SRI KRISHNA INSTITUTIONS COMBATORE Sri Krishna College of Engineering and Technology

An Autonomous Institution, Affiliated to Anna University

Coimbatore - 641 008





CURRICULUM AND SYLLABI B.E. ELECTRICAL AND ELECTRONICS ENGINEERING Regulation 2022

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To provide the students with high quality technical education in the field of Electrical and Electronics Engineering enabling them to become competent and responsible engineers with employability and entrepreneurial skills.

MISSION

M1: Equip the students with adequate knowledge in the field of Electrical and Electronics Engineering and professional skills necessary to face the future challenges with confidence and courage.

M2: Engineer them to engage in research activities leading to innovative applications of technology.

M3: Enable them to become responsible citizens of the country with a willingness to serve the society.

Programme Outcomes (POs)

At the time of their graduation students of Electrical and Electronics Engineering Programme should be in possession of the following Programme Outcomes

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineeringfundamentals, and an engineering specialization to the solution of complex electrical engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze electrical engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex electrical engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex electrical engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member orleader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give andreceive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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

Program Educational Objectives (PEOs)

PEO1: Graduates will have successful career in industry that meets the needs of Indian and multinational companies.

PEO2: Graduates will have the ability to synthesize data and develop technical concepts for application to product design and to solve contemporary problems

PEO3: Graduates will work as part of teams on multidisciplinary projects with good technical, communication and interpersonal skills.

PEO4: Graduates will fulfill the roles and responsibilities of professional electrical engineers in their chosen career with an attitude to serve the industry and society.

PEO5: Graduates will undertake research, pursuing higher studies, thereby adopting extended learning, keeping pace with the technological developments and codes of professional practice.

Programme		Programme Outcomes												
Educational Objectives	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
PEO 1	3	3	3	2	3	2	3	2	2	3	2	3		
PEO 2	3	3	3	2	3	2	3	2	2	3	3	3		
PEO 3	2	2	2	3	2	2	3	2	2	3	2	3		
PEO 4	3	3	3	2	3	2	2	2	2	3	3	2		
PEO 5	2	2	2	1	1	3	2	3	3	2	2	2		

Mapping of PO's to PEO's

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed
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Program Specific Outcome (PSOs)

After the successful completion of the B.E. Electrical and Electronics Engineering programme, the graduates will be able to:

PSO1: Analyze basic scientific concepts and provide solutions to Electrical and Electronics Engineering problems with a specific focus on emerging energy challenges.

PSO2: Use relevant software apply current techniques for data processing problems in the field of modern electronic systems for sustainable development.

PSO3: Develop products/software to cater to the societal & Industrial needs and adapt ethical values so as to become successful electrical engineering professionals.

Year	Sem	Course Code / Course				Ρ	rogr	am (Outo	ome	es				Pr Sp Out	ogra pecif tcon	im fic nes
		Title	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
		22SB102 – Biology for Engineers	3	1	1	1	1	1	1	0	1	0	0	2	2	1	1
	Sem Course Code / Course Title Program Outcomes 1 2 3 4 5 6 7 8 9 10 11 12 22SB102 - Biology for Engineers 3 1 1 1 1 1 1 0 1 0 0 2 22MA104 - Calculus and Transforms 1 3 3 3 3 2 0 0 0 2 0 0 0 1 0 3 1 1 1 1 0	0	3	1	0												
	_	22PH102 - Physics for Electrical Science	2	2	2	2	ogram ogram 7 8 9 10 11 12 1 1 1 1 0 1 0 10 11 12 1 1 1 1 0 1 0 0 2 2 2 0 0 0 2 0 0 3 2 0 0 0 2 0 0 1 2 0 0 0 1 0 3 1 1 2 0 0 0 1 0 3 1	1	0								
	lester	22EN101 - Technical Communication Skills	0	0	0	0	0	0	0	1	0	3	1	1	0	0	0
	Sen	22IT101 - Application Development Practices	3	2	3	3	3	2	0	0	0	0	0	2	3	3	2
		22CS101 - Problem Solving using C++	3	3	3	2	2	0	0	0	2	1	0	2	3	2	1
l Year		22MC101 - Mandatory Course I: Induction Programme	0	0	0	0	0	3	3	3	3	3	3	3	0	0	1
		22GE201- Universal Human Values	0	0	0	0	0	3	1	1	1	0	1	0	0	1	1
ΙΥе		22EE201 - Basics of Electrical Circuits	Title 1 2 3 4 5 6 7 8 9 10 11 12 1 B102 - Biology for ineers 3 1 1 1 1 1 0 1 0 0 2 2 IA104 - Calculus and asforms I 3 3 3 3 2 0 0 0 2 0 0 0 2 2 0	3	0	0											
		22TA101- Heritage of Tamils	0	0	0	0	Program outcomes Outcomes 4 5 6 7 8 9 10 11 12 1 2 3 1 1 1 1 0 0 2 0 0 2 2 1 1 3 2 0 0 0 2 0 0 3 1 0 2 2 0 0 0 2 0 0 3 1 0 2 2 0 0 0 2 0 0 1 10 3 1 1 0 2 2 0 0 0 2 1 0 2 3 3 2 1 3 1 1 1<										
	=	22CH101 - Engineering Chemistry	2	1	2	1	0	0	1	0	0	0	0	0	2	0	0
	ester	22IT201 - Database Management Systems	3	2	2	0	1	0	0	0	1	1	2	3	2	2	2
	Sem	22AD201 - Java Programming	3	2	2	0	1	0	0	1	2	1	0	2	0	1	3
		22EE202- Analog Electronics	3	2	2	2	2	0	0	0	0	0	0	2	3	3	0
		22EE203 - Basics of Electrical Circuits Laboratory	3	2	1	1	3	0	1	2	2	2	0	0	3	2	3
l Year		22MC102 - Mandatory Course II: Environmental Sciences	0	0	0	0	0	3	3	3	2	0	0	3	0	0	3

Year	Sem	Course Code / CourseTitle	e Program Outcomes											Progra Specifi Outcom			am fic nes
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
		22EE301 - Electrical Machines-I	3	3	3	2	0	1	1	0	0	0	0	2	0	2	0
And Control And Control Semester IV Semester IV		22EE302 -Digital Electronics	3	2	2	2	0	1	1	0	0	0	0	2	0	2	0
		22EE303 – Linear Integrated Circuits	Fode / CourseTitle I 2 3 4 5 6 1 2 3 3 3 2 0 1 2-Digital cs 3 2 2 2 0 1 3 3 2 2 2 0 1 3 2 2 2 0 1 3 2 2 2 0 1 3 2 2 2 0 0 0 4 Calculus and gramming 2 2 2 0 0 0 - Tamils and gy 0 0 0 0 0 0 0 - Electrical s- I Laboratory 3 3 2 2 3 0 - Electrical s- I Laboratory 3 3 2 2 0 0 0 - Electrical s- I Laboratory 3 2 2 1 2 0 - Electrical s- C	0	0	0	0	0	2	3	3	0					
	≡	22MA304 - Calculus and Transforms II	2	2	2	0	0	0	0	0	0	0	0	0	2	0	0
	lester	22CS301 - Advanced Java Programming	3	3	3	2	3	3 0 0 0 2 2 2				2	3	2	3		
	Sem	22TA201- Tamils and Technology	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1
		22CS201 - Data Structures and Algorithms	3	3	3	1	3	2	2	1	2	0	2	1	3	2	2
		22EE304 - Electrical Machines-I Laboratory	3	3	2	2	3	0	1	2	2	2	0	0	3	0	3
l Year		22EE305 – Linear and Digital Integrated circuits Laboratory	3	3	2	2	3	2	2	0	2	0	2	2	3	3	0
۲ ا		22EE401 - Electrical Machines-II	2	2	2	2	0	0	0	0	2	10 11 12 1 2 3 0 0 2 0 2 0 0 0 2 0 2 0 0 0 2 0 2 0 0 0 2 3 3 0 0 0 2 3 3 0 1 0 0 2 3 3 0 1 0 0 1 0 0 1 0 0 1 0 0 1 1 0 2 1 3 2 2 3 0 0 1 3 0 3 3 1 0 1 3 0 3 3 1 0 2 2 2 0 3 1 0 3 3 2 2 3 1					
		22EE402 - Electric Power Generation	3	2	2	1	2	0	0	0	0	0	0	2	2	2	0
		22EE403 - Control Systems	3	2	1	1	2	1	0	0	1	2	0	0	3	0	0
	N	22MA402 - Probability and Computational Methods	2	2	2	0	0	0	0	0	0	0	0	0	1	0	0
	nestei	22EE0XX - Open Elective-I	3	3	3	3	3	0	0	0	2	1	0	3	3	2	2
	Sen	22EE0XX - Open Elective-II	3	3	3	3	3	2	2	3	3	2	3	3	2	3	3
		22EE404 - Electrical Machines-II Laboratory	2	2	2	2	3	0	0	0	2	0	0	1	3	0	3
		22EE405 - Control Systems Laboratory	2	2	2	2	3	0	0	0	2	0	0	1	3	0	3
		22MC1XX - Mandatory Course III	0	0	0	0	0	3	3	3	2	0	0	3	0	0	3

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING REGULATION 2022 CHOICE BASED CREDIT SYSTEM I – VIII SEMESTER CURRICULUM AND SYLLABI

SEME	STER I						
S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Ext/Int	Cat.
1	22SB102	Biology for Engineers	3/0/0	3	3	60/40	BSC
2	22MA104	Calculus and Transforms I	3/1/0	4	4	60/40	BSC
3	22PH102	Physics for Electrical Science	3/0/2	5	4	50/50	BSC
4	22EN101	Technical Communication Skills	2/0/2	4	3	50/50	HSMC
5	22IT101	Application Development Practices	3/0/2	5	4	50/50	ESC
6	22CS101	Problem Solving using C++	3/0/2	5	4	50/50	ESC
7	22MC101	Mandatory Course I: Induction Programme	3 W	eeks	0	0/100	MC
		Total	17/1/10	27	22	700	

SEME	STER II						
S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Ext/Int	Cat.
1	22GE201	Universal Human Values	3/0/0	3	3	60/40	HSMC
2	22EE201	Basics of Electrical Circuits	2/1/0	3	3	60/40	BSC
3	22TA101	Heritage of Tamils	1/0/0	1	1	60/40	HSMC
4	22CH101	Engineering Chemistry	3/0/2	5	4	50/50	BSC
5	22IT201	Database Management Systems	3/0/2	5	4	50/50	ESC
6	22AD201	Java Programming	3/0/2	5	4	50/50	ESC
7	22EE202	Analog Electronics	3/0/2	5	4	50/50	PCC
8	22EE203	Basics of Electrical Circuits Laboratory	0/0/2	2	1	40/60	BSC
9	22MC102	Mandatory Course II: Environmental Sciences	1/0/0	1	0	0/100	MC
		Total	19/1/10	30	24	900	

SEME	STER III						
S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Ext/Int	Cat.
1	22EE301	Electrical Machines-I	3/0/0	3	3	60/40	PCC
2	22EE302	Digital Electronics	3/0/0	3	3	60/40	PCC
3	22EE303	Linear Integrated Circuits	3/0/0	3	3	60/40	PCC
4	22MA304	Calculus and Transforms II	3/1/0	4	4	60/40	BSC
5	22TA201	Tamils and Technology	1/0/0	1	1	60/40	HSMC
6	22CS201	Data Structures and Algorithms	1/0/4	5	3	50/50	ESC
7	22CS301	Advanced Java Programming	1/0/4	5	3	50/50	ESC
8	22EE304	Electrical Machines-I Laboratory	0/0/2	2	1	40/60	PCC
9	22EE305	Linear and Digital Integrated Circuits Laboratory	0/0/2	2	1	40/60	PCC
		Total	15/1/12	28	22	900	

SEME	STER IV						
S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Ext/Int	Cat.
1	22EE401	Electrical Machines-II	3/0/0	3	3	60/40	PCC
2	22EE402	Electric Power Generation	3/0/0	3	3	60/40	PCC
3	22EE403	Control Systems	3/1/0	4	4	60/40	PCC
4	22MA402	Probability and Computational Methods	3/1/0	4	4	60/40	BSC
5	22EE0XX	Open Elective-I	1/0/4 (or) 3/0/0	5 (or) 3	3	40/60 (or) 60/40	OEC
6	22EE0XX	Open Elective-II	0/0/6 (or) 3/0/0	6 (or) 3	3	40/60 (or) 60/40	OEC
7	22EE404	Electrical Machines-II Laboratory	0/0/2	2	1	40/60	PCC
8	22EE405	Control Systems Laboratory	0/0/2	2	1	40/60	PCC
9	22MC1XX	Mandatory Course III	1/0/0	1	0	0/100	MC
		Total	14/2/14 (or) 19/2/04	30 (or) 25	22	900	

SEMES	STER V						
S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Ext/Int	Cat.
1	22EE501	Transmission and Distribution	3/0/0	3	3	60/40	PCC
2	22EE502	Power Electronics	3/0/0	3	3	60/40	PCC
3	22EE503	Measuring Instruments and Smart Sensors	3/0/0	3	3	60/40	PCC
4	22EE0XX	Open Elective-III	0/0/6 (or) 3/0/0	6 (or) 3	3	40/60 (or) 60/40	OEC
5	22EE9XX	Professional Elective-I	3/0/0	3	3	60/40	PEC
6	22EE504	Virtual Instrumentation	3/0/2	5	4	50/50	PCC
7	22EE505	Power Electronics Laboratory	0/0/2	2	1	40/60	PCC
8	22MC1XX	Mandatory Course IV	1/0/0	1	0	0/100	MC
		Total	16/0/10 (or) 19/0/04	26 (or) 23	20	800	

SEME	STER VI						
S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Ext/Int	Cat.
1	22EE601	Power System Analysis	3/0/0	2	3	60/40	PCC
2	22EE9XX	Professional Elective-II	3/0/0	3	3	60/40	PEC
3	22EE9XX	Professional Elective-III	3/0/0	3	3	60/40	PEC
4	22EE0XX	Emerging Elective-I	3/0/0	3	3	60/40	EEC
5	22EC611	Principles of Digital Signal Processing	3/0/2	5	4	50/50	PCC
6	22EE602	Microcontrollers	3/0/2	5	4	50/50	PCC
7	20EE603	Power System Simulation Laboratory	0/0/2	2	1	40/60	PCC
8	22EE604	Mini Project- I	0/0/2	2	1	40/60	PROJ
9	22EES01	Employment Enhancement Skills		-	2	40/60	EES
		Total	18/0/08	26	24	900	

SEME	STER VII						
S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Ext/Int	Cat.
1	22EE701	Power System Protection and Switchgear	3/0/0	3	3	60/40	PCC
2	22MG701	Engineering Economics	3/0/0	3	3	60/40	HSMC
3	22EE9XX	Professional Elective-IV	3/0/0	3	3	60/40	PEC
4	22EE0XX	Professional Elective-V	3/0/0	3	3	60/40	PEC
5	22EE0XX	Professional Elective-VI	3/0/0	3	3	60/40	PEC
6	22EE9XX	Emerging Elective-II	3/0/0	3	3	60/40	EEC
7	22EE702	Digital Simulation of Electrical Systems Laboratory	0/0/2	3	1	40/60	PCC
		Total	18/0/2	21	19	700	

SEME													
S.No	Course Code	Course Title		L/T/P	Contact Hrs/Wk	С	Ext/Int	Cat.					
1	22EE801	Project		0/0/24	24	12	40/60	PROJ					
			Total	0/0/24	24	12	100						

SCHEME OF CREDIT DISTRIBUTION - SUMMARY

	Ctris and			Cred	its/S	Seme	ester				C			
5.NO	Stream	I	II	ш	IV	v	VI	VII	VIII	Credits	Theory	Theory Cum Lab	Lab	%
1.	Humanities and Social Sciences Including Management (HSMC)	3	4	1				3		11	4	1		6.66
2.	Basic Science Courses (BSC)	11	8	4	4					27	5	2	1	16.36
3.	Engineering Science Courses (ESC)	8	8	6						22	0	7		13.33
4.	Professional Core Courses (PCC)		4	11	12	14	12	4		57	13	2	9	34.54
5.	Professional Elective Courses (PEC)					3	6	9		18	6			10.90
6.	Open Elective Course (OEC) / Emerging Elective Course (EEC)				6	3	3	3		15		4	1	7.87
7.	Project Work (PROJ) / Employability Enhancement Skills (EES)						3		12	15			3	9.09
8.	Mandatory Courses (MC)	0	0		0	0				0	4			0
	Total	22	24	22	22	20	24	19	12	165	32	16	14	100

CURRICULUM STRUCTURE FOR UG DEGREE PROGRAMME
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S.No	Course Work – Subject Area	AICTE Suggested Breakdown of Credits	SKCET Credits						
1.	Humanities and Social Sciences (HS), including Management Courses	12*	11						
2.	Basic Sciences (BS) including Mathematics, Physics, Chemistry, Biology	26*	27						
3.	Engineering Sciences (ES), including Materials, Workshop, Drawing, Basics of Electrical/Electronics/Mechanical/Computer Engineering, Instrumentation	20*	22						
4.	Professional Subjects - Core (PC), relevant to the chosen specialization/branch	53*	57						
5.	Professional Subjects - Electives (PE), relevant to the chosen specialization/ branch;	18*	18						
6.	Open Subjects - Electives (OE), from other technical and/or emerging subject areas	18*	15						
7.	Project Work, Seminar and/or Internship in Industry or elsewhere	11*	13						
8.	Employability Enhancement Skills	-	2						
9.	Mandatory Courses (MC)	Non-credit	Non-credit						
	Total	158*	165*						
*Minor	Minor Variations is allowed as per need of the respective disciplines								

HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT (11 Credits)

S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Cat.
1.	22EN101	Technical Communication Skills	2/0/2	4	3	HSMC
2.	22GE201	Universal Human Values	3/0/0	3	3	HSMC
3.	22TA101	Heritage of Tamils	1/0/0	1	1	HSMC
4.	22TA201	Tamils and Technology	1/0/0	1	1	HSMC
5.	22MG701	Engineering Economics	3/0/0	3	3	HSMC

BASIC SCIENCE COURSES (27 Credits)

S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Cat.
1.	22MA104	Calculus and Transforms I	3/1/0	4	4	BSC
2.	22SB102	Biology for Engineers	3/0/0	3	3	BSC
3.	22PHXXX	Physics for Electrical Science	3/0/2	5	4	BSC
4.	22CHXXX	Engineering Chemistry	3/0/2	5	4	BSC
5.	22EE201	Basics of Electrical Circuits	2/1/0	3	3	BSC
6.	22MA304	Calculus and Transforms II	3/1/0	4	4	BSC
7.	22MA402	Probability and Computational Methods	3/1/0	4	4	BSC
8.	22EE203	Basics of Electrical Circuits Laboratory	0/0/2	2	1	BSC

ENGINEERING SCIENCE COURSES (22 Credits)

S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Cat.
1.	22IT101	Application Development Practices	3/0/2	5	4	ESC
2.	22CS101	Problem Solving using C++	3/0/2	5	4	ESC
3.	22IT201	Database Management Systems	3/0/2	5	4	ESC
4.	22AD201	Java Programming	3/0/2	5	4	ESC
5.	22CS201	Data Structures and Algorithms	1/0/4	5	3	ESC
6.	22CS301	Advanced Java Programming	1/0/4	5	3	ESC

PROFESSIONAL CORE COURSES (57 Credits)

S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Cat.
1.	22EE202	Analog Electronics	3/0/2	5	4	PCC
2.	22EE301	Electrical Machines-I	3/0/0	3	3	PCC
3.	22EE302	Digital Electronics	3/0/0	3	3	PCC
4.	22EE303	Linear Integrated Circuits	3/0/0	3	3	PCC
5.	22EE304	Electrical Machines- I Laboratory	0/0/2	2	1	PCC
6.	22EE305	Linear and Digital Integrated Circuits Laboratory	0/0/2	2	1	PCC
7.	22EE401	Electrical Machines-II	3/0/0	3	3	PCC
8.	22EE402	Electric Power Generation	3/0/0	3	3	PCC
9.	22EE403	Control System	3/1/0	4	4	PCC
10.	22EE404	Electrical Machines-II Laboratory	0/0/2	2	1	PCC
11.	22EE405	Control System Laboratory	0/0/2	2	1	PCC
12.	22EE501	Transmission and Distribution	3/0/0	3	3	PCC
13.	22EE502	Power Electronics	3/0/0	3	3	PCC
14.	22EE503	Measuring Instruments and Smart sensors	3/0/0	3	3	PCC
15.	22EE504	Virtual Instrumentation	3/0/2	5	4	PCC
16.	22EE505	Power Electronics Laboratory	0/0/2	2	1	PCC
17.	22EE601	Power System Analysis	3/0/0	3	3	PCC
18.	22EE602	Microcontrollers	3/0/2	5	4	PCC
19.	22EC611	Principles of Digital Signal Processing	3/0/2	5	4	PCC
20.	22EE603	Power System Simulation Laboratory	0/0/2	2	1	PCC
21.	22EE701	Power System Protection and Switchgear	3/0/0	3	3	PCC
22.	22EE702	Digital Simulation for Electrical Systems Laboratory	0/0/2	2	1	PCC

PROFESSIONAL ELECTIVE COURSES (18 Credits)

S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Cat.				
	Elective Stream I – Power Engineering									
1.	22EE901	Electrical Power Fundamentals	3/0/0	3	3	PEC				
2.	22EE902	Power System Restructuring	3/0/0	3	3	PEC				
3.	22EE903	Power System Management and Monitoring	3/0/0	3	3	PEC				
4.	22EE904	Power System Operation and Economics	3/0/0	3	3	PEC				
5.	22EE905	Power Quality	3/0/0	3	3	PEC				
6.	22EE906	High Voltage Engineering	3/0/0	3	3	PEC				
7.	22EE907	Power System Dynamics	3/0/0	3	3	PEC				
8.	22EE908	Distribution Automation Systems	3/0/0	3	3	PEC				
9.	22EE909	Power System Automation	3/0/0	3	3	PEC				
10.	22EE910	Residential and Commercial Electrical Systems	3/0/0	3	3	PEC				
		Elective Stream II – Applied Electron	ics							
1.	22EE911	Process Control and Instrumentation	3/0/0	4	3	PEC				
2.	22EE912	Avionics Technology	3/0/0	3	3	PEC				
3.	22EE913	Nano Technology	3/0/0	3	3	PEC				
4.	22EE914	Principles of Communication Engineering	3/0/0	3	3	PEC				
5.	22EE915	Green Electronics	3/0/0	3	3	PEC				
6.	22EE916	Biomedical Electronic Systems	3/0/0	3	3	PEC				
7.	22EE917	Integrated Optoelectronics Devices and Circuits	3/0/0	3	3	PEC				
8.	22EE918	Optical Sensor Technology	3/0/0	3	3	PEC				
9.	22EE919	Flexible and Stretchable Electronics	3/0/0	3	3	PEC				
10.	22EE920	Photonics Engineering Design	3/0/0	3	3	PEC				
		Elective Stream III – Embedded Syste	ems							
1.	22EE921	VLSI Design	3/0/0	3	3	PEC				
2.	22EE922	Embedded System Design using ARM	3/0/0	3	3	PEC				
3.	22EE923	Machine Learning for Embedded Applications	3/0/0	3	3	PEC				
4.	22EE924	Embedded System Programming	3/0/0	3	3	PEC				
5.	22EE925	Embedded system design process	3/0/0	3	3	PEC				
6.	22EE926	Embedded Systems for Automotive Applications	3/0/0	3	3	PEC				
7.	22EE927	Embedded Systems in Smart Grid	3/0/0	3	3	PEC				
8.	22EE928	FPGA Based System Design	3/0/0	3	3	PEC				
9.	22EE929	Embedded Control for Electrical Drives	3/0/0	3	3	PEC				
10.	22EE930	Intelligent Control and Automation	3/0/0	3	3	PEC				

S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Cat.			
		Elective Stream IV – Converter and I	Drives						
1.	22EE931	Design of Electrical Machines	3/0/0	3	3	PEC			
2.	22EE932	Special Electrical Machines	3/0/0	3	3	PEC			
3.	22EE933	PLC, SCADA and Automation	3/0/0	3	3	PEC			
4.	22EE934	Servo Drives in Robotics	3/0/0	3	3	PEC			
5.	22EE935	Modern Power Converters	3/0/0	3	3	PEC			
6.	22EE936	Industrial Management in Power Electronics	3/0/0	3	3	PEC			
7.	22EE937	Electric Traction and Control	3/0/0	3	3	PEC			
8.	22EE938	Intelligent Controllers for Drone Technology	3/0/0	3	3	PEC			
9.	22EE939	Applications of Power Electronics in Power Systems	3/0/0	3	3	PEC			
10.	22EE940	Evolutionary Algorithms for Optimal Control Techniques	3/0/0	3	3	PEC			
	Elective Stream V – Renewable Energy Systems								
1.	22EE941	Optimal Energy Controllers	3/0/0	3	3	PEC			
2.	22EE942	Renewable Energy and Storage System	3/0/0	3	3	PEC			
3.	22EE943	Power Electronics for Renewable Energy System	3/0/0	3	3	PEC			
4.	22EE944	Sustainable Green Energy System	3/0/0	3	3	PEC			
5.	22EE945	Design and modeling of RES Components	3/0/0	3	3	PEC			
6.	22EE946	Hybrid Smart grid Technology	3/0/0	3	3	PEC			
7.	22EE947	Fuel Cell and Biogas System	3/0/0	3	3	PEC			
8.	22EE948	Building Integrated PV System	3/0/0	3	3	PEC			
9.	22EE949	Industrial Electrification using RES	3/0/0	3	3	PEC			
10.	22EE950	Hybrid Wind and Solar Electric Systems	3/0/0	3	3	PEC			
		Elective Stream VI – E-Mobility							
1.	22EE951	Electric Vehicle Technology	3/0/0	3	3	PEC			
2.	22EE952	Vehicle Design and Fabrication	3/0/0	3	3	PEC			
3.	22EE953	Vehicle Charging Infrastructure	3/0/0	3	3	PEC			
4.	22EE954	Energy Management and Efficiency	3/0/0	3	3	PEC			
5.	22EE955	Autonomous Electric Vehicle	3/0/0	3	3	PEC			
6.	22EE956	Electric Motor Design and Optimization	3/0/0	3	3	PEC			
7.	22EE957	Vehicle-to-Grid Integration	3/0/0	3	3	PEC			
8.	22EE958	Renewable Energy Integration with EV Charging	3/0/0	3	3	PEC			
9.	22EE959	Plug-in Hybrid Electric Vehicles (PHEV)	3/0/0	3	3	PEC			
10.	22EE960	Electric Vehicle Cyber security	3/0/0	3	3	PEC			

