
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	10	30	10	50

Pre-Requisite: Basic Electronics, Basic Physics

Course Objective: The course aims to:	
1	Introduce fundamental laws, theorems and graph theory concepts essential for electrical circuit analysis.
2	Analyze AC and transient behavior of electrical circuits, including steady-state phasor techniques, resonance phenomena and transient response of RL, RC, and RLC circuits using classical and Laplace transform methods.
3	Understand and analyze two-port networks and network synthesis techniques, including various parameter representations and realization using Foster and Cauer forms.
4	Classify, design and analyze passive and active filters and attenuators used in communication and signal processing systems.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Apply network theorems and graph theory concepts for simplification of electrical networks.
CO2	Analyze AC steady-state behavior of electrical circuits.
CO3	Evaluate transient response of first- and second-order circuits using time-domain methods and Laplace transform techniques.
CO4	Design two-port networks, synthesized RLC networks, passive filters and attenuators for specified performance requirements.

CO-PO & PSO Mapping:														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	–	–	–	–	–	–	–	–	1	2	–	–
CO2	3	3	–	2	–	–	–	–	–	–	1	–	1	–
CO3	3	2	2	–	–	–	–	–	–	–	–	–	2	–
CO4	3	2	3	–	2	–	–	–	–	–	–	2	1	2

Course Content		
Unit No.	**Contents**	**Hrs**
1	**Network Theorems and Graph Theory** Mesh and Nodal Analysis, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Source Transformation, Network Topology, Graph Theory - Tree and Co-Tree, Loops and Cut-Sets, Incidence Matrix, Tie-Set and Cut-Set Matrices.	**8**
2	**AC Steady-State Analysis** Phasor Representation of Sinusoidal Signals, Impedance and Admittance Concepts, Mesh and Nodal Analysis in AC Circuits, Power in AC Circuits: Active, Reactive, Apparent Power, Power Factor, Resonance in Series and Parallel RLC Circuits.	**7**
3	**Transient Analysis** First-Order Circuits: RL and RC, Second-Order Circuits: RLC, Natural and Forced Response, Time Constant and its Significance, Step and Impulse Response, Use of Laplace Transform in Transient Analysis.	**7**

4	**Two-Port Network Parameters** Introduction to Two-Port Networks, Z, Y, h, g and ABCD Parameters, Interconnection of Two-Port Networks, Reciprocity and Symmetry.	7
5	**Network Synthesis** Introduction, Realization using Foster and Cauer Forms, Synthesis of RLC Networks, Passive Filter Design.	7
6	**Filters and Attenuators** Classification and Types of Filters, Analysis and Design of Passive Filters, Attenuators: T and π-Type, Design of Simple Equalizers, Introduction to Active Filters.	6

Text Books:

1. Van Valkenburg M.E. – Network Analysis, Prentice Hall of India
2. Sudhakar A., Shyammohan S. Palli – Circuits and Networks: Analysis and Synthesis, McGraw-Hill
3. D. Roy Choudhury – Networks and Systems, New Age International

Reference Books:

1. Hayt W.H., Kemmerly J.E., Durbin S.M. – Engineering Circuit Analysis, McGraw-Hill
2. Smarajit Ghosh – Network Theory: Analysis and Synthesis, PHI Learning 3. F.F. Kuo – Network Analysis and Synthesis, Wiley India

MOOC/NPTEL Platform:

1. "Network Analysis" by Prof. M. Vidyasagar (IIT Hyderabad). https://nptel.ac.in/courses/108105159
2. Coursera Courses "Linear Circuits 1: DC Analysis" and "Linear Circuits 2: AC Analysis" by Georgia Tech.

Course Name: **Entrepreneurship Development**	**L**	**T**	**P**	**Credits**
Course Code: **25ET406**	1	--	--	1
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	25	--	25	--

Pre-Requisite: Basic knowledge of management

Course Objective: The course aims to:	
1	Introduce the concept of entrepreneurship and its significance in economic development.
2	Develop entrepreneurial competencies and motivation
3	Familiarize with business planning and project management.
4	Create awareness about startup ecosystem, government schemes, and legal frameworks.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Understand entrepreneurship concepts, startup ecosystem, and ethical responsibilities in engineering enterprises.
CO2	Analyze market opportunities and feasibility of technology-driven business ideas.
CO3	Develop a basic business plan considering sustainability, project planning, and teamwork.