OPEN ELECTIVE COURSES (6 Credits)

S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Cat.			
Stream - I									
1.	22EE001	Residential Electrical Systems	3/0/0	3	3	OEC			
2.	22EE002	Autonomous Vehicles	3/0/0	3	3	OEC			
3.	22EE003	Special Purpose Machines	3/0/0	3	3	OEC			
	Stream - II								
4.	22EE004	Renewable Energy Sources	3/0/0	3	3	OEC			
5.	22EE005	Servo and Robot Drives	3/0/0	3	3	OEC			
6.	22EE006	Industrial Safety Management	3/0/0	3	3	OEC			

EMERGING ELECTIVE COURSES (6 Credits)

S.No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	С	Cat.				
	Stream - I									
1.	22EE007	Machine Learning Applications in Energy Systems	3/0/0	3	3	EEC				
2.	22EE008	Big Data Analytics for Smart Grid	3/0/0	3	3	EEC				
3.	22EE009	High Voltage Insulation Technology	3/0/0	3	3	EEC				
		Stream - II								
4.	22EE010	Internet of Things for Electrical Systems	3/0/0	3	3	EEC				
5.	22EE011	Rapid System Prototyping with FPGAs	3/0/0	3	3	EEC				
6.	22EE012	Grid Integration of EV	3/0/0	3	3	EEC				

MANDATORY COURSES (0 credits)

S.No	CourseCode	Course Title	L/T/P	Contact Hrs/Wk	С	Cat.
1.	22MC101	Induction Program	3 v	0	MC	
2.	22MC102	Environmental Sciences	2/0/0	2	0	MC
3.	22MC103	Soft Skills	2/0/0	2	0	MC
4.	22MC104	Management Organizational Behavior	2/0/0	2	0	MC
5.	22MC105	General Aptitude	2/0/0	2	0	MC
6.	22MC106	Life Skills and Ethics	2/0/0	2	0	MC
7.	22MC107	Stress Management	2/0/0	2	0	MC
8.	22MC108	Constitution of India	2/0/0	2	0	MC
9.	22MC109	Essence of Indian Traditional Knowledge	2/0/0	2	0	MC
10.	22MC110	Spoken English	2/0/0	2	0	MC

VALUE ADDED COURSES (4 Credits)

S.No	Course Code	Course Title	Credits
1.	22VA301	Solar Energy Technology	2
2.	22VA302	Industry 4.0 using Industrial Internet of Things	2
3.	22VA303	Microgrid Technology	2
4.	22VA304	FPGA-based Switched Mode Power Converters	2
5.	22VA305	Phase-Locked Loop Circuit Design	2
6.	22VA306	Substation Designing	2
7.	22VA307	Contemporary Digital Techniques	2
8.	22VA308	Recent Power Electronics and Control	2
9.	22VA309	Neuro-Instrumentation	2

EMPLOYABILITY ENHANCEMENT SKILLS (2 Credits)

S.No	Name of the Course	L/T/P	Contact Hrs/Wk	С	Cat.
1.	Employability Enhancement Skills (Internship / Journal Publication)	-	4 Weeks	2	EES

SEMESTER WISE CREDIT DISTRIBUTION

Semester	I	II	111	IV	v	VI	VII	VIII	Total
Credits	22	24	22	22	20	24	19	12	165

Total Credits: 165

L: Lecture T: Tutorial P: Practical C: Credit Cat.: Category Hrs/Wk: Hours/Week

HSMC	C : Humanities and Social Sciences (including Management Courses)	OEC	: Open Elective Courses
BSC	: Basic Science Courses	PROJ	: Project Work
ESC	: Engineering Science Courses	EEC	: Emerging Elective Courses
PCC	: Professional Core Courses	МС	: Mandatory Course

- **PEC** : Professional Elective Courses
- **EES** : Employability Enhancement Skills

Course O	bjectives:	
1	To grasp and apply biological engineering principles, procedures needed to so world problems.	olve real-
2	To give a basic knowledge of the applications of biological systems in Industries.	relevant
3	To understand the mutual dependence of modern biology and engineering.	
4	To give a basic knowledge of artificial organs and physiological assist devices.	
5	To understand about the use of various nanomaterials towards biological applic	ations.
Course O	Putcomes: noletion of the course, students shall have ability to	
	Inderstand the structure of human physiology and functioning of artificial	
C102.1	organs inside the human being.	[U]
C102.2	Analyse the structures of biological and artificial neural networks.	[A]
C102.3	Apply the concept of Brain computer interface in different applications.	[AP]
C102.4	Integrate the knowledge of Nanomaterials for biotechnology.	[AP]
C102.5	Apply the perceptions of Nano devices for diagnosis and therapy.	[AP]
Course C	ontents:	
Module 1 Cell and systems, Kidney - A	: Human Physiology and Artificial Organs their structure - Transport of ions through cell - Respiratory Systems, Cardio Immune System - Introduction and Application of Artificial neural networks - Artificial Pancreas - Artificial Liver - Artificial heart valves.	15 Hrs ovascular Artificial
Module 3 Introduction and defe diagnosis drug deliv	 Motor Interface - Measuring of surgical and non-surgical BCI - Neuro feedback ontrol signal processing and application Nanobiology Nanobiology - Nanomaterials for antimicrobial coatings - medical implants nse textiles. Biosensors - Biodevices and implantable devices. Nanomaterials therapy - Implications of Drug delivery - various forms of nanocarriers - ery. 	Training 15 Hrs -medical erials for Targeted
	Total Hours	45
Text Boo	ks:	
1	Fowler, Samantha, Roush, Rebecca, Wise, James, "Concepts of Biology", Kong: Samurai Media Limited, 2018.	Hong
2	Miller, Gerald E, "Artificial Organs", United States: Morgan & Publishers, 2006.	Claypool
3	Rao, Rajesh P. N. "Brain-Computer Interfacing: An Introduction Kingdom, Cambridge University Press, 2013.	". United
4	Ramsden, Jeremy, and Ramsden, Jeremy, "Nano technology: An Intro Elsevier Science, 2016.	duction",
Reference	e Books:	
1	Johnson, Arthur T. "Biology for Engineers", Second Edition. United Stat Press, 2018.	es: CRC
2	Ertel, Wolfgang "Introduction to Artificial Intelligence", Germany: Springer Inte Publishing, 2018.	rnational
3	Chakraborty, Tanushree, Akhtar, Nasim "Biology for Engineers", PHI learn Ltd., 2021.	ning Pvt.
R2022		

Biology for Engineers

C (Theory Concept) NIL 3/0/0/3

22SB102

Nature of Course

Course Pre-requisites

4	Colomer-Farrarons, Jordi, "Portable Bio-Devices: Design of Electrochemical Instruments							
	from Miniaturized To Implantable Devices", Croatia, IntechOpen, 2011.							
Web Refe	Web References:							
1	https://ocw.mit.edu/courses/biological-engineering/20-010j-introduction-to-							
	bioengineering-be-010j-spring-2006/videos/Lecture-1-bioengineering/							
2	https://www.technicalsymposium.com/alllecturenotes_biomed.html							
3	https://ocw.mit.edu/courses/biology/7-28-molecular-biology-spring-2005/							

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)									
Formative Assessment based on Capstone Model									
Course Outcome	Bloom's Level	Assessment Component	FA (16%) [80 Marks]						
C102.1	Understand	Quiz	20						
C102.2	Analyze	Class Presentation	20						
C102.3	Apply	Assignment	20						
C102.4	Apply	Group Assignment	20						
C102.5	Apply		20						

Assessment based on Summative and End Semester Examination										
Bloom's Level	Summative Ass [120 N	essment (24%) larks]	End Semester Examination (60%)							
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]							
Remember	10	20	10							
Understand	30	40	40							
Apply	30	40	30							
Analyse	30	-	20							
Evaluate	-	-	-							
Create	-	-	-							

Assessment based on Continuous and End Semester Examination										
	End									
	CA 1 : 100 Ma	rks		Examination						
SA 1 (60 Marks)	FA 1 (40 Marks)			FA 2 (40 Marks)		(60%)				
	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	[100 Marks]				

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C102.1	3				1	1	1		1			2	2	1	1
C102.2	3	1	1	1	1	1	1		1			2	2	1	1
C102.3	3	1	1	1	1	1	1		1			2	2	1	1
C102.4	3	1	1	1	1	1	1		1			2	2	1	1
C102.5	3	1	1	1	1	1	1		1			2	2	1	1
1	Reasonably Agreed			2	Moderately Agreed			3		Strongl	y Agree	d			

22MA104	Calculus and Transforms I 3/1/0/4										
Nature of C	ourse	B (Analytical)									
Course Pre	-requisites	- (
Course Ob	iectives:										
1	To find the sol	To find the solution of ordinary differential equations as most of the engineering problems are characterized in this form.									
2	To develop log	Fo develop logical thinking and analytical skills in evaluating multiple integrals.									
3	To gain knowle	edge in integrals which are needed in Engineering appli	ications.								
4	To acquaint th disciplines.	e concepts of vector calculus needed for problems in al	II engineerin	g							
5	To impart the l for linear ordin	knowledge of Laplace transform, to find solutions of initi ary differential equations.	ial value pro	blems							
Course Out	comes:	euroe atudente chell heur chilitu te									
Upon comp	bietion of the co	burse, students shall have ability to									
C104.1	Understand th	e concepts of basic differentiation and integration.		[R]							
C104.2	Understand th	e concepts of ordinary differential equations and I ransf	orm.								
C104.3	Apply the num	erical method to solve first order ordinary differential eq	juations.	[AP]							
C104.4	Compute the problems.	multiple integrals and vector-valued functions to solve	real world	[AP]							
C104.5	Apply Laplace	e transform techniques in system modelling, solving s.	boundary	[AP]							
Course Co	ntents:										
Module I: C	ordinary Differe	ential Equations	20 H	rs							
equation - L Solving elec methods: Ta Multistep m	egendre's Line ctrical circuits - I aylor series me nethod: Milne's	ar equation - Method of Variation of Parameters - Ap Numerical solution to first order ordinary differential equ thod - Modified Euler's Method - Runge - Kutta Metho Predictor- Corrector Method - Adam - Bashforth P	oplications c ations: Sing od of fourth Predictor- C	of ODE: gle step order - orrector							
Module II: I	ntegral Calculi	IS	20 H	rs							
Bernoulli's f integral - Ch integral - Ve and Curl of Gauss dive cubes and r	Module II: Integral Calculus 20 Hrs Bernoulli's formula - Gamma function - Double integration in Cartesian coordinates - Area as double integral - Change of order of integration - Triple integration in Cartesian coordinates - Volume as triple integral - Vector integration: Gradient of a scalar point function - Directional derivatives - Divergence and Curl of vector point function - Solenoidal and Irrotational vectors - Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (Statement only) - Simple applications involving										
Module III:	Laplace Transf	form	20 Hrs	5							
Convergence signal, Expo Derivatives functions -	Convergence of Laplace transform - Transform of some standard functions (Ramp signal, Sinusoidal signal, Exponential signal) - Unit step function - Unit Impulse function - Properties -Transforms of Derivatives and Integral functions - Initial and final value theorem - Laplace Transform of periodic functions - Inverse Laplace transform - Partial fraction method - Convolution theorem (Excluding										
11007-000	ang second on		al Houre	60							
Text Books	:	100	ai noui s								
1	G.B.Thomas a Reprint, 2018.	and R.L.Finney, Calculus and Analytic Geometry, 14	4 th Edition, F	² earson,							
2	Kreyszig. E, "A Sons (Asia) Lii	Advanced Engineering Mathematics", 10 th Edition, John mited, Singapore 2018.	Wiley and								
3	Grewal. B.S, " 2018.	Higher Engineering Mathematics", 44 th edition, Khanna	Publication	s, Delhi,							
4	Grewal B.S, "I	Numerical Methods in Engineering & Science with pro	ograms in C	, C++ &							

	MATLAB", 11 th Edition, Khanna Publishers, Delhi, 2013.							
Reference Books:								
1	Veerarajan. T, "Engineering Mathematics II",Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2018.							
2	Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, 4 th edition, 2012.							
3	N.P.Bali and Dr.Manish Goyal,"A Textbook of Engineering Mathematics", 9 th edition, Laxmi publications ltd, 2014.							
Web Refere	ences:							
1	https://onlinecourses.nptel.ac.in/noc22 ma72/preview							
2	https://onlinecourses.nptel.ac.in/noc22_ma03/preview							
3	https://onlinecourses.nptel.ac.in/noc21 ma69/preview							
4	https://archive.nptel.ac.in/courses/111/106/111106139/							
Online Reso	burces:							
1	https://www.coursera.org/learn/ordinary-differential-equations							
2	https://www.coursera.org/learn/vector-calculus-engineers							
3	https://www.danfleisch.com/laplace/							
4	https://www.classcentral.com/course/swayam-laplace-transform-19925							

Formative Assessment	Summative Assessment	native Assessment Total Continuous Assessment			Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)						
Formative Assessment based on Capstone Model						
Course OutcomeBloom's LevelFA [80]						
C104.1	Remember	Quiz	20			
C104.2	Understand	Quiz	20			
C104.3	Apply	Group Assignment	20			
C104.4	Apply	Class Presentation	20			
C104.5	Apply	Group Activities / Tutorial	20			

Assessment based on Summative and End Semester Examination						
Bloom's Level	Summative Ass [120 M	essment (24%) larks]	End Semester Examination (60%)			
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]			
Remember	20	15	20			
Understand	30	35	30			
Apply	50	50	50			
Analyse	-	-	-			
Evaluate	-	-	-			
Create	-	-	-			

Assessment based on Continuous and End Semester Examination								
	End - Semester Examination							
SA 1	FA 1 (40	FA 1 (40 Marks)		FA 1 (40 Marks)		FA 2 (4	(60%)	
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	[100 Marks]		

No. of the CO	РО 1	PO 2	PO 3	РО 4	РО 5	PO 6	РО 7	PO 8	РО 9	PO 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
C104.1	1	1	1										1		
C104.2	1	2	1										2		
C104.3	3	3	2										2		
C104.4	1	1	2										1		
C104.5	2	1	2										2		
1	Reasonably Agreed		2	Moderately Agreed		3	S	trongly	Agree	d					

Nature of Course E (Theory skill based) Course Pre-requisites NIL									
Course Pre-requisites NIL									
Course Pre-requisites NIL									
Course Objectives:									
1 To gain knowledge of the basics of semiconducting materials, magnetic materials superconducting materials and nanomaterials.									
2 To familiarize the principles of electrostatics and electrodynamics.									
Course Outcomes: Upon completion of the course, students shall have ability to									
C102.1 Outline the conducting materials, semiconductor physics and functioning of semiconductor devices.									
C102.2 Interrelate electric and magnetic fields behavior of electrostatics and electrodynamics.									
C102.3 Infer changes in the properties of magnetic materials and their applications.									
C102.4 Recall the basic concepts of superconductors and nano materials in different Engineering applications. [R									
C102.5 Apply the gained knowledge to solve the problems related to their field of study.									
Course Contents:									
Module 1: Conducting Materials and Semiconducting Materials15 HrsConducting Materials: Classical free electron theory: Drude - Lorentz theory, electrical conductivityand thermal conductivity, Wiedemann - Franz law - Origin of band theory - Classification of solidmaterials based on band theory.Semiconducting Materials: Direct and indirect band gap semiconductors - Intrinsic semiconductorat 0 K - Intrinsic semiconductor at room temperature - Intrinsic semiconductors - Electron and Holeconcentrations - Fermi Energy - Doping - Extrinsic semiconductor: n-type and p-type carrierconcentration derivation - Conductivity of semiconductors - Law of Mass action - Fermi level inextrinsic semiconductors definition - Hall effect - Hall coefficient measurement - Applications of									
Module 2: Electrostatics and Electrodynamics15 HrsElectrostatics: Coulomb's law - Gauss's law and applications of Gauss's law: Electric field duinfinite line of charge - Electric field in matter: dielectric, polarization, susceptibility, typespolarization (Electronic & Ionic Polarization only).									
Magnetism: Definitions of fundamental terms - Biot - Savart law and its applications: magnetic field due to line charge - circular coil - Ampere's law and its applications: magnetic field due to a line charge - Magnetic Field due to a Solenoid - Magnetic Lorentz force: force experienced by a current carrying conductor in a magnetic field - Electromagnetic induction Faraday's law of induction - Lenz law - Expression for induced emf in a conductor - Maxwell's equations (equations only).									
Magnetic Materials: definition of terms permeability (absolute and relative), magnetic permeability magnetic field intensity, magnetic moment of a bar magnet, intensity of magnetization, magnetic I of force, magnetic flux - classification of magnetic materials: Dia, Para, Ferro, Ferri and Anti-fimagnetic materials and its properties - Domain theory of ferromagnetism, hysteresis, hard and magnetic materials - Applications. Superconductors: properties of superconductor: resistivity, Meissner effect, persistent current, I capacity, entropy, isotope effect, effect of heavy current, effect of temperature and effect of magnetic of temperature superconductor Applications of super conductors - Josephson effect - Cryotron - Quantum interference (qualitat SQUID.									
Nanomaterials: Introduction and properties, Moore's law Quantum confinement, Quantum well,									

and dot. (Definitions) - Synthesis: chemical vapor deposition and ball milling. Total Theory Hours 45 Lab Components CO S.No List of Experiments BT Mapping Determination of thermal conductivity of a bad conductor - Lee's 1 C102.1 [E] disc. [E] 2 C102.1 Determination of a bandgap of semiconductor. [E] 3 Determination of Hall co-efficient – Hall Effect. C102.2[E] 4 C102.3 Characteristics curves of solar cell. [E] C102.4 5 Time constant of RC circuits. Magnetic field along the axis of current carrying coil- Stewart and [E] 6 C102.2 Gee method. [E] 7 C102.4 LCR circuits Faraday's electromagnetic induction law – simulation lab. [E] 8 C102.2 (https://phet.colorado.edu/sims/html/faradavs-law/latest/faradavslaw en.html) [E] C102.2 9 Hysteresis loss. Determine the mass susceptibility of a diamagnetic material -[E] C102.3 10 Quincke's method - simulation lab. (https://vlab.amrita.edu/?sub=1&brch=192&sim=854&cnt=4) Life Skills Experiments Determination of pressure required to shut off the fuel pump [E] C102.5 11 nozzle. Determination of capacitance required to shut off the circuit in a C102.5 [E] 12 circuit breaker. Determination of earth, neutral and phase line in a circuit. C102.5 [E] 13 Total Lab Hours 30 Total Hours 75 Text Books: 1 Rajendran, V "Engineering Physics" Mc Graw Hill Publications ltd, New Delhi, 2016. David Halliday, Robert Resnick, Jearl Walker "Fundamentals of Physics", 11th edition, 2 Wilev. 2018. **Reference Books:** Avadhanulu M.N., Kshirshagar P.G., Arun Murthy TVS "A Text Book of Engineering 1 Physics"S.Chand& Co Ltd, 2018. Richard P. Feynman. Robert B. Leighton, Matthew Sands "The Feynman Lectures on 2 Physics Vol. II": The New Millennium Edition.2015 David Griffiths 'Introduction to Electrodynamics' 4th Edition, Cambridge University Press 3 2017. David Jiles "Introduction to Magnetism and Magnetic Materials", 3rd Edition, Taylor & 4 Francis Group, 2015 Web References: https://www.electronics-tutorials.ws/diode/diode_1.html 1 2 https://nptel.ac.in/courses/115/104/115104109/ 3 https://nptel.ac.in/courses/115/102/115102025/ 4 http://www.phys.ufl.edu/~korytov/phy2049/old_notes/all_chapters.pdf 5 https://www.tcd.ie/Physics/research/groups/magnetism/files/lectures/5006/5006- 2.pdf

6	https://www.askiitians.com/iit-jee-magnetism/magnetic-properties-of-materials/
7	https://nptel.ac.in/courses/115/101/115101012/
8	https://nptel.ac.in/courses/118/104/118104008/

Continuous Assessment										
Theory Practica					ractical		Total	End Semester	Total	
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)	(A+B)	A+B) Assessment	Examination	
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model - Theory							
Course	Bloom's	Assessment Component	FA (10%)				
Outcome	Level	Assessment bomponent	[80 Marks]				
C102.1	Understand	Online Quiz - I	20				
C102.2	Understand	Assignment - I	20				
C102.3	Understand	Online Quiz - II	20				
C102.4	Remember	Accimpont	20				
C102.5	Apply	Assignment - II	20				

Assessment based on Summative and End Semester Examination - Theory						
Bloom's Level	Summative A [120	ssessment (15%) Marks]	End Semester Examination (35%)			
	CIA1: (60 Marks)	CIA2: (60 Marks)	[100 Marks]			
Remember	20	20	20			
Understand	50	50	50			
Apply	30	30	30			
Analyse	-	-	-			
Evaluate	-	-	-			
Create	-	-	-			
Assessment based on Continuous and End Semester Examination - Practical						

Bloom's Level	Continuous [10	Assessment (25%) 00 Marks]	End Semester Examination (15%)			
	FA: (75 Marks)	FA: (75 Marks) SA: (25 Marks) [10				
Remember	-	-	-			
Understand	20	20	20			
Apply	30	30	30			
Analyse	25	25	25			
Evaluate	25	25	25			
Create	-	-	-			

Asses	Assessment based on Continuous and End Semester Examination									
Continuous Assessment (50%)										
	CA 1 (100 Mark	s)		CA 2 (100 Mark	s)	Practic (100	cal Exam Marks)	Theory Examination		
SA 1 (60M)	F/	\ 1		F			(35%)			
	Component- I (20 Marks)	Component- II (20 Marks)	SA 2 (60M)	Component- I (20 Marks)	Component- II (20 Marks)	FA (75M)	SA (25M)	Practical Examination (15%)		

No. of the CO	РО 1	PO 2	PO 3	PO 4	РО 5	PO 6	РО 7	PO 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C102.1	3	2	1	1								2	2		
C102.2	3	2	1	1								1	2	2	
C102.3	3	2	1	1								2	3		
C102.4	3	2	1	1								2	3		
C102.5	3	2	1	1								1	1	2	
1	Rea	sonab	ly Ag	reed	2	Moderately Agreed			3	Strongly Agreed			d		

22EN101		Technical Communication Skills	2/0/2/3						
Nature of	Course	Theory Skill Based							
Course P	re-requisites	Basics of English Language							
Course C	bjectives:								
1	To enhance lea	arners' LSRW skills							
2	To develop stu	dents' ability to understand the process of communicating and ir	nterpreting						
2	ideas and human experiences.								
3	To facilitate lea	arners to acquire effective technical writing skills.							
4	To prepare lea	To prepare learners for placement and competitive exams.							
5	To facilitate eff	ective language skills for academic purposes and real-life situati	ons.						
Course C Upon cor	Outcomes: mpletion of the	course, students shall have ability to							
C101.1	Remember lan	guage skills for technical communication.	[R]						
C101.2	Apply commun	ication skills in a corporate environment.	[AP]						
C101.3	Understand a situations.	nd communicate effectively in personal and professional	[AP]						
C101 4	Understand a	and analyse a variety of reading strategies to foster	ri 11						
C101.4	text.								
C101.5	C101.5 Apply technical writing skills to write letters, emails and prepare technical documents.								
Course C	contents:								

Module 1: Introduction

Listening: Listening to News in NDTV and Times Now Channels. **Speaking:** Introduction to Effective Communication - Barriers to Effective Communication- Tips to develop Communication Skills - Self Introduction - Overview of Business Communication-Short Talk on Business Topics - Impromptu Speaking (Public Speaking) - Non-Verbal Communication-SATORI-Sharing Personal Information. **Reading:** Reading Comprehension- Values and its Importance. **Writing:** SWOT Analysis -Book Review - Movie Review-Vocabulary Building.

Module 2:

Listening: Listening to Specific Information. **Speaking:** Speaking on Specific Information. **Reading:** Skimming and Scanning-Reading Short Texts - Comparing Facts and Figures - Short Stories and Scientific Articles. **Writing:** Good and Bad Writing- Note Making - Writing Formal Letters (Inviting, Accepting and Declining Invitations)- Writing Business Letters (Calling for Quotations, Seeking Clarifications, Placing an Order and Complaint Letter)- Transcoding (Bar chart, Flowchart. Pie chart and Table)-Job Application Letter- Resume Writing.

Module 3:

Listening: Listening to Narrations and Persuasive speech and identifying narrative and persuasive techniques. **Speaking:** 21st Century Skills- Narrative Skills- Leadership- Conflict Resolution-Persuasive Speaking-How to Tell a Story with Charts and Graphs. **Reading:** Product Description and Product Review. **Writing:** Email Writing –Advantages and Disadvantages- Circular – Agenda and Minutes of the Meeting - Proofreading- Subject Verb Agreement-Tenses-Active Voice- Passive Voice- Impersonal Passive Voice-Report Phrases – Report Writing.

	Total Theo	ory Hours 30	
D2022	Department of Electrical and Electropics Engineering	Daga 27	Ì

10 Hrs

10 Hrs

10 Hrs

Lab	Component							
S.No	List of Experiments	CO Mapping	вт					
1	Listening Comprehension 1.News in NDTV and Times Now Channels 2.Listening to Specific Information	C101.1	[AP]					
2	Impromptu Speaking	C101.2	[AP]					
3	Reading Comprehension related to Competitive Exams	C101.2	[U]					
4	Immersion Activity and Presentation	C101.3	[AP]					
5	Group Discussion	C101.4	[AP]					
6	Group Assignment – Form an NGO	C101.5	[AP]					
	Total Hours							
		Total Hours	30+30=60					
Text	Books:							
1	Basic Communication Skills for Technology, by Andrea J Rutherford, P	earson Publis	hers. 2000					
2	Remedial English Grammar. F.T. Wood. Macmillan.2007							
3	Oxford Guide to Effective Writing & Speaking by John Seely, Oxford U	niversity Press	.2005					
4	Dr Sumanth S, English for Engineers, Vijay Nicole Imprints Private Lim	ited 2015.						
Refe	rence Books:							
1	Touchstone Student's Book 1 by Michael McCarthy, Jeanne McC Cambridge University Press.2005	Carten, Helen	Sandiford,					
2	Communication Skills. Sanjay Kumar and Pushp Lata. Oxford Universi	ty Press. 2011	•					
3	Touchstone Student's Book 2 by Michael McCarthy, Jeanne McC Cambridge University Press.2015	Carten, Helen	Sandiford,					
Web	References:							
1	http://www.academiccourses.com/Courses/English/Business-English							
2	https://www.liveworksheets.com/worksheets/en/English_as_a_Second_Language_(ESL)/Techn ical English							
3	https://www.coursera.org/specializations/business-english							
4	https://www.businessenglishresources.com/learn-english-for-business/ exercises-new/	student-sectio	n/practice-					

	Theory			Pi	ractical		Total	Total	End Semester	Total
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)	(A+B)	Continuous Assessment	Examination	
80	120	200	100	75	25	100	200	50	50	100

Formative Ass	Formative Assessment based on Capstone Model - Theory									
Course Outcome	Bloom's Level	Assessment Component	FA (10%) [80 Marks]							
C101.1	Remember	0	20							
C101.2	Apply	Quiz	20							
C101.3	Apply	Technical Presentation	20							
C101.4	Understand	Reading comprehension	20							
C101.5	Apply	Group Assignment	20							

Assessment based on Summative and End Semester Examination - Theory									
Bloom's Level	Summative A [120	ssessment (15%) Marks]	End Semester Examination (25%)						
	CIA1: (60 Marks)	CIA2: (60 Marks)	[100 Marks]						
Remember	20	20	20						
Understand	40	40	40						
Apply	40	40	40						
Analyse	-	-	-						
Evaluate	-	-	-						
Create	-	-	-						
Assessment base	d on Continuous and En	d Semester Examination -	Practical						
Bloom's Level	Continuous A [100	ssessment (25%)) Marks]	End Semester Examination (25%)						
	FA: (75 Marks)	SA: (25 Marks)	[100 Marks]						
Remember	20	20	20						
Understand	30	30	30						
Apply	50	50	50						
Analyse	-	-	-						
Evaluate	-	-	-						
Create	-	-	-						

Asses	Assessment based on Continuous and End Semester Examination									
	End Semester Examination (50%)									
	CA 1 (100 Mark	(S)		CA 2 (100 Marl	(s)	Practi (100	cal Exam Marks)	Theory Examination		
	F	FA 1		F.	A 2			(25%)		
SA 1 (60M)	Component-I (20 Marks)	Component-II (20 Marks)	SA 2 (60M)	Component-I (20 Marks)	Component-II (20 Marks)	FA (75M)	SA (25M)	Practical Examination (25%)		

No. of the CO	РО 1	PO 2	PO 3	РО 4	РО 5	PO 6	РО 7	PO 8	РО 9	PO 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
C101.1										3					
C101.2								2		3					
C101.3								2		3	2				
C101.4										3					
C101.5										3		3			
1	Rea	sonab	ly Ag	reed	2	I	Moder	ately	Agree	d	3	Strongly Agreed			d

22IT101	Application Development Practices											
Nature of	Course	F (Theory programming)										
Course P	re-requisites	Nil										
Course O	bjectives:											
1	To discuss th	ne essence of agile development methods.										
2	Ability to und	erstand and apply Scrum framework.										
3	To set up and	d create a GitHub repository.										
4	To impart the	o impart the knowledge of web application development platforms.										
5	To create inte	Fo create interactive websites using HTML, CSS.										
6	To recognize web design.	the user experience design methodologies like Java script for	responsive									
Course O	utcomes:											
Upon con	npletion of the	course, students shall have ability to										
C101.1	Identify the development	ntify the driving forces and adopt Agile approaches to software [AP]										
C101.2	Demonstrate GitHub repos	monstrate the values and practices of Scrum and how to setup the [U] [U]										
C101.3	Find the wor and Dynamic	ind the working model and learn basic web concepts to develop Static [R]										
C101.4	Utilize the kr business wet standards.	nowledge of HTML and CSS code to create personal and/or osites following current professional and/or industry	[AP]									
C101.5	Develop dyna mechanisms.	mic web page with validation and event handling	[AP]									
Course C	ontents:											
Module 1: History of "Waterfall Waterfall M Developm Model, Wh What is M Method, C Model?, A Waterfall M Roles and Planning M Backlog. I Guidelines Poker®, F Points?, W	Traditional S Model" – An C Model, "Waterfa ent – Definition by use Agile?, A NOT an Agile common Charac dvantages of A Model, Agile – d Responsibilit Meeting, Sprint Retrospective, Definition of "D s for Breaking P Planning Poker Vhat Goes into	oftware Development Model, Software Development Model at Dverview, Waterfall or Sequential Based Development Model, "R all Model" – Advantages, "Waterfall Model" – Disadvantages, Agile n, Agile Development Model, Graphical Illustration of Agile De Agile Manifesto and Principles, 12 Principles of Agile Methods, Ag software development?, Foundation of an Agile software de cteristics of Agile Methods, Agile Methods and Practices, When to Agile Model, Disadvantages of Agile Model, Difference between Myths and Reality, Agile Market Insight. Introduction to SCRU ties, Scrum Core Practices and Artifacts, User Story, Sprint Product Backlog, Sprint Backlog, Burn-Down Chart, Velocity, In one", Splitting User Story into Task, Why to Split User Story in Down a User Story into Tasks, Examples of Scrum Task Board - Process/Steps, What are Story Points?, How do We Estimat Story Points? Introduction to Extreme Programming, The Rules of	15 Hrs nd SDLC, eal Life" – e Software velopment ile Values, velopment o use Agile Agile and IM, Scrum , Release nt Review npediment nto Task?, , Planning e in Story of Extreme									

Points?, What Goes into Story Points? Introduction to Extreme Programming, The Rules of Extreme Programming, Extreme Programming (XP) – Vey Terms, Introduction to Lean Software Development, Principles of Lean Software Development, What is Kanban? Introduction to Git - Getting a Git Repository, Recording Changes to the Repository, Viewing the Commit History, Undoing Things, Working with Remotes, Tagging, Git Aliases, Git Branching, Branches in a Nutshell, Basic Branching and Merging, Branch Management, Remote Branches, Rebasing. Introduction to GitHub – Introduction, Set up Git, Create a repository, GitHub Flow, Contribution to Projects, Communicating on GitHub. Linux Basic Commands - Linux Basic Commands, Linux File Permissions, Basic System Administration, Process Management, Archival. Linux Shell Script - Shell Basics, Writing first script, Conditional statements, Loops, Command line arguments, Functions & file manipulations, Background processes, Scheduling processes -At, batch & Cron -Networking.

Module 2:

15 Hrs

HTML Basics - Understand the structure of an HTML page, New Semantic Elements in HTML 5, Learn to apply physical/logical character effects, Learn to manage document spacing. Tables -Understand the structure of an HTML table, Learn to control table format like cell spanning, cell spacing, border. List - Numbered List, Bulleted List, Working with Links, Understand the working of hyperlinks in web pages, Learn to create hyperlinks in web pages, Add hyperlinks to list items and table contents. Image Handling - Understand the role of images in web pages, Learn to add images to web pages, Learn to use images as hyperlinks. Frames - Understand the need for frames in web pages, Learn to create and work with frames. HTML Forms for User Input - Understand the role of forms in web pages, Understand various HTML elements used in forms, Single line text field, Text area, Check box, Radio buttons, Password fields, Pull-down menus, File selector dialog box. New Form Elements - Understand the new HTML form elements such as date, number, range, email, search and data list, Understand audio, video, article tags. Module 3:

15 Hrs

Introduction to Cascading Style Sheets - What CSS can do, CSS Syntax, Types of CSS. Working with Text and Fonts - Text Formatting, Text Effects, Fonts. CSS Selectors - Type Selector, Universal Selector, ID Selector, Class selector. Colors and Borders - Background, Multiple Background, Colors RGB and RGBA. HSL and HSLA. Borders. Rounded Corners. Applying Shadows in border. Implementing CSS3 in the "Real World" - Modernizr, HTML5 Shims, SASS, and Other CSS Preprocessors, CSS Grid Systems, CSS Frameworks. Introduction to Bootstrap - Introduction, Getting Started with Bootstrap, Bootstrap Basics, Bootstrap grid system, Bootstrap Basic Components, Bootstrap Components, Page Header, Breadcrumb, Button Groups, Dropdown, Nav & Navbars. JavaScript Essentials - Var, Let and Const keyword, Arrow functions, default arguments, Template Strings, String methods, Object de-structuring, Create, apply, prototype, bind method, Spread and Rest operator, Typescript Fundamentals, Types & type assertions, Creating custom object types, function types, Typescript OOPS - Classes, Interfaces, Constructor, Decorator & Spread Operator, Difference == & === , Asynchronous Programming in ES6, Promise Constructor, Promise with Chain, Promise Race.

	Iotal Theory Hours 45							
Lab Corr	ponents							
S.No	List of Experiments	CO Mapping	BT					
1	Draw basic UML diagrams (use case, Activity, class, interaction, State charts, Component and Deployment diagram)	C101.1	[AP]					
2	Develop DFD model (level-0, level-1)	C101.1	[AP]					
3	Design a web page using HTML basic tags.	C101.2	[AP]					
4	Develop web site with suitable contents and links.	C101.2	[AP]					
5	Design web pages using lists and tables.	C101.3	[AP]					
6	Build a web client-side Login, Registration form and Dashboard with drop down menus.	C101.4	[AP]					
7	Develop a HTML form and validation using HTML5 features.	C101.4	[AP]					
8	Create a website using HTML: To embed an image map in a web page. To fix the hot spots. Show all the related information when the hot spots are clicked.	C101.5	[AP]					
9	Apply style specification in HTML page using CSS.	C101.5	[AP]					
10	Develop dynamic web application using HTML, CSS and JavaScript.	C101.5	[AP]					
	Tota	al lab Hours	30					
		Total Hours	75					
Text Books:								
1	1 Roman Pichler, "Agile Product Management with Scrum Creating Products that Customers Love", Pearson Education, 1st Edition, 2010.							

2	Jeff Sutherland, "Scrum the Art of Doing Twice the Work in Half the Time", Random House Publisher, 1st Edition, 2014.
3	Scott Chacon, Ben Straub, "Pro GIT", Apress Publisher, 3rd Edition, 2014.
4	Richard Blum, Christine Bresnahan, "Linux Command Line and Shell Scripting BIBLE", Wiley India Pvt. Limited, 5th Edition, 2008.
5	Jennifer Niederst Robbins., "Learning Web Design, A beginner's guide to HTML, CSS, JavaScript, and Web Graphics", O'Reilly Media, 5th Edition, 2018.
6	Jennifer Smith and the AGI Creative Team, "Web Design with HTML and CSS", Wiley Publisher, 1st Edition, 2011.
7	Stephen Blumenthal, "JavaScript: JavaScript for Beginners - Learn JavaScript Programming with ease",1st Edition, 2017.
Reference	e Books:
1	Robert C. Martin, "Agile Software Development, Principles, Patterns and Practices", Prentice Hall, 2 nd Edition, 2014.
2	Mike Cohn, "User Stories Applied: For Agile Software", Addison Wesley, 2 nd Edition, 2016.
3	Thomas a Powell, "HTML & amp; CSS: The Complete Reference", 5 th Edition, Tata McGraw Hill Education Private Limited, 2010.
4	Russ Ferguson, "Beginning JavaScript: The Ultimate Guide to Modern JavaScript Development", Apress Publishers, 3 rd Edition, 2019.
5	Deitel, Deitel, Goldberg, "Internet and World Wide Web – How to program", 5 th Edition, Prentice Hall Publishers, 2012.
Web Ref	erences:
1	https://www.coursera.org/specializations/agile-development
2	https://www.edx.org/learn/agile
3	https://nptel.ac.in/courses/106/105/106105182/
4	https://developer.mozilla.org/en-US/docs/Web/HTML
5	https://developer.mozilla.org/en-US/docs/Web/CSS
6	https://developer.mozilla.org/en-US/docs/Web/JavaScript
Online F	lesources:
1	http://www.agilenutshell.com/
2	https://www.atlassian.com/agile/scrum
3	https://www.youtube.com/user/AgileMikeCohn
4	https://www.coursera.org/learn/html-css-javascript-for-web-developers
5	https://online-learning.harvard.edu/subject/javascript

Continuous Assessment										
Theory				Practical			Total	Total	End Semester	Total
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)	(A+B)	Continuous Assessment	Examination	
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model - Theory								
Course	Bloom's	Assessment Component	FA (10%)					
Outcome	Level		[80 Marks]					
C101.1	Apply	Assignment - 1	20					
C101.2	Understand	Quiz	20					
C101.3	Remember		20					

C101.4	Ар	ply	Case Study	20					
C101.5	Ар	ply	Assignmen	Assignment – 2					
Assessment b	ase	d on Summ	ative and E	nd Semester Examination - Th	neory				
Bloom's Level		ę	Summative [12]	Assessment (15%) 20 Marks]	End Semester E (35%)	xamination			
		CIA1: (60) Marks)	CIA2: (60 Marks)	[100 Mai	rks]			
Remember		4	0	20	20				
Understand		3	0	30	20				
Apply	Apply 3			50	60				
Analyse	Analyse								
Evaluate	Evaluate -			-	-				
Create	Create -			-	-				
Assessment b	ase	d on Contin	uous and E	nd Semester Examination - P	ractical				
		(Continuous	Assessment (25%)	End Semester E	xamination			
Bloom's Leve	əl		[10	00 Marks]	(15%)				
		FA: (75	Marks)	SA: (25 Marks)	[100 Mai	rks]			
Remember		3	0	20	20				
Understand		2	0	30	30				
Apply		50		50	50				
Analyse -			-	-					
Evaluate .			-	-					
Create -					-				

Asses	Assessment based on Continuous and End Semester Examination										
	End Semester Examination (50%)										
	CA 1 (100 Mark	s)		CA 2 (100 Mark	(s)	Practio (100	cal Exam Marks)	Theory Examination			
	F/	FA 1		FA 2				(35%)			
SA 1 (60M) Component- I II (20 Marks) (20 Marks)			SA 2 (60M)	Component- I (20 Marks)	Component-II (20 Marks)	FA (75M)	SA (25M)	Practical Examination (15%)			

No. of the CO	РО 1	PO 2	PO 3	РО 4	РО 5	PO 6	РО 7	PO 8	РО 9	PO 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
C101.1	2	2	1	1								2	3	2	2
C101.2	3	2	3	3	3	2						2	3	3	2
C101.3	3	2	3	3	3	2						2	3	3	2
C101.4	3	2	3	3	3	2						2	3	3	2
C101.5	3	2	3	3	3	2						1	3	3	2
1	Rea	sonab	ly Ag	reed	2	Moderately Agreed			3	9	Strongl	y Agree	d		

Nature of Course C (Theory Concept), K (Problem Programming) Course Pre-requisites NIL Course Objectives: NIL 1 To learn the fundamental programming concepts and methodologies which are essentia to build good C++ programs. 2 To gain knowledge on control structures and functions in C++ 3 To provide the basic object oriented programming concepts and apply them in problem solving. 4 To introduce file streams and operations for storing data permanently. 5 To know generic programming paradigm. Course Outcomes: Upon completion of the course, students shall have ability to C101.1 Solve problems using operators and control Statements [AP] C101.2 Write C++ functions for processing strings and arrays [AP] C101.3 Apply the concepts of pointers and functions in programs. [AP] C101.4 Develop C++ programs using various object-oriented concepts to solve real world problems [A]							
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C101.4 Develop C++ programs using various object-oriented concepts to solve [A]							
C101.5 Implement the concepts on file streams and operations [AP]							
Course Contents:							
Module 1: C++ Programming Fundamentals15 HrsC vs C++, Basic of OOPS, the main () function, Header files, Basic Input and Output (I/O) using cin and cout, Variable, Constant. Operators: Arithmetic Operators, Assignment Operators, Relational Operators, Logical Operators, Bitwise Operators, Other Operators, Operator Precedence. Control Statements: if, ifelse and Nested ifelse, switchcase, break and continue, Loops - for loop, while loop, do while loop, goto. Arrays and Strings: 1D array, 2D array, Strings, String functions. Function: Basics, call by value, call by reference & return by reference, Inline function, overloading Functions, inline Functions, Recursive Functions. Pointers: Pointer, Dynamic Memory Allocation.Module 2: Object Oriented Concepts15 HrsClasses and Objects, public, private, protected. Constructors and destructors: Overloaded Constructor, Copy Constructor, Shallow Copying Deep Copying. Overloading: this' Pointer, structs vs Classes, Friends of a class, Operator Overloading Inheritance, Overloading vs overriding, Polymorphism, Virtual Functions, Pure Virtual Functions and Abstract Classes.Module 3: Files and Generic Programming15 HrsAbstract Classes as Interfaces, Exception, Files, Streams and I/O, STL, Generic Programming,							
Total Theory Hours 45							
Lab Component							
S.No List of Experiments CO BT Mapping							
1Practice of C Programming using Branching and Iterative constructs.C101.1[AP]							
2 Programs using arrays and strings C101.1 [AP]							
3 Programs using Functions C101.2 [AP]							
4 Programs using Structures and Pointers. C101.3 [AP]							
5 Programs using classes and objects C101.4 [AP]							
6 Programs using constructor and destructor C101.4 [AP]							
7 Programs using method overloading, operator overloading and C101.4 [AP]							

	polymorphism concepts.									
8	Programs using friend class	C101.4	[AP]							
9	Programs using virtual functions and abstract class. C101.4									
10	Programs using inheritance concepts	C101.4	[AP]							
11	Programs using exception handling concept	C101.5	[AP]							
12	Programs using Files.	C101.5	[AP]							
13	Mini project	C101.5	[AP]							
	Total Lab Hours 30									
		Total Hours	75							
Text Boo	Text Books:									
1 E Balagurusamy ,"Object Oriented Programming With C++", 4 th Edition, Tata McGraw-Hill Education, 2008.										
2	YashavantP. Kanetkar, "Let us C++", BPB Publications, 2020.									
3	3 M. Sprankle, "Problem Solving and Programming Concepts", 9th Edition, Pearson Education, New Delbi, 2011									
Reference	ce Books:									
1	Herbert Schildt, "The Complete Reference C++", 4th edition ,MH,2	015								
2	John Hubbard, "Schaum's Outline of Programming with C++", MH,	2016								
Web Ref	erences:									
1	https://www.geeksforgeeks.org/c-plus-plus/									
2	http://web.stanford.edu/class/cs106l/									
Online R	lesources:									
3	https://nptel.ac.in/courses/106101208									
4	https://www.hackerrank.com/domains/cpp									
5	https://codeforces.com/blog/entry/74684									
6	https://www.hackerearth.com/practice/notes/tricky-and-fun-programming-in-c/									

Continuous Assessment										
Theory				Practical			Total	Total	End Semester	Total
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)	(A+B)	Continuous Assessment	Examination	
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model – Theory								
Course Outcome	Bloom's Level	Assessment Component	FA (10%) [80 Marks]					
C101.1	Apply	Quiz	20					
C101.2 & C101.3	Apply	Assignment	20					
C101.4	Analyze	Group Assignment	20					
C101.5	Apply	Case study	20					

Assessment based on Summative and End Semester Examination – Theory									
Bloom's Level	Summative A [120	ssessment (15%)) Marks]	End Semester Examination (35%)						
	CIA1: (60 Marks)	CIA2: (60 Marks)	[100 Marks]						
Remember	20	20	20						
Understand	40	30	30						
Apply	40	50	50						
Analyse	-	-	-						
Evaluate	-	-	-						
Create	-	-	-						
Assessment base	ed on Continuous and En	nd Semester Examination –	Practical						
Bloom's Level	Continuous A [100	Assessment (25%) 0 Marks]	End Semester Examination (15%)						
	FA: (75 Marks)	SA: (25 Marks)	[100 Marks]						
Remember	10	20	20						
Understand	30	20	20						
Apply	50	60	60						
Analyse	10	-	-						
Evaluate	-	-	-						
Create	-	-	-						

Asses	Assessment based on Continuous and End Semester Examination										
	Continuous Assessment (50%)										
	CA 1 (100 Mark	s)		CA 2 (100 Mark	(s)	Practio (100	cal Exam Marks)	Theory Examination			
	F/	FA 1		FA 2				(35%)			
SA 1 (60M)	Component- I (20 Marks)	Component- II (20 Marks)	SA 2 (60M)	Component- I (20 Marks)	Component-II (20 Marks)	FA (75M)	SA (25M)	Practical Examination (15%)			

No. of the CO	РО 1	PO 2	РО 3	PO 4	РО 5	PO 6	РО 7	PO 8	РО 9	РО 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
C101.1	3	3											3		
C101.2	3	3	3	2	2				2	1		3	3	2	1
C101.3	3	3	3	2	3				2	1		3	3	2	1
C101.4	3	3	3	3	3				3	2		3	3	2	2
C101.5	3	3	3	3	3				2	2		2	3	2	1
C101	3	3	3	3	3				3	2		2	3	2	2
1	Reasonably Agreed				2	Moderately Agreed					3	Strongly Agreed			
22GE201	Universal Human Values 3/0														
--	--	--	--	--	--	--	--								
Nature of	Course	C (Theory Concept)													
Course Pr	e-requisites	NIL													
Course O	bjectives:														
1	Development o being), family, s	f a holistic perspective based on self-exploration about themselve society and nature/existence.	s (human												
2	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence														
3	Strengthening of	of self-reflection.													
4	Development of	f commitment and courage to act.													
5	Helping the students to appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of														
6	All numan being Highlighting pla human conduc interaction with	gs. ausible implications of such a Holistic understanding in terms t, trustful and mutually fulfilling human behavior and mutually Nature.	of ethical enriching												
Course O	utcomes:														
Upon com	pletion of the c	ourse, students shall have ability to													
C201.1	Understand and sustainable solu mind.	d take responsibilities in life and handle problems to attain utions while keeping human relationships and human nature in	[U]												
C201.2	Apply responsit relationship and	pilities towards their commitments (human values, human d human society).	[AP]												
C201.3	Apply what they life, atleast a be	Apply what they have learnt to their own self indifferent day-to-day settings in real [AP]													
C201.4	Analyze ethical harmonious env	Analyze ethical and unethical practices, and formulate strategies to actualize a [A]													
C201.5	Understand the fulfilling particip	harmony in nature and existence, and work out mutually on ation in nature.	[U]												
Course Co	ontents:														
Module 1 Education Self-evalua Exploration and Prosp as an inst activities o Waste Ma Lectures b	Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education, Understanding Harmony in the Human Being - Harmony in Myself! 15 Hrs Self-evaluation of the students - Pre-test of UHV- Purpose and motivation for the course. Self-Exploration–Its content and process- A look at basic Human Aspirations. Understanding Happiness and Prosperity correctly - Understanding the needs of Self ('i') and 'Body' - Understanding the Body as an instrument of 'l' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'l' and harmony in 'l' - Understanding the harmony of 'l' with the Body- Social activities - Waste Management - Water Conservation - Soil Pollution - Physical Health and related activities - Lectures by eminent persons- Literary activities.														
Module 2: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship, Understanding Harmony in the Nature and Existence - Whole existence as Coexistence 15 Hrs Understanding values in human relationship - Understanding the harmony in the society (society being an extension of family): - Visualizing a universal harmonious order in society- Understanding the harmony in Nature Understanding Existence as Coexistence of mutually interacting units in all- pervasive space. Holistic perception of harmony at all levels of existence-Buddy program- Relationships-Homesickness- Managing peer pressure-Projects- Socially responsible engineers - Visit to local areas (orphanages, special children) - Physical activities (games).															
Module 3 Ethics Natural ad Humanistic profession	B: Implications acceptance of hit and c Education - Hit c Education - Case	of the above Holistic Understanding of Harmony on Prof 15 uman values - Definitiveness of Ethical Human Conduct - umanistic Constitution and Humanistic Universal Order - Comp studies of typical holistic technologies, management models	essional Hrs Basis for etence in and eco-												

friendly production systems - Strategy for transition from the present state to Universal Human Order -Sum up: Self-evaluation of the students - Post test of UHV.

Total Hours

45

Text Book	(S:							
1	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010							
2	Rajni Setia, Priyanka Sharma, "Human Values", Genius Publication", Jaipur, 2019.							
Reference	Reference Books:							
1	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.							
2	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi							
3	3 India Wins Freedom - Maulana Abdul Kalam Azad.							
Web Refe	rences:							
1	https://examupdates.in/professional-ethics-and-human-values/							
2	http://hvpe1.blogspot.com/2016/06/notes-human-values-and-professional.html							
3	https://www.yourmorals.org/schwartz.2006.basic%20human%20values.pdf							
4	https://nptel.ac.in/courses/109/104/109104068/							
5	https://medium.com/the-mission/the-12-important-life-skills-i-wish-id-learned-in-school- f4593b49445b							
6	https://www.thebalancecareers.com/life-skills-list-and-examples-4147222							

Formative Assessment	Formative Assessment Summative Assessment		Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)								
Formative <i>J</i>	Formative Assessment based on Capstone Model							
Course OutcomeBloom's LevelAssessment ComponentFA (16%) [80 Marks]								
C201.1	Understand & Apply	Pre-Test and Post -Test	20					
C201.2	Understand & Apply	Online Quiz	20					
C201.3	Understand & Apply	Buddy Program	20					
C201.4	Understand & Apply							
C201.5	Apply	Seminar	20					

Assessment based on Summative and End Semester Examination								
Bloom's Level	Summative Asso [120 M	essment (24%) arks]	End Semester Examination (60%)					
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]					
Remember	10	10	10					
Understand	10	20	20					
Apply	40	40	40					
Analyse	40	30	30					

Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination								
	End							
	Examination							
SA 1	FA 1 (4	FA 1 (40 Marks)		FA 2 (40 Marks)		(60%)		
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	[100 Marks]		

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C201.1						3									
C201.2						3			3						
C201.3						3		3							
C201.4						3	3	3			2			2	3
C201.5						3	3								
1	Rea	sonab	ly Ag	reed	2	Moderately Agreed		ed	3		Strongl	y Agree	d		

22EE201	Basics of Electrical Circuits2/1/0/3					
Nature of C	ourse	G (Theory analytical)				
Course Pre	-requisites	Nil				
Course Ob	ectives:					
1	To understand	DC and AC circuits.				
2	To learn netwo	ork theorems and two port networks for circuit analysis.				
3	To explore the	transient and resonance response of different electrical circu	uit.			
Course Out	tcomes:					
Upon comp	pletion of the c	ourse, students shall have ability to				
C201.1	Analyze the co	oncepts in AC circuit and DC circuits.	[/	A]		
C201.2	Derive the sin AC Circuits	usoidal steady-state (single-phase and three-phase) respon	ise of [A	NP]		
C201.3	Apply network	theorems for the analysis of electrical circuits.	[A	NP]		
C201.4	Examine two	port circuit behavior.	[/	A]		
C201.5	Investigate the transient and resonance response of electrical circuits. [A]					
Course Contents:						

Module 1: DC Circuits and AC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's current and voltage laws, Resistor in series and parallel, Voltage division, Current division, Star-delta transformation, Mesh and Nodal analysis. Representation of sinusoidal waveforms, peak and rms values, Phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), Three phase balanced circuits - voltage, current, power relations in star and delta connections.