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	–	–	–	–	–	2	–	3	–	–	2	–	–	–
CO2	–	3	2	–	–	–	–	–	–	–	–	–	–	–
CO3	–	–	3	–	–	–	2	–	2	2	–	–	–	–

Course Content		
Unit No.	**Unit Title and Content**	**Hrs**
1	**Introduction to Entrepreneurship:** Definition, Importance, Entrepreneur vs. Manager, Entrepreneurial motivation and Barriers, Classification of Entrepreneurship, Theory of Entrepreneurship, Concept of Entrepreneurship.	**3**
2	**Corporate Entrepreneurship:** Introduction, Flavors of Corporate Entrepreneurship, Corporate Venturing, Intrapreneurship, Organizational Transformation, Industry Rule Bending, Need for Corporate Entrepreneurship, Domain of Corporate Entrepreneurship	**4**
3	**Business Plan and Project Management:** Idea Generation, Screening and Project Identification, Creative Performance, Feasibility Study, Market Survey, Business Plan Elements.	**4**
4	**Family and Non Family Entrepreneur & Women entrepreneurs:** Role of Professionals, Professionalism vs. Family Entrepreneurs, Role of Woman Entrepreneur, Factors Influencing Women Entrepreneur, Challenges for Women Entrepreneurs, Growth and Development of Women Entrepreneurs in India	**4**

Text Books:

1. Vasant Desai - Dynamics of Entrepreneurial Development and Management, Himalaya Publishing.
2. S.S. Khanka - Entrepreneurial Development, S. Chand.
3. P. Saravanavel - Entrepreneurship Development, Ess Pee Kay Publishing House.

Reference Books:

1. C.B. Gupta & N.P. Srinivasan - Entrepreneurial Development, Sultan Chand & Sons.
2. Hisrich, Peters & Shepherd - Entrepreneurship, McGraw Hill.
3. David H. Holt - Entrepreneurship: New Venture Creation, Prentice Hall of India.

MOOC/NPTEL Platform:

1. "Entrepreneurship" by Prof. S. S. S. Kumar (IIT Madras) https://nptel.ac.in/courses/110106141

2. "Entrepreneurship and Innovation" by Prof. V. Gopal (IIT Roorkee)
   https://nptel.ac.in/courses/110107094
3. "Developing Soft Skills and Personality" by Prof. T. Ravichandran (IIT Kanpur)
   https://nptel.ac.in/courses/109104115

Course Name: **Quantitative Aptitude and Logical Reasoning - I** Course Code: 25ET407	**L**	**T**	**P**	**Credits**
	1	--	--	1
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	--	--	--	--

Course Description:

This course builds essential skills in arithmetic, percentages, ratios, profit & loss, and interest, alongside problem-solving methods like LCM-HCF, time-rate-work, and SI-CI. It also covers logical reasoning topics—blood relations, coding-decoding, direction sense, and series—to sharpen analytical thinking. Learners gain speed, accuracy, and adaptability for exams, recruitment, and entrepreneurial decisions.

Pre-Requisite: Basic concepts of Basic Mathematical Knowledge, Language Proficiency and Analytical Readiness.

Course Objective: The course aims to:	
1	Develop the ability to recall and explain fundamental principles, enabling learners to build a strong conceptual foundation for quantitative and reasoning skills.
2	Gain proficiency in applying methods and techniques to solve structured problems and practical scenarios with accuracy and confidence.
3	Cultivate analytical thinking by examining relationships, patterns, and logical structures, thereby enhancing decision-making and problem validation skills.
4	Integrate diverse approaches and create effective strategies, supporting innovation and adaptability in academic, professional, and real-world contexts.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Recall key concepts of Mathematics for placements and business applications.
CO2	Apply quantitative methods to solve structured numerical problems in exams and entrepreneurial contexts.
CO3	Analyze logical reasoning problems to identify patterns and enhance reasoning skills.
CO4	Evaluate alternative solution approaches for efficiency and create integrated solutions supporting innovation and adaptability.

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-	-	-	2	-	-	-
CO3	3	-	-	3	-	-	-	-	3	-	-	-	-	-
CO4	-	-	3	-	1	-	2	-	-	1	-	-	-	-

Course Content		
Unit No.	**Description**	**Hrs**
1	**Foundations of Quantitative Aptitude** **Number Systems-** Basics, Base System, Exponents,Numerical Analogy-Basics, Relation between two numbers. **Percentage**-numericalPercentage Understand Conversion, Single change, Successive change, Product Stability, Applications of percentage. **Ratios and Fractions**-Comparison of Ratio & fraction, Properties of Ratio & Proportion, Mean Proportion., Joint ratio.	3
2	**Averages, Profit & Loss, and Interest Calculations:** **Average** -Average, Allegations Weighted average, Concept of average speed & allegation, Applications of Average & mixture allegation. **Profit & Loss** - Same selling price different Cost Price, Same cost price	3