Module 2: Network Theorems and Two Port Networks

Superposition theorem, Thevenin's theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem. Analysis with dependent current and voltage sources. Concept of duality and dual networks. Basics of two port networks - impedance parameters, admittance parameters, transmission parameters and hybrid parameters.

Module 3: Transients and Resonance Analysis

Steady State and Transient response - DC and AC Transients response of RL and RC Circuits using Laplace transforms - Resonance: Series Resonance - Bandwidth of an RLC circuit - Q factor, Magnification in Resonance. Parallel Resonance - Resonant frequency for a tank circuit factor of parallel resonance, magnification. Self and mutually induced emf, coefficient of coupling, dot convention in coupled circuits.

	Total Hours 45
Text Books	:
1	Joseph A. Edminister, Mahmood Nahvi, "Electric circuits", Schaum"s series, McGraw- Hill, 5 th Edition, New Delhi ,2020.
2	William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", TMH publishers, 8 th Edition, New Delhi, 2017.
3	M. E. Van Valkenburg, "Network Analysis", Phi Learning, 3/E 3rd Edition, 2014.
Reference	Books:
1	Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric Circuits", 3 rd Edition, McGraw Hill, 2017.
2	Robins & Miller, "Circuit analysis theory and practice", Delmar Publishers, 5 th Edition, 2012.
3	J Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGraw Hill, 2017.

15 Hrs

15 Hrs

15 Hrs

Web Refere	Web References:					
1	http://www.electrical4u.com/circuit-analysis.html					
2	http://www.technologystudent.com					
3	http://www.allaboutcircuits.com					
4	http://www.nptel.ac.in					
Online Reso	Online Resources:					
1	http://www.electrical-knowhow.com/					
2	https://www.edx.org/course/electricity-magnetism-part-1-ricex-phys102-1x-1					
3	https://www.mooc-list.com/course/fundamentals-electrical-engineering-coursera					
4	https://nptel.ac.in/course.php					

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)										
Formative <i>I</i>	Assessment base	ed on Capstone Model								
Course	Course Assessment Component (Choose and map FA (16%)									
Outcome	utcome Bloom's Level components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment) [80									
C201.1	Analyze	Assignment	20							
C201.2	Apply	Assignment	20							
C201.3	Apply	Group Assignment	20							
C201.4	C201.4 Analyze Class Presentation									
C201.5	Analyze	Quiz	20							

Assessment based on Summative and End Semester Examination										
Bloom's Level	Summative Ass [120 N	essment (24%) larks]	End Semester Examination (60%)							
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]							
Remember	10	10	10							
Understand	30	40	40							
Apply	30	30	30							
Analyse	30	20	20							
Evaluate	-	-	-							
Create	-	-	-							

Assessment based on Continuous and End Semester Examination								
	End							
	arks	Examination						
SA 1	FA 1 (40	0 Marks)		FA 2 (4	(60%)			
(60 Marks)	[100 Marks]							

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C201.1	2	1			2							2	3	3	
C201.2	3	2	1	1	2							2	3	3	
C201.3	3	2	1	1	2							2	3	3	
C201.4	2	1			2							2	3	3	
C201.5	2	1			2							2	3	3	
1	Rea	sonab	ly Ag	reed	2	I	Moder	ately	Agree	ed	3		Strongl	y Agree	d

22TA101 Heritage of Tamils 1/0/0/									
Nature of CourseC (Theory Concept)									
Pre requisites NIL									
Course Objectives:									
1 To know various concepts of Tamil Language families.									
2 To know about the essentialities of Heritage.									
3 To understand the Aram concepts of Tamils and the cu	Iltural influence.								
Course Outcomes :									
Upon completion of the course, students shall have ability t	0								
C101.1 Know about the language families in India, impact of contribution of Bharathiyar and Bharathidhasan.	religions and the	[U]							
C101.2 Observe the growth of sculpture, making of musical instruction role of temples in socio and economic lives.	struments and the	[U]							
C101.3 Understand the significance of folklore and martial arts	5.	[U]							
C101.4 Learn the sangam literature, sangam age and overs	seas conquest of	[U]							
C101.5 Understand the contribution of Tamils to Indian Freed of Siddha medicine and print history of Tamil Books.	lom Struggle, role	[U]							
Course Contents:									
Literature in Tamil - Secular Nature of Sangam Literature - Literature - Management Principles in Thirukural - Tamil Epid Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanr Development of Modern literature in Tamil - Contribution of Bhar Module – II: Heritage - Rock Art Paintings to Modern Art – Se Hero stone to modern sculpture - Bronze icons - Tribes and their making - Massive Terracotta sculptures, Village deities, Thiruv Making of musical instruments - Mridhangam, Parai, Veenai, Ya Temples in Social and Economic Life of Tamils. Folk An Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather Tiger dance - Sports and Games of Tamils. Module – III : Thinai Concept of Tamils Flora and Fauna of Tamils & Aham and Puram Concept fro Literature - Aram Concept of Tamils - Education and Literacy Cities and Ports of Sangam Age - Export and Import during San	Distributive Justice cs and Impact of nars - Forms of m athiyar and Bharat culpture ir handicrafts - Art valluvar Statue at k zh and Nadhaswar d Martial Arts: puppetry, Silamba during Sangam A gam Age - Overse	e in Sangam Buddhism & inor Poetry - hidhasan. 5 Hours of temple car Kanyakumari, ram - Role of Therukoothu, attam, Valari, 5 Hours and Sangam ge - Ancient as Conquest							
of Tamils to Indian Freedom Struggle - The Cultural Influence of India – Self-Respect Movement - Role of Siddha Medicine in Ind Inscriptions & Manuscripts – Print History of Tamil Books.	f Tamils over the oligenous Systems of Total Hours	other parts of of Medicine – 15							
Text Books:									
 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே. தமிழ்நாடு பாடஙால் மற்றும் கல்வியியல் பணி 	கே. பிள்ளை (ெ 1கள் கழகம்).	வளியீடு:							
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் _{. (} விகடன் ட	பிரசுரம்).								
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிக வெளியீடு)	கம் ₍ தொல்லியல் _:	துறை							

4.	பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in
	print)
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:
	International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)
	(Published by: International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by:
	International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by:
	Department of Archaeology & Tamil Nadu Text Book and Educational Services
	Corporation, Tamil Nadu).
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay)
	(Published by: The Author).
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu
	Text Book and Educational Services Corporation, Tamil Nadu).
Referer	nce Books:
1.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)										
Formative /	Formative Assessment based on Capstone Model									
Course OutcomeBloom's LevelAssessment ComponentFA (16%) [80 Marks]										
C101.1	Understand	Quiz	20							
C101.2	Understand	Seminar	20							
C101.3	C101.3 Understand Seminar 20									
C101.4	Understand	Quiz	20							

Assessment based on Summative and End Semester Examination									
Bloom's Level	Summative Ass [120 M	essment (24%) arks]	End Semester Examination (60%)						
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]						
Remember	40	40	40						
Understand	60	60	60						
Apply	-	-	-						
Analyse	-	-	-						
Evaluate	-	-	-						
Create	-	-	-						

Assessment based on Continuous and End Semester Examination								
	End Semester							
	CA 1 : 100 Ma	arks		CA 2 : 100 Ma	arks	Examination		
	FA 1 (40 Marks)FA 2 (40 Marks)							
SA 1 (60 Marks)	[]							

Course Outcome	Programme Outcomes (PO)										Programme Specific Outcomes (PSO)				
(00)	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C101.1	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
C101.2	-	-	-	-	-	-	-	1	1	-	-	1	-	-	-
C101.3	-	-	-	-	-	-	-	1	1	-	-	1	-	-	-
C101.4	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
C101.5	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-

22CH101		Engineering Chemistry	3/0/2/4
Nature of	Course	E (Theory Skill based)	
Course P	re-requisites	NIL	
Course O	bjectives:		
1	To understand the electroanalytical me	ne principles and applications of electrochemistry and ethods.	to learn
2	To learn the effect	of corrosion in materials and the methods for prevention of co	rrosion.
3	To understand the	basic concepts, synthesis, and applications of nanomaterials.	
4	To explore the sy sources.	inthesis and properties of important engineering plastics	and energy
5	To understand t spectroscopy.	he concepts of photophysical and photochemical pro	ocesses in
Course O Upon cor	npletion of the cou	irse, students shall have ability to	
C101.1	Recall the principle as an analyzer.	and working of reference electrodes and conductivity meter	ers [R]
C101.2	Apply the various c	orrosion control techniques in real time industrial environmen	ts. [AP]
C101.3	Interpret the basic of	concepts and applications of Nano chemistry.	[U]
C101.4	Use the knowledge products in enginee	e of various energy sources in storage devices and polyme ering field.	ric [AP]
C101.5	Interpret the princip	le and working of certain analytical techniques.	[U]
Course C	ontents:		
Course C Electroch Electroch potentials saturated reversible estimation mechanis protection	ontents emistry and Corro emistry-Introduction , Nernst equation calomel electrode, and irreversible of hardness by E m of dry and wet -electroplating of Cl	n, Oxidation and reduction potentials-Free energy and and applications. Reference electrodes-standard hydrogen glass electrode-pH measurement. Electrochemical cells-elec cells. Water treatment-characteristics of water-hardness DTA method with numerical problems. Importance of corros corrosion-galvanic corrosion-differential aeration corrosion hromium-electroless plating of Nickel.	Hrs emf, cell electrode, trolytic cell- types and sion-types– Corrosion
Nano-Che Nano Ch nanopartie Electroche Sources-F Batteries-	emistry and Energ emistry-Basics-Con cle, nanocluster, emical deposition a fuel Cells-Solid ox Alkaline-Lead acid,	y sources: nparison of molecules, nanomaterials and bulk materials nanorod, nanowire and nanotube. Preparation of nan nd electro spinning. Applications of nanomaterials in medici ide and polymer electrolytes in H2-O2 fuel cell. Storag Nickel cadmium and Lithium-ion batteries.	5 Hrs s; Types - omaterials: ne. Energy e Devices-
Polymer of Introduction problems) preparation moulding moulding) moulding)	chemistry and Spe on-monomers and . Mechanism of ac on, properties and u of plastics for Ca , Mobile Phone Ca . Spectroscopy-Be	ectroscopic techniques: 1 polymers-classification of polymers-Degree of Polymerizati ddition polymerization (free radical mechanism). Plastics-cla uses of Nylon 6,6, Nylon 6, PVC, Bakelite and PET. Mouldin ar parts, bottle caps (Injection moulding), Pipes, Hoses ases, Battery Trays (Compression moulding) and PET bo eer Lambert's law, principle, instrumentation, and appl	5 Hrs on (Simple assification- g methods- (Extrusion ittles (Blow ications of

spectroscopy (FES).

Industrial visit- Moulding and spectroscopic techniques

Total Theory Hours 45

Electronic spectroscopy (UV-visible), Vibrational and rotational spectroscopy (IR) and Flame emission

Lab Com	iponents								
S.No	List of Experiments	CO Mapping	вт						
1	Determination of total, temporary, calcium and magnesium hardness of water sample by EDTA method.	C101.1	[E]						
2	Estimation of alkalinity of water sample.	C101.1	[E]						
3	Estimation of dissolved oxygen in water.	C101.2	[E]						
4	Potentiometry- determination of redox potentials and emf's. C101.1 [E]								
5	Conductometric titration-mixture of acids vs NaOH	C101.1	[E]						
6	Determination of strength of strong acid by pH-metry.	C101.2	[E]						
7	Determination of corrosion rate of mild steel in acid medium.	C101.4	[E]						
8	Electroplating of nickel over copper.	C101.3	[E]						
9	Spectrophotometry-Estimation of iron in water.	C101.5	[E]						
10	Determination of single electrode potential of Zinc and Copper by given solution.	C101.1	[E]						
Understa	anding the concepts by simple Demonstrations/Experiments:								
11	To detect the chlorine content in tap water using simple chemical method.	C101.1	[E]						
12	To know the presence of dissolved oxygen in given water sample	C101.2	[E]						
13	To illustrate the rate of corrosion in steel nails using acid medium. C101.2								
Total Lab Hours 30									
Total Hours 75									
Text Boo	oks:								
1	Dara S.S, Umare S.S, "Engineering Chemistry", First revised E Company Ltd., New Delhi 2015.	dition by S.	Chand &						
2	Jain P. C. & Monica Jain., "Engineering Chemistry", 16 th Edition, Company (P) Ltd, New Delhi, 2015.	DhanpatRai	Publishing						
3	Fundamentals of Molecular Spectroscopy, 4 th Edition by C. N. Banw Hill Book Company (P) Ltd, England, 1994.	ell Publishing	g McGraw-						
4	Nanochemistry, 2 nd Edition by K. Klabunde, G. Sergeev Springer Pu	blisher, 2013							
Reference	ce Books:	uide e Ulairea	- 14						
1	Shikha Agarwal., "Engineering Chemistry and Applications", Camp 2016.	ridge Univer	sity press,						
2	Liliya., Bazylak.I., Gennady. E.,Zaikov.,Haghvi.A.K.,"Polymers and CRC Press,2014.	Polymeric Co	omposites"						
3	Lefrou., Christine., Fabry.,Pierre.,Poignet.,Jean-claude.,"Electrocher with examples" 2012 ., Springer.	nistry - The E	Basics,						
4	Zaki Ahmad, Digby Macdonald, "Principles of Corrosion Engined Control", Elsevier Science, 2nd Edition 2012.	ering and	Corrosion						
5	Introduction to Nano: basics to Nanoscience and Nanotech Amretashis, Sarkar, Chandan Kumar, Springer Publisher, 2015.	nology, by	Sengupta,						
Web Ref	erences:								
1	1 http://www.analyticalinstruments.in/home/index.html								
2	2 www.springer.com > Home > Chemistry > Electrochemistry								
১	mups.//www.ktn.se//eiectrochem/weicome-to-the-aivision-of-applied	a-electrochen	nistry						

4	www.edx.org/						
5	https://www.ntnu.edu/studies/courses						
6	www.corrosionsource.com/						
Online Resources:							
1	https://ocw.mit.edu/courses/chemistry						
2	nptel.ac.in/courses/105106112/1_introduction/5_corrosion.pdf						
3	https://alison.com - Spectroscopic technique, Colorimetry						
4	https://ocw.mit.edu/courses/chemistry						
5	nptel.ac.in/courses/113108051						

	Theory			Practical			Total	Total	End Semester	Total
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)	(A+B)	Continuous Assessment	Examination	
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model - Theory									
Course Outcome	Bloom's Level		Assessment Compone	ent	FA (10%) [80 Marks]				
C101.1	Remember	Online Qui	z-l		20				
C101.2	Apply	Assignmer	Assignment-I						
C101.3	Understand	Online Qui	Online Quiz-II						
C101.4	Apply	Assignmer	Assignment-II						
C101.5	Understand								
Assessment b	ased on Sur	nmative and E	nd Semester Examination - T	heory					
Bloom's Level		Summative [12	Assessment (15%) 20 Marks]	End Semester E (35%	r Examination 5%)				
	CIA1:	(60 Marks)	CIA2: (60 Marks)	[100 Ma	rks]				
Remember		20	20	20					
Understand		35	35	35					
Apply		45	45	45					
Analyse		-	-	-					
Evaluate		-	-	-					
Create		-							
Assessment b	ased on Cor	ntinuous and E	End Semester Examination - I	Practical					
		Continuous	Assessment (25%)	End Semester E	xamination				
Bloom's Leve		[1	00 Marks]	(15%)				
	FA:	(75 Marks)	SA: (25 Marks)	[100 Ma	rks]				
Remember		-	-	-					
Understand		20	20	20					
Apply		30	30	30					
Analyse		25	25	25					
Evaluate		25	25	25					
Create		-	-	-					

Asses	Assessment based on Continuous and End Semester Examination									
	End Semester Examination (50%)									
	CA 1 (100 Mark	s)		CA 2 (100 Mark	(S)	Practio (100	cal Exam Marks)	Theory Examination		
	F/	\ 1		F/			(35%)			
SA 1 (60M)	Component- I (20 Marks)	Component- II (20 Marks)	SA 2 (60M)	Component- I (20 Marks)	Component- II (20 Marks)	FA (75M)	SA (25M)	Practical Examination (15%)		

No. of the CO	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
C101.1	3	2	2		1							1			
C101.2	3	2	2	1	1							1			
C101.3	3	3	2		1							1			
C101.4	3	2	2		1							1			
C101.5	3	2	2	1	1							1			
1	Rea	sonab	ly Ag	reed	2		Moder	ately	Agree	d	3	S	strong	y Agree	d

22IT2	22IT201			tabase Management Systems 3/0/2/4						
Nature of	f Cours	se:	D (Theory	Application)						
Prerequi	sites:		Nil							
Course Objectives:										
1 2	 I o describe information and data models and relational databases. To explain an Entity Relationship Diagram and design a relational database for a specific 									
	use case.									
3		plement c	different rela	itional model co	nstraints.					
4 Course (abase usin	y SQL Comman	us					
Upon con	npletior	n of the co	ourse, stude	ents shall have a	ability to:					
C201.1	Conce	eptualize	data using	he relational mo	odel.		[U]			
C201.2	Impro	Improve the database design through normalization. [U]								
C201.3	Manip	Manipulate a database using SQL.								
C201.4	Implement advanced SQL concepts on database.									
C201.5	Infer t	he transa	ctions man	agement in a da	tabase environment.		[A]			
Course C	Conten	ts:								
Compone Relationa Module I DDL Cor Comman Subqueri MAX, Cla Transacti Module I Creation Opening, Payroll P Storage Processir transactio	DBMS Architecture, Data Models – Introduction, Benefits, and Phases, ER Diagrams – Symbols, Components, Relationships, Weak entities, Attributes, Cardinality, Relational Algebra, Domain Relational Calculus, Tuple Relational Calculus, Normalization - 1NF, 2NF, 3NF, BCNF, 4NF Module II Constraints and SQL Commands DDL Commands - Create, Drop, Alter, Truncate, Rename, Keys - primary Key, Foreign Key DML Commands - Select, Insert, Update, Delete, Any, All, In, Exists, Non Exists, Union, Intersection, Subqueries - nested, correlated, Joins- Inner, Outer, and Equi, Functions - SUM, COUNT, AVG, MIN, MAX, Clauses - Group By, Having By, Embedded SQL, Dynamic SQL, Transaction Concepts – Transaction model – ACID Properties – Serializability –Transactions as SQL statements. Module III Queries And Transactions Creation and Dropping of Views, Creation and Execution of Stored Procedures Cursors and Triggers - Opening, Fetching and Closing, Creation , Insertion, Deletion and Updating Database Applications: Payroll Processing Systems, Railway Reservation Systems, Bank Management System Introduction, Storage media and file structures, B+ Tree Hashing – static and Dynamic, Introduction to Query Processing – Issues in query optimization – Steps in query processing, Concurrency control and transactions. Lock based protocols Recovery System – Failure classification.									
Lab Expe 1. Conce 2. Implem 3. Querie 4. Practic 5. Implem 6. Implem	Lab Experiments: 1. Conceptual Database design using E-R DIAGRAM 2. Implementation of SQL commands DDL, DML, DCL and TCL 3. Queries to demonstrate implementation of Integrity Constraints 4. Practice of Inbuilt functions 5. Implementation of Join and Nested Queries AND Set operators 6. Implementation of virtual tables using Views									
7. Practic 8. Docum 9.Study c	e of Pro ent Da f Clouc	ocedural e tabase cre I Storage	extensions eation using	(Procedure, Fur g MongoDB	nction, Cursors, Triggers)				

10.Mini Project (Application Development)

- i) IT Training Group Database
- ii) Blood Donation System
- iii) Salary Management System

iv) Traffic Light Information System

Total Hours: 45+30=75

Text Boo	oks:							
1	Abraham Silberschatz, Henry F Korth, S Sudarshan, "Data base System Concepts", 7 th Edition, McGraw hill, 2020.							
2	Vijay Krishna Pallaw, "Database Management Systems", 2 nd Edition Asian Books Private Limited, 2010.							
3	Mark L. Gillenson, "Fundamentals of Database Systems", 7 th Edition, Wiley India Pvt. Limited, 2008.							
Reference	ce Books:							
1	Raghu Ramakrishnan, Johannes Gehrke, Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw-Hill Education, 2017							
2	C. Date, "SQL and Relational Theory", O'Reilly Media, Incorporated, 2011.							
Web Ref	erences:							
1	http://www.sqlcourse.com/							
2	https://www.w3schools.com/sql/							
3	https://www.geeksforgeeks.org/dbms/							
Online R	lesources:							
1	https://www.coursera.org/learn/database-management							
2	https://www.udemy.com/database-management-system/							
3	https://onlinecourses.swayam2.ac.in/cec22_cs18/preview							

Theory Practical							Total	Total	End Semester	Total
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)	(A+B)	Continuous Assessment	Examination	
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model - Theory									
Course Outcome	Bloom's Level	Assessment Component	FA (10%) [80 Marks]						
C201.1	Lindoratorad	Quiz	20						
C201.2	Understand	Assignment	20						
C201.3, C201.4	Apply	Group Assignment	20						
C201.5	Analyse	Case Study	20						

Assessment based on Summative and End Semester Examination - Theory									
Bloom's Level	Summative A [120	ssessment (15%) Marks]	End Semester Examination (35%)						
	CIA1: (60 Marks) CIA2: (60 Marks)		[100 Marks]						
Remember	10	10	20						
Understand	40	30	30						
Apply	50	40	40						
Analyse	-	20	10						
Evaluate	-	-	-						
Create	-	-	-						
Assessment base	d on Continuous and I	End Semester Examinat	ion - Practical						
	Continuous A	ssessment (25%)	End Semester Examination						
Bloom's Level	[100	Marks]	(15%)						
	FA: (75 Marks)	SA: (25 Marks)	[100 Marks]						
Remember	20	10	10						
Understand	20	20	20						
Apply	40	40	40						
Analyse	20	30	30						
Evaluate	-	-	-						
Create	-	-	-						

Asses	Assessment based on Continuous and End Semester Examination									
	End Semester Examination (50%)									
	CA 1 (100 Mark	s)		CA 2 (100 Marl	(s)	Practi (100	cal Exam Marks)	Theory Examination (35%)		
	F/	A 1		F.	A 2					
SA 1 (60M)	Component- I (20 Marks)	Component- II (20 Marks)	SA 2 (60M)	Component- I (20 Marks)	Component-II (20 Marks)	FA (75M)	SA (25M)	Practical Examination (15%)		

Course Outcome		Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
(CO)	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
C201.1	3	1			1					1		1	2		1	
C201.2	3	3	3	3					2	2		3	3	2	2	
C201.3	3	3	2	1					2	1	2	3	3	2	2	
C201.4	3	3	2	2	2				2	1	2	2	3	2	2	
C201.5	3	2	2		2				1	2	2	3	2	2	2	

Course I	Pre-requisites NIL										
Course (Dbjectives:										
1	To understand the JavaBeans concepts and basic of core java.										
2	To understand and develop Wrapper classes and their utilities.										
3	To employ different types of modifiers, loop statements and strir	ngs.									
4	To implement streams and java console class formatting.										
Upon completion of the course, students shall have ability to											
C201.1	Infer the basic concepts of java programming.		[U]								
C201.2	Illustrate the usage of different aspects of Controls statements in scenarios.	n real world	[AP]								
C201.3	Apply Array and strings in real time environment.										
C201.4	Analyse and Interpret String Buffer and StringBuilder Classes.										
C201.5	Utilize the functionalities of streams and java console class.		[AP]								
Course 0	Contents:										
MODULE Introduce Console in Type Cor Operator Operator if-else Bra MODULE Looping using bre Instantiat dimension Facts Ab StringBui Navigatio MODULE Streams Random Currency Locating	Course Contents: 15 Hrs MODULE I Introduction to Java Introduction to Java: Java Architecture- JVM, JRE & JDK, Keywords, Features of Java, Console input and output statements, variables and Identifiers, Scope of Variables, Data types, Type Conversion, Comments, Command Line Arguments, Access Modifiers Operators - Unary Operator - Arithmetic Operator - Shift Operator - Relational Operator - Bitwise Operator - Logical Operator - Ternary Operator and Assignment Operator. Decision Statements - if Statements, if-else Branching, switch Statements. MODULE II Loops, Array & Strings 15 Hrs Looping Statements: using for loop, using while Loops, Using do Loops. Jump Statements: using break and continue, Unlabelled Statements, Labelled Statements. Arrays: Declaration, Instantiation and Initialization of Java Array, Types of Array - Single Dimension array, Multidimension array Strings: String, StringBuilder, and StringBuilfer, The String Class, Important Methods in the String Class, The StringBuilfer and StringBuilder Classes, Important Methods in the StringBuilder Classes, File Navigation and I/O. MODULE III Java I/O 15 Hrs Streams: Types of Streams, The Byte-stream I/O hierarchy, Character Stream Hierarchy, Random Access File class, The java.io.Console Class, Serialization, Dates, Numbers, and										
Looding	Total The	ory Hours	45								
Lab Com	ponent	-									
S.No	List of Experiments	CO Mapping	BT								
1	Implementation of simple java program using Command Line Arguments	C201.1	[E]								
2	Implementation of simple java programs using decision making statements	C201.2	[E]								
3	Implementation of simple java programs using Looping C201.2 statements										
4	Implementation of Simple java programs using Jump statements	C201.2	[E]								

Java Programming

F (Theory Programming)

22AD201

Nature of Course

3/0/2/4

5	Implementation of 1D Array	C201.3	[E]								
6	Implementation of 2D Array	C201.3	[E]								
7	Implementation of String functions	C201.4	[E]								
8	Implementation of simple java program using Streams	C201.4	[E]								
9	Implementation of simple java program using Date and Number classes	C201.4	[E]								
10	Implementation of simple java program using Tokenizing	C201.5	[E]								
	Т	otal Hours	45+30=75								
Text Bo	oks:										
1	Herbert Schildt, "Java: The Complete Reference", 9th edition, Ta	ata McGraw	Hill, 2014.								
2	Kathy Sierra, "Head First Java: A Brain-Friendly Guide, 2nd Edit	tion, Oreilly,	2009.								
3	3 Herbert Schildt, "Java A Beginner's Guide, Create, Compile and Run Java Programs Today", 8th edition, Tata McGraw Hill, 2020.										
Referen	ice Books:										
1	Paul Deitel, Harvey Deitel, "Java How To Program", 10th Edition Publications, 2014.	n, Prentice H	lall								
2	Y. Daniel Liang, "Introduction to Java Programming", 9th Edition Publications, 2015.	, Prentice H	all								
3	Ed Roman, RIma Patel, Sriganesh, Gerald Brose, "Mastering Er 3 rd edition, Wikely, 2005.	nterprise Jav	/aBeans"								
Web Re	ferences:										
1	http://www.nptel.ac.in										
2	http://www.javaworld.com										
3	https://www.learnjavaonline.org/										
4	https://www.codecademy.com/learn/learn-java										
Online R	esources:										
1	https://www.coursera.org/courses?query=java										
2	https://www.tutorialspoint.com/java/index.htm										
3	https://www.w3schools.com/java/java_intro.asp										

Assessment Theory				Р	ractical		Total	Total	End Semester	Total
Formative	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)	(A+B)	Continuous Assessment	Examination	
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model - Theory										
Course Outcome	Bloom's Level	Assessment Component	FA (10%) [80 Marks]							
C201.1	Understand	Quiz & Assignment	20							
C201.2	Apply	Assignment	20							
C201.3	Apply	Case study	20							
C201.4	Analyze	Croup Assignment	20							
C201.5 Apply		Group Assignment	20							

Assessment based on Summative and End Semester Examination - Theory											
Bloom's Level	Summative A [120	Assessment (15%) 0 Marks]	End Semester Examination (35%)								
	CIA1: (60 Marks)	CIA2: (60 Marks)	[100 Marks]								
Remember	20	10	10								
Understand	10	10	15								
Apply	70	80	75								
Analyse	-	-	-								
Evaluate	-	-	-								
Create			-								
Assessment base	ed on Continuous and Er	nd Semester Examination -	Practical								
Bloom's Level	Continuous A [10	Assessment (25%) 0 Marks]	End Semester Examination (15%)								
	FA: (75 Marks)	SA: (25 Marks)	[100 Marks]								
Remember	10	10	10								
Understand	20	10	10								
Apply	70	80	80								
Analyse	-	-	-								
Evaluate	-	-	-								
Create	-	-	-								

Asses	Assessment based on Continuous and End Semester Examination											
	End Semester Examination (50%)											
	CA 1 (100 Mark	(S)		CA 2 (100 Marks)			cal Exam Marks)	Theory Examination				
	F/	A 1		FA 2				(35%)				
SA 1 (60M)	Component- I (20 Marks)	Component- II (20 Marks)	SA 2 (60M)	Component- I (20 Marks)	Component- II (20 Marks)	FA (75M)	SA (25M)	Practical Examination (15%)				

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
C201.1	2	2	2						2			2	2		2
C201.2	3	3	3					2	2	2		2	2	2	2
C201.3	2	2	3		2				2			3			3
C201.4	3	2	2		2			2	2	2		3		2	3
C201.5	3	2	2		2			2	2	2		3		2	3
1	Rea	sonab	ly Ag	reed	2	Moderately Agreed				3	Strongly Ag			d	

22EE202		Analog Electronics		3/0/2/4								
Nature of	Course	E (Theory skill based)										
Course P	re-requisites	NIL										
Course O	bjectives:											
1	To remember	the basic PN junction diode and its applications.										
2	To understand apply BJT to a	d the basic structure, operation and characteristics o act as amplifier.	f Electronic D	evices and								
3	To gain knowl	ledge about differential amplifiers.										
4	4 To analyze the small signal characteristics of transistor amplifiers and oscillators.											
Upon completion of the course, students shall have ability to												
C202.1	Describe the b	Describe the basic PN junction diode and its applications [U]										
C202.2	Analyse the b Devices.	Analyse the basic structure, operation and characteristics of Electronic [A]										
C202.3	Apply the cha	racteristics of transistors for amplifier operations		[AP]								
C202.4	Analyse the c	haracteristics of feedback amplifiers		[A]								
C202.5	Infer the operation	ation of phase shift and Wien bridge oscillator		[U]								
Course C	ontents:											
Module 1: Diodes10 HrsTheory of PN junction - PN Junction Diode –Structure, Operation and V-I Characteristics - Rectifiers- Half Wave and Full Wave Rectifiers, Diode clampers and clippers - Operation and V-ICharacteristics of Zener diode - Structure, Operation of LED and LCD - Structure, Operation ofCharge Coupled Display (CCD).Module 2: Electronic Devices and their Characteristics15 HrsBipolar Junction Transistors (BJT) - Types - Structure and Operation - Input and OutputCharacteristics - Transistor as a switch - Biasing of BJT. Junction Field Effect Transistors (JFET) -Types - Structure and Operation - Drain and Transfer Characteristics - FET as Variable Resistor -Metal Oxide Semiconductor Field Effect Transistor (MOSFET) - Types - Structure, Operation and V-ICharacteristics of n-channel MOSFET-Biasing of MOSFET.Module 3: Amplifier Circuits and OscillatorsBJT small signal model - Analysis of CE amplifier, Gain and Frequency response - DifferentialAmplifier - Multi-stage amplifier - Common mode and Differential mode analysis - Current mirrorcircuits. Basic concepts of Feedback amplifier - types - Negative feedback - Stability of FeedbackAmplifier - Multivibrators - Time based Circuits. Condition for oscillations - Phase shift Oscillator -												
Lab Cam		Total Tr	neory Hours	45								
	ponents		<u> </u>									
S.No	List of Experi	ments	CO Mapping	BT								
1	Characteristics	s of PN diode	C202.1	[U]								
2	Characteristics	C202.1	[U]									
3	Zener diode based voltage regulator C202.1											
4	Design of half	Design of half wave, full wave and bridge rectifier circuits C202.1 [AP]										
5	Diode as clippe	Diode as clipper and clamper [AP]										
6		haracteristics of BJT in CE configuration C202.2 [AP]										
	Characteristics	Configuration C202.2 [AP] Configuration C202.2 [AP]										

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8	Frequency Response of Common Emitter BJT Amplifier for a public addressingsystem.	C202.3	[AP]							
9	Simulation of signal conditioning circuits	C202.4	[A]							
10	Wien bridge oscillator	C202.5	[U]							
	Tota	Lab Hours	30							
		Total Hours	75							
Text Boo	ks:									
1	1 David A. Bell, 'Electronic Devices and Circuits', Oxford University Press, 5 th Edition, reprint, 2015.									
2	Floyd, Thomas.L 'Electronic Devices, Prentice Hall,9 th Edition, 2012									
3	3 S. Salivahanan, N.Suresh Kumar, 'Electronic Devices and Circuits' Tata McGraw Hill, 6 th									
Reference	e Books:									
1	Robert Diffenderfer, 'Electronic Devices: Systems and Applicatio 2010.	ns', Cengage	e Learning,							
2	Robert L.Boylestad, 'Electronic Devices and Circuit theory', Pearso	n Education,	2013,							
3	Jacob Millman, Christos.C.Halkias and SatyabrataJit, 'Electronic Tata McGraw Hill, 2010.	Devices and	d Circuits',							
4	Theodore F. Bogart, Jeffery S. Beasley and Guilermo Rico, 'Electronic Devices and Circuits', Pearson Education, 6 th edition, 2019.									
Web Ref	erences:									
1	https://nptel.iitg.ernet.in/Elec_Comm_Engg//Video-ECE.pdf									
2	https://nptel.ac.in/video.php?subjectId=117103063									

	Theory			Pi	ractical		Total	Total	End Semester	Total
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)	(A+B)	Continuous Assessment	Examination	
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model - Theory											
Course Outcome	Bloom's Level	Assessment Component	FA (10%) [80 Marks]								
C202.1	Understand	Quiz	20								
C202.2	Analyze	Class Presentation	20								
C202.3	Apply	Assignment	20								
C202.4	Analyze	Case Study	20								
C202.5	Understand		20								

Assessment base	Assessment based on Summative and End Semester Examination - Theory							
Bloom's Level	Summative / [12	Assessment (15%) 0 Marks]	End Semester Examination (35%)					
	CIA1: (60 Marks)	CIA2: (60 Marks)	[100 Marks]					
Remember	20	20	20					
Understand	20	20	20					
Apply	30	30	30					
Analyse	30	30	30					
Evaluate	-	-	-					
Create	-	-	-					
Assessment base	ed on Continuous and E	nd Semester Examination -	Practical					
Bloom's Level	Continuous [10	Assessment (25%) 00 Marks]	End Semester Examination (15%)					
	FA: (75 Marks)	SA: (25 Marks)	[100 Marks]					
Remember	0	0	0					
Understand	40	40	40					
Apply	30	30	30					
Analyse	30	30	30					
Evaluate	0	0	0					
Create	0	0	0					

Asses	Assessment based on Continuous and End Semester Examination										
	Continuous Assessment (50%)										
	CA 1 (100 Mark	s)		CA 2 (100 Mark	(S)	Practio (100	cal Exam Marks)	Theory Examination			
	F/	A 1		F	A 2			(35%)			
SA 1 (60M)	SA 1 (60M)Component- I (20 Marks)Component- II (20 Marks)SA 2 (60M)Component- I (20 Marks)FA (75M)SA (25M)										

No. of the CO	РО 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C202.1	2	1			2							2	3	3	
C202.2	3	3	2	2	2							2	3	3	
C202.3	3	2	1	1	2							2	3	3	
C202.4	3	3	2	2	2							2	3	3	
C202.5	2	1			2							2	3	3	
1	Rea	sonab	ly Ag	reed	2	Moderately Agreed			3	ę	Strongl	y Agree	d		

22EE203	3 Basics of Electrical Circuits Laboratory 0/0								
Nature of	Course M (Practical application)		I						
Pre-requi	sites Nil								
Course O	bjectives:								
1	To implement the basic DC and AC Electric Circuits.								
2	To estimate the current flow and voltage across the circuit elements using different theorems.								
3	To understand the frequency and transient response of electric circuit.								
Course O Upon con	utcomes: npletion of the course, students shall have ability to								
C203.1	Estimate voltage and current by KVL and KCL in an Electric Circuit.		[A]						
C203.2	Verify the current flow and voltage across the circuit elements usin analysis method.	ng different	[A]						
C203.3	Determine frequency and transient response of electric circuit.		[U]						
C203.4	Analyze the different electrical circuits by simulation		[A]						
C203.5	Measure three phase power in a three phase AC circuits.		[AP]						
Course C	ontents:								
S.No	List of Experiments	CO Mapping	RBT						
1	Estimation of voltage and current by KVL and KCL in an Electric Circuit.	C202.1	[A]						
2	Determination of mesh current and node voltage by Mesh and Nodal C202.1								
3	Apply Superposition Theorem in Electrical Circuits C202.3								
4	Apply Reciprocity Theorem in Electrical Circuits	C202.3	[AP]						
5	Application of Thevenin's theorem for Maximum Power Transfer	C202.3	[AP]						
6	Apply Norton Theorem in Electrical Circuits	C202.3	[AP]						
7	Determination of series and parallel resonance frequency response of circuits.	C202.5	[U]						
8	Determination of transient current in RL, RC and RLC circuits	C202.5	[U]						
9	Verification of circuit analysis by simulation	C202.4	[A]						
10	Measurement of three phase power	C202.5	[AP]						
	Total Hours	30)						
Text Bool	<s:< td=""><td></td><td></td></s:<>								
1	Joseph A. Edminister, Mahmood Nahvi, "Electric circuits", Schaum"s 5 th Edition, New Delhi ,2020.	series, McG	Fraw- Hill,						
2	William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, "Engineeri TMH publishers, 8 th Edition, New Delhi, 2017.	ng Circuits /	Analysis",						
3	M. E. Van Valkenburg, "Network Analysis", Phi Learning, 3/E 3rd Edition	n, 2014.							
Reference	e Books:								
1	Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric C Edition, McGraw Hill, 2017.	Circuits",	3 rd						
2	Robins & Miller, "Circuit analysis theory and practice", Delmar Publishe Edition, 2012.	ers,	5 th						
3	J Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis McGraw Hill, 2017.	and Synthe	sis", Tata						
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Web Refe	Web References:							
1	http://www.electrical4u.com/circuit-analysis.html							
2	http://www.technologystudent.com							
3	http://www.allaboutcircuits.com							
4	http://www.nptel.ac.in							

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination								
Bloom's Level	Continuous A [100	End Semester Practical Examination						
	FA (75 Marks)	SA (25 Marks)	(40%) [100 Marks]					
Remember	0	0	0					
Understand	20	20	20					
Apply	30	30	30					
Analyse	30	30	30					
Evaluate	20	20	20					
Create	0	0	0					

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C203.1	3	2	1	1			1	2	2	2			3		3
C203.2	3	2	1	1			1	2	2	2			3		3
C203.3	3	3	2	2			1	2	2	2			3		3
C203.4	3	2	1	1			1	2	2	2			3		3
C203.5	2	1			3								3	2	
1	Rea	sonab	ly Ag	reed	2	I	Moder	ately	Agree	d	3		Strongl	y Agree	d

22EE301		Electrical Machines - I	3/0/0/3
Nature of	Course	G (Theory and Analytical)	
Course P	re-requisites	Basics of Electrical Circuits	
Course C	bjectives:		
1	To study the bas	sic concepts of magnetic field.	
2	To understand	the construction, working principle of DC machines and ana	lyse their
2	performance.		
3	To familiarize w	vith the construction details of different types of transformers,	working
Course C	outcomes:		
Upon cor	npletion of the c	ourse, students shall have ability to	
C301.1	Interpret the bas	sic concepts of magnetic circuits and infer the different magnetic	เบา
	excited system.		L - J
C301.2	Analyse the ope	ration of various DC machine configurations.	[A]
C301.3	Choose an app	propriate DC motor for any industrial application and	[AP]
	appraise its sign	micance.	
C301.4	Interpret the cor	istructional details of different type of transformers, working	[U]
	principle and the		
C301.5	operations.	frormance of single-phase and three -phase transformer	[A]
Course C	contents:		

Module 1: Magnetic Fields and Magnetic Circuits

Nature of magnetic field - Electromagnetism - Leakage flux and fringing effect - Reluctance and Permeance - BH Characteristics - Analysis of series and parallel magnetic circuit - Properties of magnetic material - Faraday's law of electromagnetic induction - Induced voltage and Induction -Eddy current and hysteresis losses - Singly and Double excited magnetic system.

Module 2: DC Machines

DC Generator - Construction, Principle of Operation - EMF equation - Types, Characteristics, commutation - Interpoles - Armature reaction - Armature circuit equation for motoring and generation. DC Motor - Principle of operation - Torque equation - Types - Electrical and mechanical characteristics - Need for starters - Types of starters - Soft starters - Braking - Speed control methods - Testing of DC motors - Case study: selection of DC motors for various industrial application.

Module 3: Single Phase and Three Phase Transformers

Single Phase Transformers - Principle of operation - Types - Basic construction - Equivalent circuit -Phasor diagram - Regulation and efficiency - Separation of Hysteresis and Eddy current losses -Testing of Transformers - Open circuit and short circuit tests, polarity test, back-to-back test. Three phase Transformers - Construction - Types of connection and their comparative features - Auto transformer - All day efficiency - Parallel operation of transformers.

> Total Hours 45

Text Boo	ks:								
1.	A.E. Fitzgerald, Charles Kingsley, JR., Stephen D. Umans, "Electric Machinery", 6th								
	Edition, McGraw Hill International Edition, New York, 2017.								
2.	P.C.Sen, "Principles of Electric Machines and Power Electronics", Wiley, 2013.								
2	D.P. Kothari and I.J. Nagrath, "Electric Machines", Tata McGraw Hill Publishing								
3	Company Ltd, 2017.								
Referenc	e Books:								
1	I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 5 th Edition,								
I	2017.								
-									
2	P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.								

15 Hrs

15 Hrs

15 Hrs

Web Ref	Web References:							
1	https://courses.lumenlearning.com/boundless-physics/chapter/magnetism-and- magnetic-fields/							
2	https://library.automationdirect.com/selecting-motors-industrial-applications/							
3	https://electrical-engineering-portal.com/erection-procedure-for-power-transformer							

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessme	Assessment Methods & Levels (based on Blooms' Taxonomy)							
Formative	Assessment bas	ed on Capstone Model						
Course Outcome	Course OutcomeBloom's LevelFA (16%) [80 Marks]							
C301.1	Understand	Online Quiz	20					
C301.2	Analyze	Class Presentation	20					
C301.3	Apply	Assignment	20					
C301.4	Understand	Case Study	20					
C301.5	Analyze	Case Study	20					

Assessment based on Continuous and End Semester Examination								
Bloom's Level	Summative As [120]	sessment (24%) Marks]	End Semester Examination (60%)					
	CIA1 : [12 Marks]	CIA2 : [12 Marks]	[100 Marks]					
Remember	20	20	20					
Understand	30	30	20					
Apply	10	20	30					
Analyse	30	30	30					
Evaluate	-	-	-					
Create	-	-	-					

Assessme	Assessment based on Continuous and End Semester Examination							
Continuous Assessment (40%) [200 Marks]						End		
	Examination							
SA 1	FA 1 (40	0 Marks)		FA 2 (4	10 Marks)	(60%)		
(60 Marks)	[100 Marks]							

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C301.1	3	1	1	1										2	
C301.2	3	2	2	1										2	
C301.3	3	2	1									3		2	
C301.4	3	3	3	2		1	1					2		3	
C301.5	3	3	3	2		1	1					2		3	
1	Rea	sonab	ly Ag	reed	2	Moderately Agreed			3		Strongl	y Agree	d		

22EE302		Digital Electronics	3/0/0/3
Nature of	Course	J (Problem Analytical)	
Course P	re-requisites	Analog Electronics	
Course C	bjectives:		
1	To understand	the working of logic families and logic gates.	
2	To design and i	mplement Combinational and Sequential logic circuits.	
3	To use Program	nmable Logic Devices to implement the given logical problem.	
Course C	outcomes:		
Upon cor	npletion of the	course, students shall have ability to	
C302.1	Interpret, conve	ert and represent different number systems.	[U]
C302.2	Manipulate and	l examine Boolean algebra, logic operations, Boolean	[A]
	Evolutions and the	rent types of memories and Programmable Logic Devices to	
C302.3	implement the	riven logical problem	[U]
C302.4	Design various	combinational logic circuits	[A]
C302.5	Design various	sequential logic circuits	[A]
Course C	contents:		
Medule 4	. Fundamentale	of Digital Systems and logis families	
		of Digital Systems and logic families	nrs
Digital Sig	inals - Digital Cir	cuits - Logic Gates - Boolean algebra - Theorems, Number Syste	ems, one's
and two's	s Complements	- Codes - Arithmetic Codes, Error Detecting and Correcti	ng Codes
Character	isticsof digital IC	Cs - Standard representation for logic functions - K-map repre	esentation,
simplificat	tion of logic fund	ctions using K-map and Quine McCluskey method. Digital logic	families -
TTL, Scho	ottky TTL and CN	MOS logic, interfacing CMOS and TTL, Tri-state logic.	
Module 2	· Combinationa	I Digital Circuits, memories and Programmable Logic Device	s 12 Hrs
Design of	Addore Subtra	ctors Carry look aboad adder sorial adder - Multiplever De-N	
Encoder	Decoders priorit	ty encoders decoders/drivers for display devices ALLL. Element	otary ALLI
design -	Digital comparat	or - Parity checker and generator - code converters - Memorie	
ROM PR	OM FPROM F	EPROM PLDs EPGA Introduction to Verilog HDI	5 - INAIVI,
Medule 2	· Convential air		llee
wodule 3		cuits and systems	
Types of	Flip-Flops - Shift	t Registers - Analysis of Synchronous Sequential Logic circuits -	Design of
Synchron	ous Sequential L	ogic circuits - state table and excitation tables, state diagrams,	Moore and
Mealy mo	odels - Design of	f counters using flip-flops - synchronous counters, Modulo Cour	nters, Ring
Counters,	ripple (Asyncl	hronous) counters - Sequence Generator. Analysis of Asy	nchronous
sequentia	I logic circuits -	Design of Asynchronous sequential logic circuits - Transition	table, flow
table, race	e conditions, circ	uits with latches, implication table, hazards. Case study: ATM Ma	achine.
		Total H	ours 45
Text Boo	ks:		
	M. Morris R.	Mano, Michael D. Ciletti, "Digital Logic Design", Prentice	e Hall.5th
1	Edition,2013.		,
2	Floyd, "Digital F	Fundamentals", Pearson education, 11th edition, 2015.	
3	A.Anand kuma	ar, "Fundamental of Digital Circuits", PHI Learning Private	Ltd, 4th
5	edition, 2016.		
Referenc	e Books:		
1	R. P. Jain, "Moo	dern Digital Electronics", McGraw Hill Education, 4th Edition, 2009).
2	Tocci R.J., Nea	al S. Widmer, "Digital Systems: Principles and Applications	". Pearsor
	Education Asia	, 2014.	,
3	Donald P Leac	h, Albert Paul Malvino, Goutam Sha, "Digital Principles and Ap	olications",
	TataMcGraw H	ill, 7th Edition, 2010.	,
Weh Refe	rences.		
1	https://online.co	urses.nptel.ac.in/noc18_ee33	
	-		
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2	http://www.ni.com/example/14493/en/
3	http://electronics-course.com/

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessmer	Assessment Methods & Levels (based on Blooms' Taxonomy)								
Formative <i>i</i>	Assessment base	ed on Capstone Model							
Course Outcome	Course OutcomeBloom's LevelFA (16%) [80 Marks]								
C302.1	Understand	Assignment	20						
C302.2	Analyse	Technical Online Quiz	20						
C302.3	Understand	Class Presentation	20						
C302.4	Analyse	Simulation Exercise	20						
C302.5	Analyse		20						

Assessment based on Summative and End Semester Examination								
Bloom's Level	Summative Ass [120 M	sessment (24%) Marks]	End Semester Examination (60%)					
	CIA1 : [12 Marks]	CIA2 : [12 Marks]	[100 Marks]					
Remember	20	20	20					
Understand	20	20	20					
Apply	30	30	30					
Analyse	30	30	30					
Evaluate	-	-	-					
Create	-	-	-					

Assessme	Assessment based on Continuous and End Semester Examination							
	End							
	Semester Examination							
SA 1	FA 1 (4	0 Marks)		FA 2 (4	40 Marks)	(60%)		
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	[100 Marks]		

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C302.1	3	1	1	1										2	
C302.2	3	2	2	1										2	
C302.3	3	2	1									3		2	
C302.4	3	3	3	2		1	1					2		3	
C302.5	3	3	3	2		1	1					2		3	
1	Rea	sonab	ly Ag	reed	2	Moderately Agreed			3		Strong	y Agree	d		

Nuture of			
Course P	re-requisites	Nil	
Course O	bjectives:		
1	To analyse circuit	characteristics with signal analysis using Op-amp ICs.	
2	To design and cor	nstruct application circuits with ICs as Op-ampand 555 ICs.	
3	To study internal f	functional blocks and the applications of special ICs like Timers,	
0	regulator ICs and	DAC/ADCs.	
Course O	utcomes:		
Upon cor	npletion of the co	urse, students shall have ability to	
C303.1	Impact the Knowle	edge on basic building blocks of linear integrated circuits.	[U]
C303.2	Design the applica	ation circuits with IC741.	[A]
C303.3	Design the differen	nt applications of Op-amps and study their characteristics.	[A]
C303.4	Analysethe variou	s waveform generation and 555 Timer.	[A]
C303.5	Intrepret the know	ledge of special function ICs	
Course C	ontents:		
Madula 4	IC Febrication or	d On ann Characteristics	45 11.0
Module 1	: IC Fabrication ar	nd Op-amp Characteristics	15 Hrs
Advantage	es of ICs over	discrete components -Manufacturing process of monolithic	ICs –
Construct	ion of monolithic l	bipolar transistor - Integrated Resistors- General operational	amplifier
stages ar	nd internal circuit	diagrams of IC 741- Ideal Op-amp characteristics. DCperfe	ormance
characteri	stics slow rate On	en and closed loop configurations	
characteri	31103, 310W Tate, Op		
Module 2	: Application of O	p-amps 1	5 Hrs
Sign Cha	nger. Scale Chang	er. Phase Shift Circuits, Voltage Follower, V-to-Land I-to-V cor	nverters.
addor	subtractor Instru	montation amplifier Integrator Differentiator Logarithmics	molifior
auuer, s			impimer,
Antilogarit	inmic amplifier, Col	mparators, Schmitt trigger, Precision rectifier, peak detector, clip	per and
clamper, l	_ow-pass, high-pas	s and band-pass	
Analog a	nd Digital Data Co	onversions: D/A converter – specifications - weighted resistortyp	e, R-2R
Ladder tv	ne sample-and-hol	d circuits Δ/D Converters – specifications - Elash type - Su	conscive
		a circuits, A/D Converters - specifications - mash type - out	50033170
Approxima	allon type .		
Module 3	: Waveform Gener	rators and Special ICs 15 I	Hrs
Sine-wave	e denerators Triand	ular wave generator Saw-tooth wave generator- Function gener	ator
	mor IC EEE: Euro	ational block diagram characteristics & applications Acto	blo and
		cuonal block diagram, characteristics & applications - Asta	
monostab	le multivibrator -Vo	bitage Controlled Oscillator, IC Voltage regulators - I hree termi	hal fixed
and adjus	table voltage regula	ators - IC 723 general purpose regulator - switching regulator .	
		Total Hou	ırs 45
Text Boo	ks:		I
	D. Rov Choudary.	S.B. Jain. " Linear Integrated Circuits". Third edition. New Age	
1	publishers, 2014.	, ;	
	Ramakant A Gava	akwad " Opamps and Linear Integrated Circuits" IV edition	
2	Pearson Education	n/PHI 2009	
	I V Wait I P H	uelsman and G. A. Korn. "Introduction to Operational Amplifier th	
3	and applications"	McGraw Hill II S 1002	leory
Poforono			
Reference	Bohart E. Courabliu	n and Driacoll " Operational Amplifiers and Linear Integrated	
I	Circuite" 6/o Boo	rson Education, Operational Amplimers and Linear Integrated	
2		O Maran "An aluaia and Dasima (Analas Istanta I Ciarita Ist	
2	P. R. Gray and R.	G. Meyer," Analysis and Design of Analog Integrated Circuit, Jol	าท
	Wiley, 4th Ed, Rep	orint 2009.	
3	Sergio Franco. " I	Design with operational amplifiers and Analog Integrated circuit	s". Tata
	McGraw Hill 3rd F	dition 2002.	, /
Wah Dafe			
vved Kete	erences:		