	different selling price, Concept of false scale. **Simple and Compound Interest**-Basics, Difference between SI CI, Conversion Periods, Depreciation.	
3	**Advanced Quantitative Methods** **LCM and HCF**-LCM and HCF, Factors, Cyclicity, Different Methods to find LCM-HCF, HCF-LCM relation, Applications of HCF-LCM. **TRW**-Time, Rate and Work-Unitary Method, LCM Method, Calculation of remuneration. **Pipes & Cisterns**-Concept of negative work, LCM Method.	3
4	**Logical Reasoning Essentials** **Blood Relations** -Symbols, generation of tree diagram, types of questions-pointing towards person, tree based, coded blood relation. **Coding Decoding** -Letter-Letter, Letter- Number, Number-Number, Letter-Symbol, Mixed Coding. **Direction Sense and Time Numericals**-Basics, shadow-based concept, Concept of local time zone (IST, GMT, Longitude, Latitude), Problems on local time difference, Coded direction sense.	3
5	**Pattern Recognition and Analytical Series** **Series Completion** - Types of series, Number series pattern, Letter series, Alphanumeric series. **Pattern, Step Completion** - Image completion, Mirror images, Water images, input-Output. **Syllogism-** Basics, Types of Statements, Different diagram for different statements, Types of Questions-Based on Conclusion, Based on Statements.	3

Reference books:

1. R. S. Aggarwal, "Quantitative Aptitude", S Chand Publishing, New Delhi.
2. R. S. Aggarwal, "Logical Reasoning", S Chand Publishing, New Delhi.
3. Arun Sharma, "Quantitative Aptitude", McGraw Hill Publishing, New Delhi.
4. Arun Sharma, "Logical Reasoning", McGraw Hill Publishing, New Delhi.

Course Name: **Constitution of India**	**L**	**T**	**P**	**Credits**
Course Code: 25ET408	2	-	-	2
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	25	--	25	--

Course Description:

This course provides an overview of the Indian Constitution, focusing on its historical background, structure, and key features. It covers fundamental rights, directive principles, duties, and the functioning of the Union, State, and local governments. The course also explains constitutional bodies, amendment processes, emergency provisions, and Centre–State relations. It promotes active citizenship and highlights the role of engineers in democratic governance and nation-building..

Pre-Requisite: Basic knowledge of Indian History

Course Objective: The course aims to:	
1	Introduction to the historical and legal foundations of the Indian Constitution and its key features.
2	Understanding of the structure and functioning of Union, State, and local governments.
3	Familiarization with fundamental rights, duties, directive principles, and constitutional bodies.
4	Promotion of responsible citizenship and active participation in a democratic society.

Course Outcomes: At the end of the course, students will be able to:	
CO1	Understand and explain the historical and legal foundations of the Indian Constitution along with its key features.
CO2	Describe the structure, functions, and governance mechanisms of Union, State, and local governments, including the roles of constitutional bodies, Fundamental Rights, Duties, and Directive Principles.
CO3	Demonstrate an understanding of responsible citizenship and actively participate in a democratic society through constitutional values and practices.

CO-PO & PSO Mapping:														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	–	–	–	–	–	2	2	–	1	–	1	–	–	–
CO2	–	–	–	–	–	2	2	–	1	–	1	–	–	–
CO3	–	–	–	–	–	2	2	–	1	–	1	–	–	–

Course Content		
Unit No.	**Contents**	**Hrs**
1	**Introduction to the Constitution** Historical background of the Indian Constitution, Framing of the Constitution and the Constituent Assembly, Features of the Indian Constitution, Preamble and its significance, Citizenship: Types and constitutional provisions.	**5**
2	**Fundamental Rights and Duties** Fundamental Rights: Definition, types, and limitations, Directive Principles of State Policy (DPSP), Fundamental Duties of Indian citizens, Relationship between Fundamental Rights and DPSP.	**5**
3	**Union Government Structure** Parliament: Lok Sabha and Rajya Sabha – composition and functions President: Powers, election, and role, Prime Minister and Council of Ministers, Judiciary: Supreme Court – structure, powers, and independence.	**5**
4	**State Government and Local Governance** State legislature and Governor, Chief Minister and State Council of Ministers, High Courts and Subordinate Courts, Panchayati Raj System and Municipalities – 73rd & 74th Amendments.	**5**
5	**Constitutional Bodies and Amendments** Different types of Constitutional Bodies, Constitutional amendment process (Article 368), Major constitutional amendments (42nd, 44th, 73rd, 74th, 86th).	**5**

6	**Important Provisions and Current Developments** Emergency provisions: National, State, and Financial, Official language and special provisions, Center-State relations: Legislative, administrative, financial, Recent constitutional and legal developments, Role of citizens and engineers in democracy and governance.	**5**

Text Books:

1. M. Laxmikanth, Indian Polity, McGraw-Hill Education
2. D.D. Basu, Introduction to the Constitution of India, LexisNexis
3. J.N. Pandey, Constitutional Law of India, Central Law Agency

Reference Books:

1. Subhash C. Kashyap ,Our Constitution: An Introduction to India's Constitution and Constitutional Law, National Book Trust
2. V.N. Shukla ,Constitution of India, Eastern Book Company
3. Brij Kishore Sharma, Introduction to the Constitution of India, Pearson Education