Linear Integrated Circuits

G (Theory Analytical)

22EE303

Nature of Course

3/0/0/3

	2002, Available from: http://www.ti.com/lit/an/slod006b/slod006b.pdf
2	www.ti.com/amplifier-circuit/overview.html
3	https:// <u>www.ti.com/seclit/ml/ssqu016/ssqu016.pdf</u>
4	http://www.ti.com/lit/ds/symlink/opa2192.pdf

Formative Assessment	e Int Summative Assessment		Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)							
Formative Assessment based on Capstone Model							
Course OutcomeBloom's LevelAssessment ComponentFA (16%) [80 Marks]							
C303.1	Understand	Quiz					
C303.2	Analyze	Simulation exercises 20					
C303.3	Analyze	Class Presentation 20					
C303.4	Analyze	Assignment	20				
C303.5	Understand	Assignment	20				

Assessment based on Summative and End Semester Examination							
Bloom's Level	Summative As [120 I	End Semester Examination (60%)					
	CIA1 : [12 Marks]	CIA2 : [12 Marks]	[100 Marks]				
Remember	20	20	20				
Understand	20	20	20				
Apply	30	30	30				
Analyse	30	30	30				
Evaluate	-	-	-				
Create	-	-	-				

Assessment based on Continuous and End Semester Examination							
Continuous Assessment (40%) [200 Marks]						End	
	arks	Semester					
SA 1	FA 1 (40 Marks)			FA 2 (4	40 Marks)	(60%)	
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	[100 Marks]	

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C303.1	2	1					2				2	2	2		
C303.2	3	3	2	2			2				2	2	3	2	
C303.3	3	3	2	2			2				2	2	3	2	
C303.4	3	3	2	2			2				2	2	3	2	
C303.5	2	1					2				2	2	2		
1	Rea	sonab	ly Ag	reed	2	Moderately Agreed		3		Strongl	y Agree	d			

22MA304			Calculus and Transforms II (ECE/EEE)		3/1/0/4				
Nature of	Course	e	B (Analytical)						
Pre requi	sites		-						
Course O	Course Objectives:								
To familiarize with functions of several variables applicable in engineering and to understand the different possible forms of Fourier series and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data.									
2	To acc engine	quaint the stuc ering fields.	ent with transform techniques whic	h are used in a \	ariety of				
3	To stu terms	dy the concep of partial diffe	of mathematical formulation of ce ential equations.	rtain practical pro	blems in				
4	Apply	the knowledge	of differential equation and extrem	ne values of					
Course O Upon con	utcome npletior	es n of the cours	e, students shall have ability to						
C304.1	Reme	mber the basi	concepts of partial differentiation	and integration.	[R]				
C304.2	Under proble	rstand the c ems.	ncepts of Fourier series to s	olve engineerin	g [U]				
C304.3	3 Find the extreme values of the given functions to solve the engineering [AP]				g [AP]				
C304.4	.4 Illustrate Fourier transform techniques in Signals, System analysis and Digital signal processing and to apply the Z transform techniques in [AP] discrete sequences.								
C304.5	Apply	analytical me	nods to solve the partial differentia	l equations.	[AP]				
Course C	ontents	6							

Module 1 - Functions Of Several Variables and Fourier Series

20 Hrs

Functions of several variables: Total derivatives – Differentiation of implicit functions – Jacobians – Taylor series expansion – Maxima and Minima (excluding constrained maxima and minima) Fourier Series: Dirichlet's conditions – General Fourier Series – Odd and Even Functions – Half range sine series and cosine series – Parseval's Identity – Harmonic Analysis.

Module 2 - Transforms

20 Hrs

20 Hrs

Fourier Transform: Complex form of Fourier Transforms – Fourier sine and cosine transforms – Properties – Convolution theorem and Parseval's Identity (Statement only) – Evaluation of integrals using Parseval's Identity.

Z-transform: Convergence of Z-transform – Z-transform of Standard functions – Properties – Inverse Z-transform – Convolution theorem (Statement only) – Solution of difference equations using Z-transform Techniques.

Module 3- Partial Differential Equations

Introduction to PDE – Solving PDE by Lagrange's linear equations – Linear homogeneous partial differential equations of second and higher order with constant coefficients – Classifications – Application of partial differential equations: One dimensional wave equation – One dimensional equation of heat conduction –Fourier series solutions in Cartesian coordinates

	Total hours	60				
Text Books:						
1	Kreyszig E, "Advanced Engineering Mathematics" Tenth Edition, Jo Sons (Asia) Limited, Singapore 2018.	ohn Wiley and				
2	Grewal B.S, "Higher Engineering Mathematics", 44th edition, Khanna Publications, Delhi, 2018.					
3	Grewal. B. S, "Numerical methods in Engineering and Science", Kh Publications, Delhi, 2016.	anna				
Reference	Reference Books:					

1	Veerarajan. T, "Transforms and Partial differential equations", 3rd edition, Tata					
•	McGraw-Hill Publishing Company Ltd., reprint, 2016.					
2	N.P. Bali ,"A Text book of Engineering Mathematics Sem - III/IV" 13th edition, Laxmi					
2	Publications Ltd, 2017.					
_	Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 4th					
3	edition, 2016.					
Mak Def						
Web Ret	erences:					
1	https://www.youtube.com/watch?v=jNC0jxb0OxE					
2	https://www.youtube.com/watch?v=iRXXmtcocAQ					
3	https://www.youtube.com/watch?v=OGT59INHz3Y					
Online R	Online Resources:					
1	https://nptel.ac.in/courses/111/106/111106111/					
2	https://nptel.ac.in/courses/111/107/111107111/					
3	https://nptel.ac.in/courses/111/107/111107107/					

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)							
Formative Assessment based on Capstone Model							
Course Outcome	Bloom's Level	FA (16%) [80 Marks]					
C304.1	Remember	Quiz	20				
C304.2	Understand	Seminar	20				
C304.3 – C304.5	Apply	Tutorial	20				
C304.3 – C304.5	Apply	Assignment	20				

Assessment based on Summative and End Semester Examination							
Bloom's Level	Summative Ass [120 M	essment (24%) arks]	End Semester Examination (60%)				
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]				
Remember	20	20	20				
Understand	30	30	30				
Apply	50	50	50				
Analyse	-	-	-				
Evaluate	-	-	-				
Create	-	-	-				

Assessment based on Continuous and End Semester Examination											
	End										
	CA 1: 100 Ma	rks		Semester Examination							
SA 1 (60 Marks)	FA 1 (4	0 Marks)	SA 2 (60 Marks)	FA 2 (4	(60%)						
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	[100 Marks]					

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C304.1	1	1	1										1		
C304.2	1	2	1										2		
C304.3	3	3	2										2		
C304.4	1	1	2										1		
C304.5	2	1	2										2		
1	Reasonably Agreed			2	Moderately Agreed			d	3		Strongly Agreed				
22TA201Tamils and Technology1/0/0/1															
--	--	--	---	--	--	--	--	--	--						
Nature o	ature of Course C (Theory Concept)														
Pre requ	uisites	NIL													
Course	Objectives:														
1 To know about weaving, ceramic, design and construction technologies in sangam age.															
2	To know the irrigation.	e significance of technologies such as manufacturing,	agriculture and												
3	To understar	nd the development of Scientific Tamils and Tamil Compu	ting.												
Course	Outcomes :														
Upon co	mpletion of	the course, students shall have ability to	1												
C201.1	Describe at technology.	bout the weaving industry in sangam age and cerar	nic [U]												
C201.2	Observe the	design of houses, sculptures and construction of temples	s. [U]												
C201.3	Relate the Silappathika	various manufacturing materials and stone types ram.	in [U]												
C201.4	Understand ancient perio	the significance of agriculture and irrigation technology od.	in [U]												
C201.5	Explain the of Tamil boo	growth of scientific Tamil, Tamil computing and digitizat ks.	on [U]												
Course	Contents:														
Weaving technolo Constru househo Details o Great Te (Madura Saracen	g and Cerar gy – Black a ction Techn Id materials d of Stage Cons emples of Cho i Meenakshi ic architecture	nic Technology: Weaving Industry during Sangam and Red Ware Potteries (BRW) – Graffiti on Potterie ology: Designing and Structural construction House uring Sangam Age - Building materials and Hero stones of tructions in Silappathikaram - Sculptures and Temples of blas and other worship places - Temples of Nayaka Per Temple) - Thirumalai Nayakar Mahal - Chetti Nadu e at Madras during British Period.	Age – Ceramic es. Design and & Designs in of Sangam age – Mamallapuram - iod - Type study Houses, Indo -												
Module – II: 5 Hours Manufacturing Technology: Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel - Copper and gold - Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads - Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram. Agriculture and Irrigation Technology: Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.															
Module – III :5 HoursScientific Tamil & Tamil Computing:Development of Scientific Tamil - Tamil computing –Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – TamilDigital Library – Online Tamil Dictionaries – Sorkuvai Project.															
		Total Hours	s 15												
Text Bo	oks:														
1	சுமிமா வா	லாறு – மக்களும் பண்பாடும் – கே கே பிள்ளை	പ്രഖണ്ണിന്നം												

2.	கணினித் தமிழ் – முனைவர் இல. சுந்தரம் _{. (} விகடன் பிரசுரம்).
3.	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் ₍ தொல்லியல் துறை
	வெளியீடு
4.	பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
Refere	nce Books:
1.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessmer	Assessment Methods & Levels (based on Blooms' Taxonomy)							
Formative /	Formative Assessment based on Capstone Model							
Course Outcome	Bloom's Level	Assessment Component	FA (16%) [80 Marks]					
C201.1	Understand	Seminar	20					
C201.2	Understand	Quiz	20					
C201.3, C201.4	Understand	Quiz	20					
C201.5	Understand	Seminar	20					

Assessment based on Summative and End Semester Examination							
Bloom's Level	Summative Asso [120 M	essment (24%) arks]	End Semester Examination (60%)				
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]				
Remember	40	40	40				
Understand	60	60	60				
Apply	-	-	-				
Analyse	-	-	-				
Evaluate	-	-	-				
Create	-	-	-				

Assessment based on Continuous and End Semester Examination							
	End Semester						
	CA 1 : 100 Ma	arks		Examination			
	FA 1 (4	0 Marks)	• • •	FA 2 (40 Marks)		(60%) [100 Marks]	
SA 1 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - (20 Marks)	Component - II (20 Marks)	[

Course Outcome	Programme Outcomes (PO)											Programme Specific Outcomes (PSO)			
(CO)	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C201.1	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1
C201.2	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1
C201.3	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1
C201.4	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1
C201.5	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1

22CS201	Data Structures and Algorithms1/0/4/3									
Nature of	Course F (Theory Programming)									
Course P	Course Pre-requisites Problem Solving using C++									
Course O	Course Objectives:									
1	To introduce list da	ata structure and its applications.								
2	To impart the impo	ortance of stacks and queues in problem solving.								
3	To discuss the role	of hashing in information storage and retrieval								
Course O	outcomes:	rse, students shall have ability to								
C201 1	Implement the bas	ic data structures like array and Linked List		[AP]						
C201.2	Solve real world structures.	problems efficiently by applying stack and o	queue data	[AP]						
C201.3	Illustrate the applic	ations of tree data structures.		[AP]						
C201.4	Discuss importanc	e of hashing technique in information storage.		[AP]						
C201.5	Employ graph ale analyze them.	gorithms for solving real time computing pro	blems and	[A]						
Course C	contents:									
Module 1 Linked List & Stack5 HrsLinked List: Array vs Linked list - Types of linked list - Singly, Doubly and Circular Linked list - Applications of linked list. Stack: Stack Model, Array and Linked list implementation of Stack - Applications of Stack - Infix, Prefix andPostfix expressions - infix to postfix conversion - Expression Evaluation- Balancing Parenthesis.Module 2: Queue and Trees5 HrsQueue: Queue Model, Array and Linked list implementation of Queue-Priority Queue - Applications of Queue. Trees: Binary Tree - Binary Search Tree - Insertion, Deletion, Traversal - Inorder, Preorder, Postorder, Level order traversal.Module 3: Graphs and Hashing5 HrsGraphs: Weighted and Directed graphs - Adjacency matrix and list implementation - Traversal - Breadth First Search & Depth First Search. Hashing: Direct Address Table, Hash function, Collision resolution techniques Linear Probing quadratic probing double bashing										
Lab Com	ponents			10						
S.No	List of Experimen	ts	CO Mapping	BT						
1	Implementation of S	Singly, Doubly and Circular Linked List.	C201.1	[E]						
2	Implementation of S	Stack using Arrays.	C201.3	[E]						
3	Implementation of S	Stack using Linked List.	C201.2	[E]						
4	Implementation of S	Stack applications	C201.3	[E]						
5	Implementation of (Queue using Arrays.	C201.3	[E]						
6	Implementation of (Queue using Linked List.	C201.3	[E]						
7	Implementation of (Queue applications.	C201.3	(F)						
		plementation of Queue applications. C201.3 [E]								
8	Implementation of H	lashing techniques	C201.3	[E]						

10	Implementation of Graph Traversal algorithms C201.4 [E]									
	Total Lab Hours									
	Total Hours 75									
Text Bo	Text Books:									
1	Sartaj Sahni, "Data Structures, Algorithms and Applications publications, 2004.	in C++", Sil	icon paper							
2	Anany Levitin, Introduction to the design & analysis of algorithms ,3 rd Edition,Pearson Education, 2021									
3	Michael T. Goodrich, "Data Structures and Algorithms in C++", 2nd Edition, Wiley Publication, 2011.									
Referen	ce Books:									
1	Seymour Lipschutz, "Data Structures by Schaum Series", 2nd edition, Tata McGraw Hill, 2013.									
2	Narasimha Karumanchi, "Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles" 5th Edition CareerMonk 2016									
3	Debasis Samanta, "Classic data structures", Prentice Hall of India,	2 nd edition, 20	014.							
Web Re	ferences:									
1	https://www.codingninjas.com/courses/c-plus-plus-data-structures-	and-algorithn	าร							
2	2 https://www.edx.org/course/data-structures-algorithms-using-c									
Online I	Resources:									
1	https://www.programiz.com/dsal									
2	https://freevideolectures.com/course/2519/c-programming-and-data	a-structures								
3	https://www.cprogramming.com/algorithms-and-data-structures.htm	nl								

Theory			Practical			Total	Total	End Semester	Total	
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)	(A+B)	Continuous Assessment	Examination	
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model - Theory								
Course Outcome	Bloom's Level	Assessment Component	FA (10%) [80 Marks]					
C201.1	Apply	Quiz	20					
C201.2	Apply	Case study	20					
C201.3	Apply	Group Assignment	20					
C201.4	Apply	Assignment	20					
C201.5	Analyze	Assignment	20					

Assessment based on Summative and End Semester Examination - Theory							
Bloom's Level	Summative Assessment (15%) [120 Marks]						
	CIA1: (60 Marks)	CIA2: (60 Marks)					
Remember	30	30					
Understand	20	20					
Apply	50	50					
Analyse	-	-					
Evaluate	-	-					
Create	-	-					

Assessment based on Continuous and End Semester Examination - Practical										
Bloom's Level	Continuous A [100	Assessment (25%)) Marks]	End Semester Examination (50%)							
	FA: (75 Marks)	SA: (25 Marks)	[100 Marks]							
Remember	10	10	10							
Understand	30	30	30							
Apply	60	40	40							
Analyse	-	20	20							
Evaluate		-	-							
Create	-	-	-							

Asses	Assessment based on Continuous and End Semester Examination											
	End Semester											
	CA 1 (100 Mark	s)		CA 2 (100 Mark	(\$)	Practic (100	al Exam Marks)	Practical Examination				
	F/	\ 1		F/			(50%)					
SA 1 (60M)	Component- I (20 Marks)	Component- II (20 Marks)	SA 2 (60M)	Component- I (20 Marks)	Component- II (20 Marks)	FA (75M)	SA (25M)					

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
C201.1	3	3	2									1	3	1	1
C201.2	3	3	3	3	3				2	1		2	3	2	2
C201.3	3	3	3	3	3				2	1		2	3	2	2
C201.4	3	3	3	3	3				2	1		2	3	2	2
C201.5	3	3	3	3	3				2	1		2	3	2	2
1	Reasonably Agreed				2	Moderately Agreed				3	95	Strongl	y Agree	d	

22	CS301	Advanced Java Programming	1,	/0/4/3						
Nature of	Course	F (Theory Programming)								
Pre requi	sites	Java Programming								
Course O	bjectives:									
1	1 To provide insight knowledge of OOP concepts and usage of this, static, super and final keywords.									
2	To discus	s about different type of Collection Frameworks.								
3	To demor	nstrate threads, JDBC & exception handling with real world e	xamples.							
4	To illustra	te designing of GUI applications using swing component.								
Course O	utcomes:									
Upon con	npletion of	the course, students shall have ability to								
C302.1	Illustrate and the u	the OOPs concepts like Constructors, Inheritance, Polym sage of this, static, super and final keywords.	orphism	[AP]						
C302.2	Apply the usage of o	e concepts of Exception Handling in real world application collection frameworks.	ons and	[AP]						
C302.3	Develop I	Multithreaded applications.		[AP]						
C302.4	Develop GUI Applications using swing component and to explain the [AP]									
C302.5	302.5 Develop java application to interact with database by using relevant JDBC Driver.									
Course C	ontents									

Module 1: Introduction to OOPS

Class and Object, Encapsulation and Abstraction, Inheritance, Polymorphism, Message Passing, Keywords : this, super, static, final, extends and implements. Method Signature and Prototype, Mutator Methods and Accessor Methods, Var-Arg Method, hashCode() and toString() methods. Immutable Objects Vs Mutable Objects, User defined Immutable Class, Constructors : Introduction, Default Constructor, User Defined Constructors, Constructor Overloading, Instance Variable, Instance Methods, Instance Block and Instance Flow Of Execution. Regular Expressions (RegEx).

Inheritance Introduction, Types of Inheritance, Up Casting, Down Casting, IS-A Relationship & HAS-A Relationship, Composition Vs Aggregation, **Polymorphism:** Method Overloading, & Method Overriding.

Module 2: Abstraction, Exception Handling & Collections

Abstraction:Abstract Methods and Abstract classes. Interfaces, abstract classes and Interfaces, Concrete Methods Vs Abstract Methods, Differences between classes, abstract classes and Interfaces, Marker Interfaces. **Exception** - try catch block, Finally Block, Exception Hierarchy, Multiple Exceptions In a Catch Block, Parameterized Try Block, Overriding Methods And Exception. Creating Your Own Exception, The Assert Keyword, The Generics Framework, **Collections:** Set, List, Map & Tree, The Iterator Interface. Working with Hashtable Collection **Threads:** Introduction to Threads, Creating And Starting Threads, Basic Thread Control Methods. Multithreading, Working with Multiple, threads, Thread Life Cycle, Thread Priorities, Synchronizing Methods.

Module 3: Swings, Servlets & JDBC

Swings: Introduction, JLabel, JButton, JTextField ,JTextArea, JPasswordField, JCheckbox, JComboBox, JRadioButton, JScrollBar, JMenuItem and JMenu.

JDBC: Drivers, CURD operations, Database connectivity

Servlets : Overview of Servlets , Servlet Life Cycle, Servlet Request and Response , web.xml and its need, Servlet Configuration, Session Tracking

Total Hours 15

5 Hrs

5 Hrs

5 Hrs

List of Experiments

- 1. Implementation of default and parameterized constructors.
- 2. Implementation of method overloading and overriding.
- 3. Implementation of Inheritance.
- 4. Implementation of Abstract and Interface concepts.
- 5. Programs using collection Interface.
- 6. Implementation of multithreading Concepts.
- 7. Program to handle multiple exception using try, catch and finally block.
- 8. Implementation of swing components.
- 9. Implement Simple application using servlets.

10.Implement CURD operation using JDBC.

	······································							
	Total Lab Hours	60						
	Total Hours	75						
Тех	t Books:							
1.	Herbert Schildt, "Java: The Complete Reference", 12 th edition, Mc craw Hill, 2021.							
2.	Robert Liguori, Patricia Liguori, "Java 8 Pocket Guide", O'Reilly Media, 2014.							
3.	ShagunBakliwal, Hands-on Application Development using Spring Boot, bpb publisher, 2021.							
Ref	Reference Books:							
1	Paul Deitel, Harvey Deitel, "Java How To Program", 10th Edition, Prentice Hall Publications	,2014.						
2	Cay S.Horstmann and GaryCornell, "Core Java, Vol.2: Advanced Features", 9th Edition, Hall, 2013.	Prentice						
We	b References:							
1	https://www.javatpoint.com/java-tutorial							
2	https://www.geeksforgeeks.org/java/							
3	http://www.javatpoint.com/java-tutorial							
On	line Resources:							
1	http://www.coursera.org/specializations/object-oriented-programming							
2	http://www.udemy.com/topic/java-certification/							
3	http://www.edx.org/learn/jav							

	Theory			Practical			Total	Total	End Semester	Total
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)	(A+B)	Continuous Assessment	Examination	
80	120	200	100	75	25	100	200	50	50	100

Assessment Methods & Levels (based on Blooms' Taxonomy)											
Formative Assessment based on Capstone Model											
Course Outcome Bloom's Level Assessment Component FA (16%) [80 Marks]											
C301.1 & C301.2	Apply	Quiz	20								
C301.3	Apply	Assignment	20								
C301.4 & C301.5	C301.4 & C301.5 Apply Case Study 40										

Assessment based on Summative and End Semester Examination - Theory									
Bloom's Level	Summative As [120	sessment (15%) Marks]							
	CIA1: (60 Marks)	CIA2: (60 Marks)							
Remember	10	10							
Understand	40	40							
Apply	40	40							
Analyse	10	10							
Evaluate	-	-							
Create	-	-							

Assessment based on Continuous and End Semester Examination - Practical										
Bloom's Level	Continuous [10	Assessment (25%) 00 Marks]	End Semester Examination (50%)							
	FA: (75 Marks)	SA: (25 Marks)	[100 Marks]							
Remember	10	10	10							
Understand	30	30	30							
Apply	40	40	40							
Analyse	20	20	20							
Evaluate	-	-	-							
Create	-	-	-							

Asses	Assessment based on Continuous and End Semester Examination											
	End Semester											
	CA 1 (100 Mark	s)		CA 2 (100 Mark	(S)	Practic (100	cal Exam Marks)	Practical Examination				
	F#	\ 1		F/			(50%)					
SA 1 (60M)	Component- I (20 Marks)	Component- II (20 Marks)	SA 2 (60M)	Component- I (20 Marks)	Component- II (20 Marks)	FA (75M)	SA (25M)					

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C301.1	3	3	3	1					2	2		2	3	2	3
C301.2	3	3	3	3	2				3	2		2	3	2	2
C301.3	3	3	3	2	3				2	2		2	3	3	3
C301.4	3	3	3	2	3				2	2		2	3	3	3
C301.5	3	3	3	2	3				2	2		2	3	3	3
1	Rea	sonab	ly Ag	reed	2	Moderately Agreed				3	Strongly Agreed				

22EE304		Electrical Machines – I Laboratory 0/0/2/1										
Nature of	f Course	M (Practical application)										
Pre-requ	isites	Basics of Electrical Circuits										
Course C	bjectives:											
1	To determi methods.	ne the characteristics of DC machines by using simula	ation and exp	perimental								
-	To know	the performance characteristics of transformers ba	sed on vari	ous tests								
2	underno lo	bad, loading conditions, open circuit and short circuit con	ditions.									
3	To analyse	the equivalent circuit parameters of transformers.										
Course Outcomes:												
Upon co	mpletion of	the course, students shall have ability to										
C304.1	Analyze the generator.	e no load and load characteristics of DC Separately e	xcited D C	[A]								
C304.2	Illustrate th	ne mechanical and electrical characteristics of Shunt ,Ser	ies	[U]								
C304.3	Sketch the equivalent circuit of Single phase Transformer and calculate the parameters of equivalent circuit. [AP]											
C304.4	Analyze the	Analyze the different types of three phase transformer Connections. [AP]										
C304.5	Demonstrate the indirect method of testing of DC machine to determine its efficiency. [A]											
Course C	contents:											
S.No		List of Experiments	CO Mapping	RBT								
1.	Analysis of	open circuit characteristics of DC shunt generator.	C304.1	[A]								
2.	Analysis of	no-load and load characteristics of separately excited	C304.1	[A]								
	DC genera	tor.	000111	6.7								
3.	Examine th	e effective efficiency and speed-torque characteristic of	C304.2	[U]								
1	DC snunth	ion the lead characteristics of DC compound motor	0004.0									
4. 5	Determinat	notion of Efficiency using Swinburne's test	C304.2	[U]								
Э.	Fredetermi	nation of Efficiency using Swinburne's test	C304.2	[U]								
	Examine th	e Speed Control methods of DC shunt motor by										
6	i) Field Con	trol	0004.0	Г А Ј								
0.	i) Armoturo		C304.2	[A]								
	ii) Annature	Control Method / Channer based Control										
	III) Voltage	of the equivelent circuit peremeters of a single phase										
7	transforme		C304 3	[AP]								
7. 8	Verification	of Three phase Transformer connections	C304.3	[]]								
0. Q	Separation	of No load losses in single phase transformers	C304.4									
10	Testing of t	Testing of transformers using Sumpor's Test										
10.			0304.3									
			31									
Text Boo	ks:											
1.	A.E. Fitzger	aid, Unarles Kingsley, JR., Stephen D. Umans, "Electric	Machinery", 6	oth								
2	PCSpn "D	rinciples of Electric Machines and Power Electronics" M	ilev 2013									
۷.	D.P. Kotha	ri and I.J. Nagrath. "Electric Machines". Tata Mo	Graw Hill	Publishina								
3	Company L	td, 2017.										

Reference	e Books:
1	I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 5 th Edition, 2017.
2	P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
Web Refe	rences:
1	https://courses.lumenlearning.com/boundless-physics/chapter/magnetism-and-magnetic-fields/
2	https://library.automationdirect.com/selecting-motors-industrial-applications/
3	https://electrical-engineering-portal.com/erection-procedure-for-power-transformer

	Continuous Assessment								
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total				
75	25	100	60	40	100				

Assessment based on Continuous and End Semester Examination									
	Continuous As [100	End Semester Practica Examination							
Bloom's Level	FA (75 Marks)	FA SA (4 (75 Marks) (25 Marks) [100							
Remember	0	0	0						
Understand	20	20	20						
Apply	30	30	30						
Analyse	30	30	30						
Evaluate	0	0	0						
Create	20	20	20						

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C304.1	3	3	2	2			1	2	2	2			3		3
C304.2	3	2	1	1			1	2	2	2			3		3
C304.3	3	3	2	2	3		1	2	2	2			3		3
C304.4	3	2	1	1			1	2	2	2			3		3
C304.5	3	2	1	1			1	2	2	2			3		3
1	Rea	sonab	ly Ag	reed	2	Moderately Agreed			3		Strongl	y Agree	d		

22EE305	Line	ar and Digital Integrated Circuits Laboratory		0/0/2/1					
Nature of	f Course M (Practical application)								
Pre-requi	uisites Electric Circuit Analysis, Analog Electronics								
Course O	bjectives:								
1	To implement the basic circuits using op-amp and to implement the timer IC application.								
2	To design ar	d verify the output of Combinational circuits.							
3	To design ar	d verify the output of Synchronous Sequential circuits	•						
Course O Upon con	outcomes: npletion of th	e course, students shall have ability to							
C305.1	Implement th	e basic circuits using op-amp.		[AP]					
C305.2	Design of dif timer IC appl	ferent applications of electronic circuits using Op-amp ication.	and the	[A]					
C305.3	Design and v	verify the output of Combinational circuits.		[A]					
C305.4	Design and v	verify the output of Synchronous Sequential circuits		[A]					
Course C	ontents:								
S.No		List of Experiments	CO Mapping	RBT					
1.	Implementat	on of Inverting and Non inverting Amplifier	C305.1	[AP]					
2.	Design of Int	egrator and Differentiator using op-amp.	C305.2	[A]					
3.	Implementation of Zero crossing detector, Peak Detector using Op-amp C305.2								
4.	Implementat	ion of Adder and subtractor using Op-amp	C305.2	[AP]					
5.	Implementat 555 timers.	on of astable and monostable multivibrators using	C305.2	[AP]					
6.	Realization of	f logical gates using NAND and NOR logic.	C305.3	[AP]					
7.	Design of Ac	der and Subtractor circuits.	C305.3	[A]					
8.	Design of Co	de convertors.	C305.3	[A]					
9.	Design of Er	coders and Decoders using logic gates.	C305.3	[A]					
10.	Design and i Register usir	mplementation of synchronous counter and Shift g flip flops.	C305.4	[A]					
		Total Hours	30)					
Text Boo	ks:								
1	A.Anand kun 2014.	nar, 'Fundamental of Digital Circuits', PHI Learning Pri	vate Ltd, 4th	Edition,					
2	James M.Fic	re, 'Opamps and Linear Integrated Circuits', Cengage	Learning Ind	dia Pvt.					
3	M. Morris R. 2013.	Mano, Michael D. Ciletti, 'Digital Logic Design', Prenti	ce Hall, 5th E	Edition,					
Reference	e Books:								
1	ML Anand, "	Basic Electronics", S CHAND & Company Limited, 202	22.						
2	Anand, M.L. Francis, 202	"Modern Electronics and Communication Engineering	g", Taylor &						
3	Allan H. Rob Learning, 20	bins and Wilhelm C, Miller, "Circuit Analysis Theory ar 13.	nd Practice",	Cengage					
Web Refe	erences:								
1	http://nptel.a	c.in/courses/117103064/							
2	http://nptel.a	c.in/courses/117106114/							
3	http://nptel.a	c.in/courses/108106069/							
4	http://nptel.a	c.in/courses/117106086							

	Continuous As	sessment			
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination									
	Continuous As [100 l	End Semester Practical Examination							
Bloom's Level	FA (75 Marks)	SA (25 Marks)	(40%) [100 Marks]						
Remember	-	-	-						
Understand	-	-	-						
Apply	60	60	60						
Analyse	30	30	30						
Evaluate	10	10	10						
Create	-	-	-						

	Course Articulation Matrix (Laboratory)														
No. of the CO	РО 1	PO 2	PO 3	РО 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C305.1	2	1			3								3	2	
C305.2	3	3	2	2	3	2	2		2		2	2	3	3	
C305.3	3	3	2	2	3	2	2		2		2	1	3	3	
C305.4	3	3	2	2	3	2	2		2		2	2	3	3	
1	Reasonably agreed					2	Мо	derat	ely ag	greed	3		Strong	ly agree	ed

22EE401	Electrical Machines- II							
Nature of	Course	G (Theory & Analytical)						
Course P	re-requisites	Electrical Machines - I						
Course O	bjectives:							
1	To know the cor	cepts of Rotating Magnetic Field.						
2	To impart the kn	owledge of Synchronous and Induction Machines.						
3	To analyze the	performance of Synchronous and Induction Machines.						
Course O	utcomes:							
Upon con	npletion of the co	ourse, students shall have ability to						
C401.1	Illustrate the Co Alternators and	nstruction and Operation of Salient and Non-Salient Pole Synchronous Motors.	[U]					
C401.2	Examine the Pe	rformance of Synchronous Machines by various Methods	[A]					
C401.3	Interpret the Con Motor.	nstruction and Operation of Single and Three Phase Induction	[U]					
C401.4	Analyze the Per	formance of Induction Machines by various Methods.	[A]					
C401.5	C401.5 Investigate the Operation of various Starters and Speed Control methods of [A] Induction Motor.							
Course C	ontents:							
	Synchronous M	lachines 20 l	dre					

Introduction - MMF distribution - Rotating Magnetic Field. **Alternators:** Constructional details-Principle of operation and types of Rotor- EMF equation- Armature reaction - Voltage regulation -EMF, MMF and ZPF- Two Reaction Theory - Synchronization and Synchronizing Power - Parallel operation. **Synchronous motors:** Starting methods, Phasor diagram, V and Inverted - V Curves, Hunting and its suppression, Effect of change in Excitation, Synchronous Condenser.

Module 2: Induction Machines

15 Hrs

Three phase induction motors: Constructional details - Principle of operation and types of Rotor -Slip - Starting and Maximum torque - Slip-Torque Characteristics, No Load and Blocked Rotor test -Equivalent Circuit- Circle Diagram - Crawling and Cogging.

Single- Phase Induction Motors: Constructional details - Principle of Operation and types - Double Field Revolving Theory - Equivalent Circuit and its applications.

Module 3: Starting and Speed Control Methods of Induction	on Motors	10 Hrs
Need for Starting - Types of Starters - Rotor Resistance	Star- Dolta	Autotransformer and

Need for Starting - Types of Starters - Rotor Resistance, Star- Delta, Autotransformer and Soft Starters, Speed control - Change of Voltage, Frequency, Number of Poles, V/F Control - Braking Methods, Case study on Industry based Soft Starters.

	Total Hours 45									
Text Book	(S:									
1.	A.E. Fitzgerald, Charles Kingsley, JR., Stephen D. Umans, "Electric Machinery", 6th Edition, McGraw Hill International Edition, New York, 2017.									
2.	P.C.Sen, "Principles of Electric Machines and Power Electronics", Wiley, 2013.									
3	D.P. Kothari and I.J. Nagrath, "Electric Machines", Tata McGraw Hill Publishing Company Ltd, 2017.									
Reference	e Books:									
1	I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 5 th Edition, 2017.									
2	P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.									
Web Refe	rences:									
1	http://nptel.ac.in/syllabus/syllabus.php?subjectId=108105018									
2	http://freevideolectures.com/Course/2335/Basic-Electrical-Technology/23									
3	https://www.electrical4u.com/deep-bar-double-cage-induction-motor/									

	End	Total				
Formative Assessment	Formative AssessmentSummative AssessmentTotalTotal IA					
80	120	200	40	60	100	

Assessme	Assessment Methods & Levels (based on Blooms' Taxonomy)									
Formative	Formative Assessment based on Capstone Model (16 Marks)									
Course Outcome	Course OutcomeBloom's LevelAssessment ComponentMarks									
C401.1	Understand	Online Quiz	20							
C401.2	Analyze	Case Study	20							
C401.3	Understand	Accimpont	20							
C401.4	C401.4 Analyze Assignment 20									
C401.5 Analyze Technical Presentation 20										

Assessment based on Continuous and End Semester Examination										
Bloom's Level	Continuous As	End Semester								
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[60 Marks]							
Remember	20	20	20							
Understand	30	30	30							
Apply	20	20	20							
Analyse	30	30	30							
Evaluate	-	-	-							
Create	-	-	-							

Summative Assessment based on Continuous and End Semester Examination											
	End Semester Examination (60%)										
	CA 1 : 100 Ma	rks		CA 2 : 100 Ma	rks						
SA 1	FA 1 (8	Marks)	• • •	FA 2 (8	I heory Examination						
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	(100 Marks)					

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C401.1	2	1							2			1	3		3
C401.2	3	3	2	2					2			1	3		3
C401.3	2	1							2	2		1	3		3
C401.4	3	3	2	2					2			1	3		3
C401.5	2	1							2	2		1	3		3
1	Reasonably Agreed			2	ľ	Noder	ately	Agree	d	3		Strong	y Agree	d	

22EE402		Electric Power Generation	3/0/0/3				
Nature of	Course	D (Theory Application)					
Pre-requis	sites	Nil					
Course O	bjectives:						
1	To understan	d the concepts of thermal power plants and their associated c	components.				
2	To enable stu	udents to understand in detail about nuclear and gas turbine p	ower plants				
2	which play ar	n important role in power generations.					
2	To understan	nd different non-conventional energy sources and their econom	nic aspects to				
3	meet desired	social requirements.					
Course O	utcomes:						
Upon com	npletion of the	e course, students shall have ability to					
C402.1	Analyze the Nuclear and	concepts of Rankine cycle and various components of The hydro power plant.	rmal, [A]				
C402.2	Illustrate the cogeneration	safety measures of power plants, operation of binary cycles systems.	and [U]				
C402.3	Illustrate the	operation of gas turbine and combined cycle power plants.	[U]				
C402.4	Enumerate t scenarios.	he concepts of renewable energy systems and their en	ergy [AP]				
C402 5	Apply the diff	erent types of Tariff, Consumers and different types of Power					
0402.5	Generation P	Plants.	[AP]				
0							

Course Contents:

Module 1: Thermal and Hydro power plants

Basic Rankine cycle and its modifications, layout of modern coal power plant, super critical boilers, FBC boilers, steam and heating rates, binary cycles and cogeneration systems. Hydro Electric Power Plants - classification, typical layout and components. case studies on thermal and hydro power plants, Gas Insulated Switchgear (GIS). Case Study: Environmental Impact Analysis analysis of Jindal thermal power plant.

Module 2: Nuclear and Gas Turbine Power Plants

Introduction, Layout and subsystems of nuclear power plants, Types of reactors, safety waste disposal for nuclear power plants, case study on nuclear power plant, Brayton cycle analysis and optimization, components of gas turbine power plants, combined cycle power plants, Integrated Gasifier based Combined Cycle (IGCC) systems, pollution control technologies. Case Study: Advancements and Challenges in India's Nuclear Power Sector: A Case Study of XYZ Nuclear Power Plant.

Module 3: Renewable Energy Sources

Construction and working of Wind, Tidal, Solar PV and Solar Thermal, Geothermal, Biogas and Fuel Cell Power Systems, Comparison of site selection criteria, relative merits and demerits, capital and operating cost of different power plants. DC systems in power plants, station control - switch yard and control room. Economic considerations – Types of Costs, Tariff and Consumers. Case Study: Decentralized Energy for the Ecological Capital.

Text Books:								
1	Rai, G.D, "Non-Conventional Energy Sources", Khanna Publishers, 2010.							
2	El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010.							
3	R.K.Hegde., "Power Plant Engineering", Pearson Publisher Limited Ltd., 2015.							
Reference	e Books:							
1	P C Sharma, "Power plant engineering", S.K. Kataria & Sons, New Delhi, 2010.							

45

15 Hrs

15 Hrs

15 Hrs

Total Hours

2	Deshpande.M.V, "Elements of Electrical Power Station Design", PHI Learning PVT LTD,2010.
3	Wadhwa.C.L, "Generation, Distribution and Utilization of Electrical Energy", Wiley Eastern Limited, 3rd Edition, 2011.
Web Refe	rences:
1	https://nptel.ac.in/courses/108105058/8
2	http://indianpowersector.com/home/power-station/thermal-power-plant/
3	www.altenergy.org/renewables/renewables.html
4	https://www.energy.gov/fe/how-gas-turbine-power-plants-work

	End	Tetel			
Formative Assessment	Summative Assessment	Semester Examination	Total		
80	120	200	40	60	100

Assessme	Assessment Methods & Levels (based on Blooms' Taxonomy)									
Formative	Formative Assessment based on Capstone Model (16 Marks)									
Course OutcomeBloom's LevelAssessment ComponentMarks										
C402.1	Analyse	Case Study	20							
C402.2	Understand	Online Quiz	20							
C402.3	Understand	Simulation Exercises	20							
C402.4	C402.4 Apply Simulation Exercises 20									
C402.1	C402.1 Apply Assignment 20									

Assessment based on Continuous and End Semester Examination										
Bloom's Level	Continuous As	End Semester								
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[60 Marks]							
Remember	20	20	20							
Understand	30	30	30							
Apply	20	20	20							
Analyse	30	30	30							
Evaluate	-	-	-							
Create	-	-	-							

Summative Assessment based on Continuous and End Semester Examination										
	End Semester Examination (60%)									
	CA 1 : 100 Ma	rks		CA 2 : 100 Ma	irks					
SA 1	FA 1 (8	Marks)	• • •	FA 2 (8	3 Marks)	Theory Examination				
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	(100 Marks)							

No. of the CO	РО 1	РО 2	РО 3	РО 4	PO 5	PO 6	РО 7	PO 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C402.1	3	1	2	1									2	2	
C402.2	3	2	1	1									2	1	
C402.3	3	2	2	1		1	1							2	
C402.4	3	3	3	2								2	2	1	
C402.5	3	2	2	1								2	2	1	
1	Rea	sonab	oly Ag	reed	2	I	Mode	rately	Agree	ed	3		Strongl	y Agree	d

22EE403		Control Systems	3/1/0/	/4					
Nature of	f Course	G (Theory Analytical)							
Course F	Pre-requisites	Transforms and Numerical Methods							
Course C	bjectives:								
1	I o understand the methods of systems representation and to derive their transfer function models.								
2	To provide an	adequate knowledge of systems in time domain and its s	stability analy	ysis.					
3	To accord bas responses of s	ic knowledge in obtaining the open loop and closed loop systems.	frequency						
4	To introduce th	e design of controllers and compensators							
Course C	Outcomes:								
Upon co	mpletion of the	course, students shall have ability to		[
C403.1	Construct the transfer function	mathematical models of various control systems and on of a system.	obtain the	[AP]					
C403.2	Analyze the f domain.	first and second order systems in time domain and	frequency	[A]					
C403.3	Analyze the fr the stability o methods.	equency responses using Bode Plot and Polar plot an f the control systems using Root locus, Routh-Hurw	d examine /itz Criteria	[A]					
C403.4	Design and rea	alize the controllers and compensators.		[C]					
C403.5	Calculate the controllers and compensators of the system and to apply basic concepts of discrete system								
Course C	Contents:								
Module 1 Basic el modelling Module 2 Time don Impulse - coefficien specificat Module 3	Module 1: System Modelling15 HrsBasic elements of control systems - Open loop and closed loop systems - Transfer function modelling: Electrical systems and Mechanical system - Translational, Rotational - signal flow graph.Module 2: Time and Frequency Response Analysis20 HrsModule 2: Time and Frequency Response Analysis20 HrsTime domain specifications - Types of test signals - First order system response - Step, Ramp, Impulse - Second Order System Response - Step input - Steady state error - Generalized error coefficients - Concept of stability - Routh Hurwitz criterion - Root locus technique - Frequency domain specifications - Bode plot - Polar plot - Gain margin and Phase margin.								
Controller lead netv Introduction of discrete	Controllers: Design of P, PI and PID controllers - Compensators: Introduction to lag, lead and lag- lead networks - Lag compensator design using Bode plot - Controllability and Observability - Introduction to Digital Control Systems: Basic Elements of discrete data control systems, advantages of discrete data control systems.								
Text Boo	ke:			60					
1	I. J. Nagrath	and M. Gopal, "Control Systems Engineering", 6 th	Edition, Ne	ew Age					
2	Katsuhiko Oga	ata, "Modern Control Engineering", 5 th edition. Pearson. N	lew Delhi. 20	015.					
3	Farid Golnaraghi and Benjamin C. Kuo, "Automatic Control systems", 9 th Edition, Wiley 2014								
Referenc	e Books:								
1	Norman S. Nis	e, "Control Systems Engineering", Wiley, New Delhi, 201	18.						
2	Richard Polev	"Control Theory Fundamentals", 2 nd Edison. Createspac	ce, 2014.						
3	Richard C. Pearson Educ	Dorf, Robert H.Bishop, "Modern Control Engineer ation, New Delhi, 2016.	ing", 13 th	Edition,					
4	A.Nagoorkani,	"Control Systems Engineering", RBA Publications 2014.							

Web References:					
1	http://www.nptel.ac.in/courses/108101037/				
2	https://nptel.ac.in/courses/108101037/14				

Formative Assessment	Summative Assessment	Total Total Assessment		End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)					
Formative <i>J</i>	Assessment base	ed on Capstone Model			
Course OutcomeBloom's LevelAssessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)FA [80]					
C403.1	Apply	Quiz	20		
C403.2	Analyze	Class Presentation	20		
C403.3	Analyze	Assignment	20		
C403.4	Create	Assignment	20		
C403.5	Apply	Case Study	20		

Assessment based on Summative and End Semester Examination							
Bloom's Level	Summative Ass [120 N	essment (24%) larks]	End Semester Examination (60%)				
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]				
Remember	20	20	20				
Understand	20	20	20				
Apply	30	30	30				
Analyse	30	30	30				
Evaluate	-	-	-				
Create	-	-	-				

Assessment based on Continuous and End Semester Examination						
	End Semester					
CA 1 : 100 Marks CA 2 : 100 Marks						Examination
	FA 1 (4	FA 1 (40 Marks)		FA 2 (40 Marks)		(60%) [100 Marks]
SA 1 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	

No. of the CO	РО 1	PO 2	PO 3	РО 4	РО 5	РО 6	РО 7	РО 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C403.1	3	2	1	1						1		2	3		
C403.2	3	3	2	2						1		2	3		
C403.3	3	3	2	2								1	3		
C403.4	3	3	3	3	3			1	2	1		3	3		1
C403.5	3	2	1	1								2	3		
1	Reasonably Agreed			2	2 Moderately Agreed			3		Strong	y Agree	d			

22MA402		Probability and Computational Methods	3/1/0/4			
Nature of (Course	B (100% Analytical)				
Course Pre	e-requisites	NII				
Course Ob	piectives:					
1	To define the	concept of probability and its features.				
0	To have a w	ell – founded knowledge of standard distributions which can	be used to			
2	describe real	life phenomena.				
3	To learn the c	concept of testing hypothesis using statistical analysis.				
4	To study the	concept of fitting a curve of best fit to the given numerical	data and to			
4	calculate the	deviation of the expected value from the observed value.				
5	To study the	various numerical methods to fit the polynomial by interpolation for	ormulas.			
Course Ou	itcomes:					
Upon com	pletion of the	course, students shall have ability to				
C402.1	Recall the cor	ncept of probability.	[R]			
	Understand t	to handle situations involving random variables and Standa	rd			
C402.2	distributions. [U]					
	Apply measures of central tendency to analyze statistical data and to find the					
C402.3	correlation an	d regression between the given data.	[AP]			
C402.4	Develop the in	nferences for engineering problems using testing of hypothesis.	[AP]			
C402.5	Apply numerio	cal methods to fit the polynomial by interpolation formulas.	[AP]			
Course Co	ntents.					

Module 1: Probability

Sample space - Axioms of Probability - Events - Conditional probability - Total Probability- Baye's Theorem (Statement only). One dimensional Random Variable - Discrete random variable Probability mass function – Discrete distributions - Binomial distribution - Poisson distribution - Continuous Random Variable - Probability density function - Continuous distribution: Uniform distribution - Normal distribution

Module 2: Statistics

Measures of Central tendency: Mean Median and Mode. Correlation (Karl Pearson's) - Rank correlation (Spearman's) - Linear regression. Testing of Hypothesis - Small Samples - Student's t-Test for single mean, difference of means - F test - Chi square test for goodness of fit and independence of attributes - Analysis of Variance - One way classification.

Module 3: Numerical Methods

Curve Fitting - Empirical laws - Linear law - Laws reducible to Linear law - Method of group averages - straight line and parabola - Principle of Least squares - Fitting straight line, Parabola and exponential curve. Interpolation - Interpolation with equal intervals - Newton's Forward and Backward difference formula - Interpolation with unequal intervals - Newton's Divided difference formula - Lagrange's interpolation formula.

	Total Hours 60
Text Books	8:
1	Peebles Jr. P.Z., Probability Random Variables and Random Signal Principles, Tata
I	McGraw-Hill Publishers, Fourth Edition, New Delhi, 2016
C	Gupta, S.C., & Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand &
2	sons, 12th edition , 2020
0	Grewal B.S., Numerical methods in Engineering and Science, 12th edition, Stylus
3	Publishing, 2018.
Reference	Books:
1	Ross, S,"A First Course in Probability, Ninth edition", Pearson Education, Delhi, 2018.
2	Richard A. Johnson, Irwin Miller, John Freund, Miller & Freund's," Probability and Statistics
	for Engineers", Ninth edition, 2016.