MOOC/NPTEL Platform:

1. NPTEL Course: Constitution of India, Prof. M.K. Bhandari (Rajasthan Technical University)
   https://nptel.ac.in/courses/109/104/109104074
2. Indian Government and Politics, Prof. R. Sudarshan (IIT Delhi)
   https://nptel.ac.in/courses/109/104/109104068

Course Name: Programming Technique Course Code: 25ET409	L	T	P	Credits
	--	--	02	1
Evaluation Scheme:	ISE-I	MSE	ISE-II	ESE
Marks:	25	-	25	50

Pre-Requisite: Basic C programming

Course Objective: The course aims to:	
1	Introduce the basic syntax, control structures, and data types in Python.
2	Develop problem-solving and algorithmic thinking using Python.
3	Familiarize students with Python's built-in data structures and file operations.
4	Provide hands-on experience with practical Python applications and debugging techniques.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Understand Python syntax, variables, and control flow
CO2	Apply functions and data structures (lists, dictionaries, tuples) in Python
CO3	Develop file-handling operations and modular programs using Python.
CO4	Analyze and debug basic Python programs for correctness and efficiency

CO-PO & PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	3	-	-	-	-	-	-	-	-	-	-	-
CO4	2	3	2	-	-	-	-	-	-	-	-	-	-	-

Course Content		
Experiment No.	**Experiment Title and Contents**	**Hrs**
1	Introduction to Python IDE and writing simple scripts	2
2	Programs on variables, data types, and operators	2
3	Conditional statements (if, if-else, nested if)	2
4	Looping constructs (for, while, nested loops)	2
5	Functions and modules	2
6	String manipulation and built-in functions	2
7	List, Tuple, Dictionary operations	2
8	File handling: read, write, append modes	2
9	Exception handling and debugging techniques	2
10	Programs on user-defined functions with arguments/return	2
11	Programs using Turtle	2
12	Programs using Tkinter	2

Note:*Minimum 10 experiments to be performed.

Course Name: **Signals and Systems Lab**	**L**	**T**	**P**	**Credits**
Course Code: **25ET410**	--	--	2	1
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-I**	**ESE**
Marks:	25	–	25	50

Pre-Requisite: Applied Mathematics, Signals and Systems, MATLAB-Programming Techniques

Course Objective: The course aims to:	
1.	Understand and generate continuous-time and discrete-time signals using simulation tools.
2.	Analyze system properties and verify Linear Time Invariant (LTI) system behavior.
3.	Implement convolution operations and verify system responses.
4.	Demonstrate sampling theorem and analyze aliasing effects.
5.	Analyze signals using Fourier, Laplace, and Z-transforms.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Generate and perform operations on continuous-time and discrete-time signals using simulation tools.
CO2	Analyze properties of systems and implement convolution for LTI systems.
CO3	Apply sampling theorem and Fourier transform for frequency domain analysis.
CO4	Analyze signals and systems using Laplace and Z-transform techniques.

CO-PO & PSO Mapping:													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1	1	3	–	–	–	1	1	1	–	–	2
CO2	3	3	2	2	3	–	–	–	1	1	1	–	–	2
CO3	3	3	2	2	3	–	–	–	1	1	2	–	–	2
CO4	3	3	2	2	3	–	–	–	1	1	2	–	–	2

Course Content		
Experiment No.	**Experiment Title and Contents**	**Hrs**
1	Generation and Representation of Standard Continuous-Time and Discrete-Time Signals	2
2	Implementation of Operations on Signals	2
3	Classification and Verification of System Properties	2
4	Determination of Impulse and Step Response of LTI Systems	2
5	Computation of Convolution Integral for Continuous-Time Signals	2
6	Computation of Convolution Sum for Discrete-Time Signals	2
7	Verification of Sampling Theorem	2
8	Study of Aliasing Effect Due to Under Sampling	2
9	Computation of Fourier Series for Periodic Signals	2
10	Evaluation of Fourier Transform of Continuous-Time Signals	2
11	Analysis of Signals and Systems using Laplace Transform and Z-Transform	2
12	Design your own experiment to analyze any real-time signal using the concept/tools studied in the subject	2

Note: *Minimum 10 experiments to be performed.

Course Name: Microcontroller Lab	**L**	**T**	**P**	**Credits**
Course Code: 25ET411	–	--	2	1
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	25	--	25	50

Pre-Requisite: Digital Electronics

Course Objective: The course aims to:	
1.	Familiarize students with 8085 microprocessor and 8051 microcontroller architecture, instruction set, and programming model.
2.	Develop skills to write, assemble, simulate, and execute assembly/C programs for 8051 microcontroller.
3.	Provide hands-on experience in timers, counters, interrupts, and serial communication of 8051.
4.	Enable students to interface external devices such as LEDs, switches, displays, motors, ADC/DAC with 8051 microcontroller.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Explain the architecture, pin functions, instruction set, and timing concepts of 8085 microprocessor and 8051 microcontroller.
CO2	Develop and execute assembly and Embedded C programs using various addressing modes and instructions of 8051.
CO3	Analyze and implement timers, counters, interrupts, and serial communication programs for 8051-based systems.
CO4	Design and demonstrate interfacing applications of 8051 with I/O devices, displays, converters, and motors.

CO-PO & PSO Mapping:														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	–	–	1	–	–	–	–	–	–	–	2	–
CO2	3	3	2	1	2	–	–	–	1	–	–	–	2	–
CO3	3	3	2	2	2	–	–	–	1	–	–	–	2	–
CO4	3	2	3	2	2	1	–	–	2	1	1	–	2	–

Course Content		
Experiment No.	**Experiment Title and Contents**	**Hrs**
1	Assembly language program using data transfer, arithmetic and logical instructions (8051)	2
2	Program using branching and bit manipulation instructions of 8051	2
3	Program for delay generation using Timer 0 / Timer 1	2
4	Program using counter mode of timers in 8051	2
5	Interrupt programming using external or timer interrupt	2
6	Interfacing LEDs and Switches with 8051	2
7	Interfacing 7-Segment Display with 8051	2
8	Interfacing 16×2 LCD with 8051	2
9	Interfacing ADC/DAC or Keypad with 8051	2
10	Serial communication between PC and 8051 using RS-232 / UART	2
11	Interfacing DC motor / Stepper motor with 8051	2

Note: *Minimum 10 experiments to be performed.

MULTIDISCIPLINARY MINOR (MDM)

Name of the MDM Basket- INTERNET OF THINGS(IoT)

Course Name: **Fundamentals of Internet of Things** Course Code: 25ET304A	**L**	**T**	**P**	**Credits**
	3	--	--	3
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	10	30	10	50

Pre-Requisite: Basic Programming Knowledge, Basic Electronics, Computer Networks Basics

Course Objective: The course aims to:	
1	3. Develop Python programming skills for IoT applications.
2	4. Understand IoT architecture and system components.
3	5. Apply communication protocols in IoT systems.
4	6. Design basic IoT-based applications.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Apply Python programming concepts for IoT applications.
CO2	Develop programs for IoT data acquisition and processing.
CO3	Explain IoT architecture and communication models.
CO4	Design simple IoT-based systems.

CO-PO & PSO Mapping:														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	1	3	-	-	-	1	-	-	-	1	-
CO2	3	3	2	2	3	-	-	-	1	1	-	-	3	-
CO3	3	2	1	-	2	1	1	-	-	1	-	-	-	2
CO4	3	3	3	2	3	1	1	1	2	1	1	-	2	-

Course Content		
Unit No.	**Contents**	**Hrs**
1	**Python Programming Fundamentals** Introduction to Python, Variables, Data Types, Operators Conditional Statements and Loops, Functions and Modules, Lists, Tuples, Dictionaries String Handling, File Handling	**7**
2	**Advanced Python Concept** Object-Oriented Programming, Exception Handling, Working with Libraries, NumPy and Pandas Basics, Data Visualization using Matplotlib	**7**
3	**Introduction to IoT** Serial Communication using Python, Socket Programming Basics, MQTT using Python	**6**
4	**Introduction to IoT Concepts** Definition and Characteristics of IoT, IoT Architecture (3-layer & 5-layer models), IoT Functional Blocks, IoT Communication Models, IoT vs M2M, IoT Design Methodology.	**8**
5	**IoT Hardware Platforms** Embedded Systems Overview, Arduino and Raspberry Pi Overview, Sensors and Actuators, Introduction to IoT Gateways	**7**
6	**IoT Applications and Security** 2. IoT Application Domains, Smart Home Systems, Smart Agriculture, Smart Healthcare, Security and Privacy Issues in IoT	**7**

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Text Books:

1. Misra, Sudip., Mukherjee, Anandarup., Roy, Arijit- Introduction to IoT. India: Cambridge University Press,.
2. Mark Lutz - Learning Python, O'Reilly.
3. Wes McKinney- Python for Data Analysis, O'Reilly.

Reference Books:

1. Pethuru Raj, Anupama C. Raman - The Internet of Things Enabling Technologies, Platforms, and Use Cases, Taylor and Francis group.
2. Raj Kamal - Internet of Things: Architecture and Design, McGraw Hill.

MOOC/NPTEL Platform:

1. https://nptel.ac.in/courses/117/102/117102060/

Course Name: **Technologies Enabling Internet of Things** Course Code: 25ET404A	**L**	**T**	**P**	**Credits**
	3	--	--	3
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	10	30	10	50

Pre-Requisite: Basic Programming Knowledge, Basic Electronics, Computer Networks Basics

Course Objective: The course aims to:	
1	7. Understand communication technologies used in IoT.
2	8. Learn networking protocols and standards for IoT systems.
3	9. Study cloud, data analytics, and security technologies for IoT.
4	10. Analyze emerging IoT technologies and trends.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Explain various wireless communication technologies used in IoT systems.
CO2	Analyze IoT networking protocols and their role in device-to-device and cloud communication
CO3	Illustrate cloud-computing models and edge/fog paradigms for IoT applications.
CO4	Apply data analytics and basic AI techniques for IoT data processing and prediction.
CO5	Evaluate security requirements and emerging technologies in IoT ecosystems

	CO-PO & PSO Mapping:													
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	-	-	-	-	-	-	-	1	-
CO2	3	3	2	-	2	-	-	-	-	-	-	-	3	-
CO3	2	3	3	2	2	-	-	-	-	-	-	-	-	2
CO4	2	3	3	3	2	-	-	-	-	-	-	-	2	-
CO5	2	3	2	1	2	2	1	1	-	-	-	-		

Course Content		
Unit No.	**Contents**	**Hrs**
1	**Wireless Communication Technologies** Wi-Fi, Bluetooth & BLE, ZigBee, LoRaWAN, Cellular IoT (NB-IoT, LTE-M), RFID and NFC	**7**
2	**IoT Networking Protocols** TCP/IP Stack for IoT, IPv6 and 6LoWPAN, MQTT, CoAP, HTTP/REST APIs, WebSockets	**7**
3	**Cloud Computing for IoT** Cloud Architecture, IaaS, PaaS, SaaS, IoT Cloud Platforms, Edge Computing and Fog Computing, Data Storage and Management	**7**
4	**Data Analytics for IoT** IoT Data Lifecycle, Big Data Concepts, Real-Time Data Processing, Predictive Analytics	**7**
5	**AI and Intelligent IoT Systems** Introduction to Machine Learning for IoT, AI-based IoT Applications, Case Studies in Smart Systems	**7**
6	**IoT Security and Emerging Technologies** Security Requirements in IoT, Cryptography Basics, Authentication & Access Control, Blockchain for IoT, 5G and IoT, Industry 4.0 and Smart Cities	**7**

Text Books:

1. Pethuru Raj and Anupama C. Raman- The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press.
2. Olivier Hersent, David Boswarthick, and Omar Elloumi, -The Internet of Things: Key Applications and Protocols, WileyPublications.
3. Kazem Sohraby, Daniel Minoli and TaiebZnati, - Wireless Sensor Networks Technology, Protocols, and Applications—, John Wiley & Sons.

Reference Books:

1. Hakima Chaouchi, - The Internet of Things Connecting Objects to the Web, ISBN : 978-1- 84821-140-7, Wiley Publications.
2. Holger Karl and Andreas Willig, -Protocols and Architectures for Wireless Sensor Networksǁ, John Wiley & Sons, Ltd.

MOOC/NPTEL Platform:

1. https://onlinecourses.nptel.ac.in/noc22_cs53/preview
2. https://www.udemy.com/course/internet-of-things-iot-fundamental-course-iot-101-level/?couponCode=IND21PM

Name of the MDM Basket- Embedded Systems

Course Name: **Digital Design**	**L**	**T**	**P**	**Credits**
Course Code: 25ET304B	3	--	--	3
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	10	30	10	50

Pre-Requisite: Basic knowledge of number systems, Binary Arithmetic, Boolean Algebra, Basic Electronics.

Course Objective: The course aims to:	
1	An understanding of logic design principles for simplifying and implementing digital circuits using universal gates and minimization techniques.
2	Knowledge of analysis and design methods for combinational logic circuits including arithmetic units, encoders, decoders, multiplexers, and display interfaces.
3	Understanding of the operation and design of sequential logic circuits including flip-flops, registers, and counters.
4	Study the characteristics, operation, and interfacing of different digital logic families such as TTL and CMOS.
5	Design and implement finite state machines and understand programmable logic devices, semiconductor memories, and basic VHDL concepts.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Design Boolean functions using Reduction Techniques as well as using universal gates.
CO2	Design combinational and sequential digital logic circuits.
CO3	Describe the classification, characteristics, and operation of digital logic families
CO4	Implement digital applications with appropriate state machines, PLA, PAL or PLDs

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CO-PO & PSO Mapping:														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	–	–	–	–	–	–	1	3	–
CO2	3	3	3	2	2	–	–	–	–	–	–	2	3	–
CO3	2	2	2	1	2	–	–	–	–	–	–	2	2	–
CO4	3	3	2	3	3	–	–	–	–	–	1	2	3	–

Course Content		
Unit No.	**Unit Title and Content**	**Hrs**
1	**Logic Design and Simplification** Universal Gates, Simplification of Logical Functions using Karnaugh Map, Quine-McCluskey (QM) Method, Circuit Applications using Gates.	**6**
2	**Combinational Logic Design** Introduction to Combinational Circuits, Adder, Subtractor, BCD arithmetic, Arithmetic Logic Unit, Digital Comparators, Parity Generators/Checkers, Encoders, Decoders, BCD to 7-Segment Display Decode, Multiplexers, Demultiplexers.	**8**
3	**Sequential Logic Design** 1 Bit Memory Cell, Flip-flops - SR, JK, Master-Slave JK, D, T type, Conversion of flip-flops, Shift Registers, Bidirectional Shift Register, Universal Shift Register, Asynchronous and Synchronous Counters.	**8**
4	**Digital Logic Families** Classification of Logic Families, Characteristics of Digital ICs, TTL Logic Family, Operation of TTL NAND Gate, Active Pull-up, Open Collector Output, CMOS Logic Family - CMOS Inverter, NAND, NOR Gates. Interfacing CMOS and TTL.	**6**
5	**State Machines** State Diagram, State Table, State Reduction, State Assignment, Mealy and Moore Machines, Finite State Machine Implementation, Sequence Detector.	**6**
6	**Programmable Logic Devices and Semiconductor Memories** Programmable Logic Devices: PROM, PAL, PLA, Introduction to FPGA and CPLD, Semiconductor Memories: Introduction, Memory Organization and Operation, Expanding Memory Size, Classification and Characteristics of Memories, Introduction to VHDL Programming.	**8**

Text Books: 1. R.P. Jain - Modern Digital Electronics, McGraw-Hill Education. 2. M. Morris Mano - Digital Design, Pearson Education. 3. A. Anand Kumar - Fundamentals of Digital Circuits, PHI Learning Pvt. Ltd.
Reference Books: 1. Thomas L. Floyd - Digital Fundamentals, Pearson Education. 2. Donald D. Givone - Digital Principles and Design, McGraw-Hill Education. 3. John F. Wakerly - Digital Design: Principles and Practices, Pearson Education
MOOC/NPTEL Platform: 1. "Digital Electronic Circuits" by Prof. Goutam Saha (IIT Kharagpur) https://onlinecourses.nptel.ac.in/noc20_ee32/preview 2. "Digital Circuits" by Prof. Santanu Chattopadhyay (IIT Kharagpur) https://onlinecourses.nptel.ac.in/noc21_ee75/preview

Course Name: Microcontroller & Interfacing Techniques	**L**	**T**	**P**	**Credits**
Course Code: 25ET404B	3	--	--	3
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	10	30	10	50

Pre-Requisite: Digital Electronics

Course Objective: The course aims to:	
1	Understand the fundamentals of microprocessors and microcontrollers with emphasis on 8085 and 8051 architectures.
2	Analyze instruction sets, addressing modes, timing diagrams, and interrupt mechanisms of 8085 and 8051
3	Develop assembly language programs and embedded C programs for 8051-based applications.
4	Design and implement basic interfacing circuits using 8051 with peripherals such as displays, sensors, motors, and serial communication modules.

Course Outcomes: At the end of the course, students will be able to:

CO	**Course Outcomes**
CO1	Explain the architecture, pin configuration, instruction cycles, and interrupt structure of the 8085 microprocessor.
CO2	Describe the architecture, memory organization, instruction set, and interrupt system of the 8051 microcontroller.
CO3	Write and debug assembly language and Embedded C programs for data transfer, arithmetic, timing, and serial communication.
CO4	Interface 8051 with external devices such as LEDs, LCDs, keypads, ADC/DAC, and motors for real-time embedded applications.

CO-PO & PSO Mapping:														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1	-	-	-	-	-	-	-	-	-	2	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	2	-
CO3	2	3	3	-	-	-	-	-	-	-	-	-	2	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-	2	-

Course Content		
Unit No.	**Contents**	**Hrs**
1	**Fundamentals of Microprocessor** 8085 architecture, programming model: Addressing modes, Instruction set, Assembly language programming, pin functions, Timing diagram and instruction cycles, State transition diagram, Single machine cycle execution, stack and subroutines, Interrupt structure and classification.	7
2	**8051 Microcontroller** Microprocessor Vs Microcontroller, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.	7
3	**8051 Instruction Set** 8051 Instruction Set: Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions	7
4	**Timers, Counters and Interrupts** Timers and Counters in 8051, Timer modes and configuration, Interrupts in 8051, Types of interrupts, Interrupt vector table, Enabling/disabling interrupts	7

5	**Interfacing with 8051** Interfacing Basics: I/O ports and data transfer, Interfacing with LEDs, Switches, 7-Segment Displays, Interfacing with LCD (16x2), Interfacing with Keypad, Interfacing with ADC and DAC, Stepper Motor and DC Motor control	7
6	**Serial Communication and Applications** Basics of Serial Communication, RS232 Protocol, 8051 Serial Communication: SBUF, SCON Registers, Modes of serial communication, Programming for data transmission and reception, Introduction to Embedded C for 8051	7

Text Books:

1. Muhammad Ali Mazidi et al-The 8051 Microcontroller and Embedded Systems: Using Assembly and C
2. Kenneth J. Ayala -The 8051 Microcontroller: Architecture, Programming, and Applications
3. Subrata Ghoshal -8051 Microcontroller–Internals, Instructions, Programming & Interfacing

Reference Books:

1. Ajay V. Deshmukh -Microcontrollers: Theory and Applications, Tata McGraw-Hill
2. K.V.K.K. Prasad -Embedded Systems with 8051 Microcontroller, Dreamtech Press .
3. -Myke Predko -Programming and Customizing the 8051 Microcontroller, McGraw-Hill Education

MOOC/NPTEL Platform:

1. https://onlinecourses.nptel.ac.in/noc26_ee58/preview

Open Elective-I

Course Name: **Sensor Technology**	**L**	**T**	**P**	**Credits**
Course Code: **25ET405D**	2	--	--	2
Evaluation Scheme:	**ISE-I**	**MSE**	**ISE-II**	**ESE**
Marks:	10	30	10	50

Pre-Requisite: Basic Electronics, Basic Physics

Course Objective: The course aims to:	
1	To introduce the fundamental concepts, classification, and working principles of sensors and transducers, including mechanical and physical sensors.
2	To explain thermal, optical, magnetic, chemical, and biosensing techniques and their operating principles.
3	To provide knowledge of signal conditioning, sensor characteristics, and interfacing techniques used in measurement systems.
4	To familiarize students with smart sensors and their applications in modern engineering systems.

Course Outcomes: At the end of the course, students will be able to:	
CO	**Course Outcomes**
CO1	Explain the fundamentals, classification, characteristics, and working principles of sensors, including mechanical and physical sensors.
CO2	Interpret and analyze the operating principles of thermal, optical, and magnetic sensors for measurement applications.
CO3	Apply chemical and biosensors along with signal conditioning and sensor interfacing techniques in environmental and biomedical systems.
CO4	Evaluate smart sensors and their applications in modern engineering systems.

CO-PO & PSO Mapping:														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	–	–	–	–	–	–	–	–	1	1	–	–
CO2	2	3	–	2	–	–	–	–	–	–	–	–	1	–
CO3	2	–	2	–	3	2	–	–	–	–	–	1	2	–
CO4	2	2	2	–	3	2	1	–	–	–	3	2	2	2

Course Content		
Unit No.	Contents	Hrs
1	**Introduction to Sensors and Transducers** Definition of Sensors and Transducers, Classification of Sensors, Active and Passive Sensors, Static and Dynamic Characteristics, Performance Parameters Such as Sensitivity, Accuracy, Resolution and Applications of Sensors	6
2	**Thermal, Optical and Magnetic Sensors** Temperature Sensors (RTD, Thermistor, Thermocouple), Optical Sensors (LDR, Photodiode, Phototransistor), Magnetic Sensors (Hall-Effect Sensor), Applications in Automotive and Energy Systems.	6
3	**Chemical and Biosensors** Chemical Sensors (Ph Sensor, Gas Sensors), Principles of Electrochemical Sensors, Biosensors (Glucose Sensor), Environmental and Biomedical Applications, Introduction to Wearable Sensors.	5
4	**Signal Conditioning and Sensor Interfacing** Need for Signal Conditioning, Amplifiers and Filters, ADC Basics, Sensor Interfacing Concepts, Noise, Grounding and Shielding.	6
5	**Smart Sensors and Applications** Smart and Digital Sensors, Sensor Networks, IOT-Based Sensor Systems, Applications in Industry, Healthcare, Robotics and Automation, Brief Case Studies.	6
6	**Thermal, Optical and Magnetic Sensors** Temperature Sensors (RTD, Thermistor, Thermocouple), Optical Sensors (LDR, Photodiode, Phototransistor), Magnetic Sensors (Hall-Effect Sensor), Applications in Automotive and Energy Systems.	6

Text books: 1. D. Patranabis- Sensors and Transducers, 2nd Edition, PHI Learning Pvt. Ltd. 2. R.K. Rajput- Sensors and Transducers, S. Chand Publications. 3. A.K. Sawhney- Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Co. 5.Kalsi H.S-Electronic Instrumentation, Tata McGraw Hill Publishing Company
Reference books: 1. Jacob Fraden- Handbook of Modern Sensors: Physics, Designs, and Applications, Springer. 2. John Turner and Martyn Hill- Instrumentation for Engineers and Scientists, Oxford Science Publications. 3. Ristic L.- Sensor Technology and Devices, Artech House.
NPTEL Video Lectures: 1. NPTEL – Sensors and Actuators (Prof. S. Deb, IIT Kharagpur): https://nptel.ac.in/courses/108105153