20 Hrs

20 Hrs

20 Hrs

3	Steven Chapra, "Applied Numerical Methods with MATLAB for engineers and scientists",			
	4 th edition, 2017.			
Web Refer	ences:			
1	http://nptel.ac.in/courses/111104079/			
2	http://www.nptelvideos.in/2012/12/probability-random-variables.html			
3	http://freevideolectures.com/Course/2311/Digital-Communication/4			
Online Res	Sourcess:			
1.	https://www.coursera.org/learn/probability-intro			
2	https://www.coursera.org/lecture/wharton-introduction-spreadsheets-models/3-1-random-			
۷.	variables-and-probability-distributions-Y3bCF			
3.	https://www.codewithc.com/newtons-interpolation-in-matlab/			

Formative Assessment	ve Summative Assessment		nt Total Continuous Assessment		Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)						
Formative Assessment based on Capstone Model						
Course OutcomeBloom's LevelFA (16%) [80 Marks]						
C402.1	Remember	Quiz	20			
C402.2	Understand	Seminar	20			
C402.3	Apply	Tutorial	20			
C402.4	Apply		20			
C402.5	Apply	Assignment	20			

Assessment based on Summative and End Semester Examination											
Bloom's Level	Summative Ass [120 M	essment (24%) arks]	End Semester Examination (60%)								
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]								
Remember	20	20	20								
Understand	30	30	30								
Apply	50	50	50								
Analyse	-	-	-								
Evaluate	-	-	-								
Create	-	-	-								

Assessment based on Continuous and End Semester Examination											
	End										
	CA 1 : 100 Ma	rks		CA 2 : 100 Ma	arks	Semester					
SA 1	FA 1 (40	0 Marks)	• • •	FA 2 (4	(60%)						
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	[100 Marks]					

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C402.1	1	1	1												
C402.2	2	2	2												
C402.3	3	3	3										1		
C402.4	3	3	3										1		
C402.5	3	3	3										1		
1	Rea	sonab	ly Ag	reed	2	Moderately Agreed		ed	3	Strongly Agreed		d			

22EE404	Electrical Machines - II Laboratory		0/0/2/1							
Nature of	Course M (Practical Application)									
Pre-requi	isites Electrical Machines - I Laboratory									
Course O	Objectives:									
1	To expose the operation of Synchronous and Induction Mac experimental skills.	chines and	give them							
Course O Upon cor	Outcomes: npletion of the course, students shall have ability to									
C404.1	Inspect the performance of Synchronous Generator by conductests.	cting various	[AP]							
C404.2	Examine the characteristics of V and inverted V curves in S	Synchronous	[A]							
C404.3	Analyze the performance of Induction Machines.		[A]							
C404.4	Investigate the performance of Induction Machines using Software.	Simulation	[A]							
C404.5	Demonstrate a specific Braking operation on an Induction Machine. [AP]									
Course C	contents:	_								
S.No	List of Experiments	CO Mapping	RBT							
1.	Performance characteristics of Three Phase Alternator by direct loading.	C404.1	[AP]							
2.	Regulation of Three Phase Alternator by EMF method.	C404.1	[AP]							
3.	Regulation of Three Phase Alternator by MMF method.	C404.1	[AP]							
4.	Regulation of Three Phase Alternator by ZPF method.	Regulation of Three Phase Alternator by ZPF method.C404.1								
5.	Regulation of Three Phase Salient Pole Alternator by Slip test. C404.1									
6. 7	V and Inverted V curves of Three Phase Synchronous Motor. C404.2									
1.	No Load and Blocked Rotor tests on Single Phase and Three	0404.3	[A]							
8.	PhaseInduction Motor (Determination of Equivalent Circuit parameters).	C404.3	[A]							
9.	Performance characteristics of Single Phase and Three Phase InductionMotors using Simulation.	C404.4	[AP]							
10.	Braking of Three Phase Induction Motor.	C404.5	[AP]							
	Total Hours	3	0							
Text Boo	ks:									
1	I. J. Nagrath and D. P. Kothari, "Electric Machines", McGr Edition, 2017.	aw Hill Edu	cation 5 th							
2	A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw H	ill Education,	2013.							
3	P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.									
Reference	e Books:									
1	P. C. Sen, "Principles of Electric Machines and Power Electronic Third Edition, 2013.	s", John Wile	y & Sons,							
2	M.G. Say," Alternating Current Machines", Pitman Publishing Ltd.	, 4 edition, 2	2013.							
3	A. S. Langsdort, "Alternating current machines", McGraw Hill Edu	cation, 2010	1							
	erences:									
1 2	http://http://freevideoloctures.com/Course/2225/Resid Electrical Technol	$\sqrt{22}$								
2	https://www.electrical/u.com/deen-bar-double-cago-induction.ma	tor/								
<u> </u>	https://www.clocifical-u.com/weep-bal-uouble-cage-induction-induct									
5	http://www.engineeringmatters.com/EngineeringMatters_Project	Maglev pdf								
, v										

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination										
	Continuous A [100	End Semester Practical Examination								
Bloom's Level	FA (75 Marks)	FA SA (75 Marks) (25 Marks)								
Remember	-	-	-							
Understand	-	-	-							
Apply	60	60	60							
Analyse	30	30	30							
Evaluate	10	10	10							
Create	-	-	-							

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C404.1	2	1							2			1	3		3
C404.2	2	1							2			1	3		3
C404.3	2	3	2	2					2			1	3		3
C404.4	2	1			3				2			1	3		3
C404.5	3	2	1	1					2			1	3		3
1	Rea	sonab	ly Ag	reed	2	Moderately Agreed			3	Strongly Agreed			d		

22EE405	Control Systems Laboratory		0/0/2/1								
Nature of	Course M (Practical application)	i									
Pre-requi	sites Control Systems										
Course O	bjectives:										
1	To enable the students to strengthen their understanding of the desig control systems using modern software resources.	n and analy	/sis of								
Course O	utcomes:										
Upon con	npletion of the course, students shall have ability to										
C405.1	Construct the transfer function a DC separately excited generator an characteristics	d obtain its	[AP]								
C405.2	Construct the transfer function of the given DC Motor for Armature and Field controlled cases	controlled	[AP]								
C405.3	Demonstrate Servo and stepper motor System also to set up a closed loop position control system and study the system performance.										
C405.4	Analyze the time response and stability of first and second order Systematics	tems	[A]								
C405.5	Design a Controllers and lag compensator for uncompensated system simulation software	stem using	[A]								
Course C	ontents:										
S.No	List of Experiments CO Mapping										
1	Determination of transfer function of separately excited DC Generator	C405.1	[AP]								
2	Determination of transfer function of Armature Controlled DC Motor	C405.2	[AP]								
3	Determination of transfer function of Field Controlled DC Motor	C405.2	[AP]								
4	Servo motor position control systems	C405.3	[U]								
5	Stepper motor position control systems	C405.3	[U]								
6	Simulation of first and Second order system for different test inputs	C405.4	[A]								
7	Time response analysis for a second order system using simulation software	C405.4	[A]								
8	Stability analysis of linear systems using digital simulation software	C405.4	[A]								
9	Design of P, PI, PD and PID controllers for type-0 and type-1 system using	C405.5	[A]								
10	Design of lag, lead and lag-lead compensator for uncompensated system using simulation software.	C405.5	[A]								
	Total Hours	3	0								
Text Boo	ks:										
1	I. J. Nagrath and M. Gopal, "Control Systems Engineering", 6 th Editio International Publishers, 2017	n, New Age									
2	Katsuhiko Ogata, "Modern Control Engineering", 5 th edition, Pearson,	New Delhi,	2015.								
3	Wiley,2014.	, 9 th Edition,									
Reference											
1	Norman S. Nise, "Control Systems Engineering", Wiley, New Delni, 20)18.									
2	Richard Poley, "Control Theory Fundamentals", 2 ¹¹⁴ Edison, Createspace, 2014.										
3	Richard C. Dorf, Robert H.Bishop, "Modern Control Engineering", 13 th Edition, Pearson Education, New Delhi, 2016.										
4	A.Nagoorkani, "Control Systems Engineering", RBA Publications 2014.										
5	S.Palani, "Control Systems Engineering", 2 ¹¹⁴ Edition, Tata McGraw-F	IIII Educatio	n,2010.								
1	nttp://www.nptel.ac.in/courses/10810103//										
2	nttp://www.nptei.ac.in/courses/108102043/										
3	nttps://nptei.ac.in/courses/108101037/14										

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination										
Bloom's Level	Continuous / [10	End Semester Practica Examination								
	FA (75 Marks)	SA (25 Marks)	(40%) [100 Marks]							
Remember	0	0	0							
Understand	20	20	20							
Apply	30	30	30							
Analyse	30	30	30							
Evaluate	0	0	0							
Create	20	20	20							

No. of the CO	РО 1	PO 2	РО 3	РО 4	РО 5	РО 6	РО 7	PO 8	РО 9	РО 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
C405.1	3	2	1	1						2			3		
C405.2	3	2	1	1						2			3	1	
C405.3	2	1											2	1	
C405.4	3	3	2	2	3			2	2	1		2	2	1	
C405.5	3	3	3	3	3			2		1	1	2	2		2
1	Rea	sonab	oly Ag	reed	2	Moderately Agreed 3 Strongly Agree				y Agreed	b				

22EE501		Transmission and Distribution	3/0/0)/3							
Nature of	Course	G (Theory Analytical)									
Course P	re-requisites	Basics of Electrical Circuits									
Course O	bjectives:										
1	1 To understand the transmission line parameters calculation for different conductors.										
2	To analyze the	concept of modelling, corona loss and efficiency of tran	nsmission li	ne.							
3	To introduce th Distribution sy	e transmission line Sag calculation methods, Substatior stem.	n layout and	d							
4	To examine the	e load duration curve, economic aspects and power tarif	ff calculatio	n.							
5	To demonstrate	e the selection of cables and insulators in power system	network.								
Course O	utcomes:										
Upon con	npletion of the	course, students shall have ability to									
C501.1	Explore the kn transmission li	owledge in the electrical circuit parameters calculation a ne losses.	and	[A]							
C501.2	Investigate the	e modelling and simulation concepts of transmission line	es.	[A]							
C501.3	Illustrate the co layout.	oncept of Sag Calculation, DC distribution, Feeders, Sul	bstation	[AP]							
C501.4 Analyze the load duration curve, economic aspects and power tariff calculation [A methods.											
C501.5	C501.5 Interpret the overhead line insulators, underground cables and its losses. [U]										
0											

Course Contents:

Module 1: Transmission line parameters calculation

Resistance, inductance, capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing of solid and bundled conductors, effect of earth on capacitance. Introduction to transmission loss, Ferranti effect and corona loss, Travelling wave phenomena.

Module 2: Modelling and Performance of transmission lines - Substation and Distribution system 15 Hrs

Modelling and simulation of medium and long transmission lines, efficiency and regulation Mechanical design of transmission lines. Sag Calculation, Load Duration Curve. Introduction to DC distribution system and its losses, Substation layout, radial and ring systems, selection of feeders and distributors, economic aspects and tariff calculations.

Module 3: Overhead line insulators, Underground cables

Selection of Insulators, different types, string efficiency. Selection of cables, rating of cables, constructional details of various types of cables, oil and gas-filled cables, XLPE cable, capacitance grading, sheath loss, thermal ratings.

	Total Hours	45
Text Bool	(S:	
1	Leonard.L. Grigsby, Electric Power Generation, Transmission and distribution, Edition, CRC Press, 2012.	Third
2	C.L. Wadhwa, Generation, Distribution and Utilization of Electrical Energy, The New Age International, 2015.	nird Edition,
3	Colin Bayliss, Brain Hardy, Transmission and Distribution Electrical Enginee Edition, Newnes Publishers, 2011.	ring, Fourth

15 Hrs

15 Hrs

Reference	e Books:							
1	V.K. Me	hta, Principles of Power	System, S. Chand Publication, 2011.					
2	A. S. Pabla, Electric Power Distribution, McGraw Hill International Edition, 2012.							
3	S.N. Si (Second New De	S.N. Singh, Electric Power Generation, Transmission and Distribution, Twelfth Printing (Second Edition) Published by Asoke K. Ghosh, Prentice-Hall of India Private Limited, New Delhi, 2011.						
Web Refe	rences:							
1	http://np	otel.ac.in/video.php?subj	jectId=108102047					
2	http://te	xtofvideo.nptel.iitm.ac.in	/108102047/lec20.pdf					
3	https://v	https://www.edx.org/course/smart-grids-electricity-future-ieeex-smartgrid-x-0						
Assessm	ent Meth	ods & Levels (based o	n Bloom's Taxonomy)					
Formative	e assess	ment based on Capsto	ne Model					
Cour Outco	rse ome	Bloom's Level	Assessment Component	Marks				
C402	2.1	Analyze	Online Quiz	20				
C402	2.2	Apply	Assignment	20				
C402	2.3	Apply	Case Study	20				
C402	2.4	Analyze	Case Study	20				
C402	2.5	Understand	Class Presentation	20				

Summative as	sessmen	t bas	ed on Continu	ious ar	nd End Sen	nester Examinat	tion
			End Somostor				
Bloom's			Theory		Formative	End Semester Examination	
Level	CIA-		CIA-II	Tern	n End	Assessment	[50 marks]
	[10 Mar	ks]	[10 Marks]	Exam [10 n	ination narks]	[20 Marks]	
Remember	-		20	20 20		20	20
Understand	20		30	30		20	30
Apply	30		30	30		30	30
Analyse	50		20		20	30	20
Evaluate	-		-				-
Create	-		-		-	-	-
Formativo			Summativ	/e Asse	essment		
Formative			Continuous		End	Semester	Total
Assessment			Assessment	t	exa	amination	
20			30			50	100

No. of the CO	РО 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C501.1	3	3	2	2		2	2			1	1		3	2	
C501.2	3	2	1	2	1	2	2			1	1		2		
C501.3	3	3	2	3		2	2	2		1	1	1	3		1
C501.4	3	3	2	2		2	2	2		1	1	1	3		1
C501.5	3	2	1	2		2	2			1	1		3		
1	Rea	sonab	oly Ag	reed	2	Moderately Agreed 3 Strongly Agreed			d						

22EE502	Power Electronics3/0/0/3						
Nature of	f Course	G (Theory Analytical)					
Course P	re-requisites	Analog Electronics					
Course C	bjectives:						
1	To understand	the characteristics of Power Semiconductor devices.					
2	To provide ade	quate knowledge of DC choppers.					
3	To impart the co	oncepts of PWM inverters.					
4 Course C	I O IIIUSTRATE THE	operation of AC voltage regulators.					
Upon coi	mpletion of the	e course, students shall have ability to					
C502.1	Examine the c	peration of DC-DC converter and resonant converters.		[A]			
C502.2	Infer the opera	ation of various types of controlled rectifiers.		[AP]			
C502.3	Design the sui impedance.	table filter for power converters and analyze the effect the	ne source	[A]			
C502.4	Examine the c	peration of inverters and AC-AC Converter.		[A]			
C502.5	Determine var and Electric ve	ious applications of power electronic circuits in Renewal chicles.	ole energy	[AP]			
Course C	contents:			I			
Silicon ca Circuit Co SMPS - Ir Module 2	arbide power de onfiguration and ntroduction to R	evices, MOSFET and its characteristics, protection and analysis - Buck, boost, buck - boost converter- Cuk an esonant Converters- classification: ZVS and ZCS.	gate drive c d SEPIC con 15 Hrs	ircuits - verter -			
SCR and phase ha factor imp	its characterist If and full wave provement - Effe	ics - Single phase half and full wave rectifiers with R, F rectifiers with R, RL, RLE load - Design of filters – Dua ect of source impedance.	RL, RLE load Il Converter -	-Three · Power			
Module 3 IGBT and bridge inv inverters technique converters	t its characteris verter - three PWM control s - AC to AC s in Renewable	AC Voltage Controllers stics, gate drive circuits and heat sink - Single phase phase inverters - constant voltage source and cons of inverters - single pulse, multi pulse, sinusoidal, spac voltage controller - Introduction to Multilevel inverte energy and Electric vehicles.	Half bridge a tant current e vector moo rs - Role of	15 Hrs and full source dulation power			
		То	tal Hours	45			
Text Boo	ks:						
1	Ned Mohan, Converters,Ap	Tore M. Undeland and William P. Robbins, "F pplications and Design", John Wiley andamp; Sons edition	Power Elect on 2011.	ronics ·			
2	M.H. Rashid, Inc. Edition 20	"Power Electronics Circuits, devices and applications" 14.	, Pearson E	ducation,			
3	P.S. Bhimbra,	"Power Electronics", Khanna Publishers edition 2018.					
Referenc	e Books:						
1	Vedam Subra	manian, "Power Electronics" New age international Seco	ond edition 20	018.			
2	M.D.Singh, "P	ower Electronics", Tata McGraw-Hill, 2 nd Edition 2014.					
3	Bimal K. Bose	, "Modern Power Electronics and amp; AC Drives", Pears	son,2015.				
Web Refe	erences:						
1	https://nptel.ac	c.in/courses/108101038/					
2	https://www.tu	torialspoint.com/power_electronics/index.htm					
3	https://in.math	works.com/videos/developing-dc-dc-converter-control-w	vith-				
4	https://in.math	works.com/videos/developing-dc-dc-converter-control-w	vith-				

	simulinkautomatically-generating-controller-code-for-implementation-on-embedded- processor1535540362783.html
5	https://in.mathworks.com/videos/series/developing-dc-dc-converter-control-with simulink.html

	Continuous Assessment							
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total			
80	120	200	40	60	100			

Assessment Methods & Levels (based on Blooms' Taxonomy)							
Formative Assessment based on Capstone Model							
Course		Assessment Component (Choose and map	FA (16%)				
Outcome	Bloom's Level	components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)	[80 Marks]				
C502.1	Analyze	Quiz	20				
C502.2	Apply	Class Presentation	20				
C502.3	Analyze	Assignment	20				
C502.4	Analyze	Assignment	20				
C502.5	Apply	Simulation Exercise	20				

Assessment based on Summative and End Semester Examination									
Bloom's Level	Summative Ass [120 M	essment (24%) larks]	End Semester Examination (60%)						
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]						
Remember	10	10	10						
Understand	20	20	20						
Apply	40	40	40						
Analyse	30	30	30						
Evaluate	-	-	-						
Create	-	-	-						

Assessme	Assessment based on Continuous and End Semester Examination								
	Continuous Assessment (40%) [200 Marks]								
	CA 1 : 100 Ma	nrks		Examination					
	FA 1 (4	0 Marks)		FA 2 (4	(60%) [100 Marks]				
SA 1 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)				

No. of the CO	РО 1	PO 2	РО 3	РО 4	РО 5	РО 6	РО 7	PO 8	РО 9	PO 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
C501.1	3	3	2	2									3	2	
C501.2	3	2	1	1							1	2	3	3	
C501.3	3	3	2	2							1	2	3	3	
C501.4	3	3	2	2							1	2	3	2	
C501.5	2	1										2	3	2	
1	Rea	sonab	ly Ag	reed	2	Moderately Agreed			3		Strong	y Agree	d		

22EE503	Meas	suring Instruments and Smart Sensors	3/0/0	/3
Nature of	Course	D (Theory Application)		
Course P	re-requisites	Nil		
Course O	bjectives:			
1	To state the fu	undamental concepts of measurements and instrumen	ts.	
2	To explore the	e operation of different bridges and transducers in real	time.	
3	l o design as instruments ei	pects and performance criterion of optical and adv mployed in industry.	anced sens	ors and
Course O Upon con	utcomes: npletion of the	course, students shall have ability to		
C503.1	Summarize th	e general measurement instruments techniques.		[U]
C503.2	Identify the ins	struments for measuring various electrical parameters.		[U]
C503.3	Analyze the o	perating principle of different bridges and transducers.		[A]
C503.4	Analyze the fu	inctioning of various optical sensors in real time.		[A]
C503.5	Apply suitable	advanced sensors in industry based applications.		[AP]
Course C	ontents:	2 II		
Module 1	Introduction	to Measurements and Instruments	1	5Hrs
Introductio	on to measure	ments and Instruments - classifications, application	ns, Elemen	ts of a
generalize	ed measureme	nt system, Static and dynamic characteristics,	Analog and	Digital
Instrumen	ts - PMMC, A	ttraction and Repulsion type Moving Iron Instrume	nts, Inductic	on type-
dynamom	eter type Wat	ttmeters, Single and Three Phase Energy Meter	r - Instrum	entation
Transform	ers - Tachomet	ter - Torque meter - Flow meter.		
Module 2	: Bridges and	Transducers	1	0 Hrs
DC and A	C Bridges - Wh	neatstone bridge, Kelvin's double bridge, Maxwell L/C	and Wien b	ridges -
Megger.	Transducers	- Characteristics, Requirements, Classifications,	Selection	Criteria,
Displacem	ient Transduce	rs - LVDI, Potentiometers, Pressure Transducers - E	sourdon tube	e, Strain
Module 3	• Optical devic	es and Advanced Sensors in Real Time	2	0 Hrs
		es and Advanced Sensors in Kear Time	torago oscill	.01115
Introductic	ipes - basic pili no to MSO	LIV and IP spectrometry Photo Plothycmo Gr	appy (PPC)	DEID
	ntroduction to	MEMS Introduction to Motol Ovide (MOS) or	apily (FFG)	, REID
Sensor [Diaza Electric	Sensor Colligion Detection Sensor Case Studio	as sensor, r	Sonoor
			s - mentiai	Sensor
(Acceleror	neter and gyros	scope).		
		Το	tal Hours	45
Text Boo	ks:	10		
4	A.K. Sawhne	ey, "A Course in Electrical and Electronic M	<i>l</i> easuremen	ts and
1	Instrumentatio	on",Dhanpatrai & Co., 19 th Edition, 2016.		
2	A.D.Helfrick	and W.D. Cooper, "Modern Electronic	Instrum	entation
2	and Measurer	nent Techniques", Prentice Hall of India, 2016.		
3	D.V.S. Murthy	y, "Transducers and Instrumentation", PHI Learning	, 2nd Editio	n,2013.
Reference	e Books:			
1	H.S Kalsi, "I edition,2010.	Electronics Instrumentation", Tata McGraw Hill, H	ligher educ	ation,3 rd
2	E. O. Doebe Design", Tata	elin and D. N. Manik, "Measurement Systems - McGraw-Hill, New Delhi, 2011.	 Applicati 	on and
3	M.M.S. Anano India, New De	d, 'Electronics Instruments and Instrumentation Techr Ihi, 2009.	nology',Prent	tice Hall
4	J.J. Carr, "E Education Ind	Elements of Electronic Instrumentation and Meas ia, New Delhi, 2011.	surement", I	Pearson

Web References:									
1	https://nptel.ac.in/courses/108/105/108105153/								
2	https:// <u>www.bosch-sensortec.com/</u>								
3	http://www.shortcoursesportal.com								
4	https://learn.ni.com/teach/resources/1014/measurements-and-instrumentation								
5	https://the-eye.eu/public/Books/Electronic%20Archive/OliverCageElectronic								
	MeasurementsAndInstrumentation-text.pdf								

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)									
Formative Assessment based on Capstone Model									
Course Outcome	Course Bloom's Level Assessment Component								
C503.1	Understand	Online Quiz	20						
C503.2	Understand	Technical Presentation	20						
C503.3	Analyze	Assignment	20						
C503.4	Analyze	Assignment	20						
C503.5 Apply Case Study 20									

Assessment based on Summative and End Semester Examination										
Bloom's Level	Summative Ass [120 N	essment (24%) larks]	End Semester Examination (60%)							
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]							
Remember	20	10	20							
Understand	40	20	40							
Apply	20	30	20							
Analyse	30	40	30							
Evaluate	-	-	-							
Create	-	-	-							

Assessment based on Continuous and End Semester Examination										
	End									
	Examination									
SΔ 1	FA 1 (4	0 Marks)		FA 2 (40 Marks)		(60%)				
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	[100 Marks]				

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C503.1	3	2	1	1									2	2	
C503.2	2	1	1	1	2							2	2		
C503.3	3	3	2	2	2							2		2	
C503.4	2	1	1	1	2							1		2	
C503.5	3	3	3	2	1							1		2	
1	Reasonably Agreed		2	Moderately Agreed			3	Strongly Agreed			d				
22EE504	Virtual Instrumentation 2/0/2														
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Nature of	Course	E (Theory skill based)													
Course P	Course Pre-requisites Measuring Instruments and Smart sensors														
Course O	Course Objectives:														
1	To understand	the architecture of VI and basic programming concepts in softwa	re tool.												
2	To learn differe	ent Data Acquisition system concepts.													
3	To develop rea	I time applications using software tool.													
4	To study variou	us Instrument Interfacing protocols.													
Course O	utcomes:														
Upon cor	npletion of the	e course, students shall have ability to													
C504.1	Explain the ar	chitecture and features of Virtual Instrument	[U]												
C504.2	Create the graphical programming in LabVIEW software. [C]														
C504.3	Illustrate the basic concepts of PC based data acquisition [U]														
C504.4	Analyze the C LabVIEW	Control system design and PID Controller toolkits in	[A]												
C504.5	Demonstrate Machine visio	the LabVIEW Toolkit usage in Image Processing and n applications	[AP]												
Course C	ontents:														
Module 1: VI Programming Techniques10 HrsBlock diagram and Architecture of VI - Graphical System Design (GSD) model - Comparison with conventional programming - LabVIEW Software environment VI's and sub -VI's - Loops - Arrays - Clusters - Graphs and charts - Case and sequence structures - Formula nodes - Local and global variable - String and File I/O.															
Module 2: DAQ and Analysis Tools10 HrsConcept of PC based data acquisition - DAQ Software Architecture-DAQ Assistant - Analog Input and Analog Output - Digital Input and Digital Output - Timers-Counters - Grounding: Differential and Single Ended - Increasing Measurement Quality of DAQ - Temperature based data acquisition system															

Module 3: LabVIEW Tools and Applications of VI10 HrsControl Design and Simulation Tools – PID Control Toolkit- IMAQ: Image processing and analysis -10 Hrs Machine Vision- Motion Control- Web Publishing Tools -Simple programming with Arduino Uno-LabVIEW interface

Lab Component								
S.No	List of Experiments	CO Mapping	BT					
1	Creating Virtual Instrumentation for simple applications	C504.1	[U]					
2	Programming exercises for loops	C504.2	[C]					
3	Programming exercises for arrays	C504.2	[A]					
4	Programming exercises for clusters	C504.2	[A]					
5	Build a VI using Graphs and Charts	C504.2	[C]					
6	Build a VI using Case and sequence structures	C504.3	[C]					
7	Programming exercises for Strings and File I/O	C504.3	[A]					
8	Real time temperature-based data acquisition system.	C504.4	[A]					
9	Programming exercises for Control Design Toolboxes	C504.4	[A]					

Total Theory Hours 30

10	Programming exercises for IMAQ Toolboxes.	C504.4	[A]								
11	Programming exercises for Arduino Uno. C504.4										
	Total Lab Hours										
	Total Hours 60										
Text Boo	oks:										
1	Jovitha Jerome, "Virtual Instrumentation using LabVIEW", Prentice	Hall, 2010.									
2	Gary W. Johnson, Richard Jennings, "Lab-view Graphical Program McGraw Hill Professional Publishing, IV Edition, 2011.	nming", Tata									
3	Steve Mackay, Edwin Wright, John Park, and Deon Reynders, "Industrial Data Networks", Elsevier, 2010.										
4	Marco Schwartz and Oliver Manickum "Programming Arduino with LabVIEW", Kindle Edition, 2015.										
Reference	ce Books:										
1	P.Surekha, S.Sumathi, "LabVIEW based Advance Instrumentation'	,Springer,200)7.								
2	Sanjay Gupta and Joseph John, "Virtual Instrumentation using Lab	VIEW', Tata									
	McGraw-Hill Inc, 2017.										
3	Behzad Ehsani, "Data Acquisition Using LabVIEW", Kindle Edition,	2016.									
4	Kevin James, "PC Interfacing and Data Acquisition: Techniques fo	r Measureme	nt								
Weh Ref	erences:										
1	http://www.ni.com/academic/students/learn-labview/										
2	http://www.ni.com/academic/students/learn-dag/										
2	https://www.electronicshub.org/labview-projects/										
3											
4	https://learn.ni.com/teach/resources										
Online R	esources:										
1	http://www.ni.com/webcast/2898/en/										

	End									
Theory				Practical			Total	Total	Semester	Total
Formative	Summative	Total	Total	Formative	Summative	Total	(A+B)	Continuous	Examination	
Assessment	Assessment	TOtal	(A)	Assessment	Assessment	(B)	` '	Assessment		
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model - Theory									
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)	FA (10%) [80 Marks]						
C504.1	Understand	Quiz	20						
C504.2	Create	Simulation Exercise	20						
C504.3	Understand	Assignment	20						
C504.4	Analyze	Close Presentation	20						
C504.5	Apply	Class Fresentation	20						

Assessment based on Summative and End Semester Examination - Theory								
Bloom's Level	Summative A [120	End Semester Examination (25%)						
	CIA1: (60 Marks)	[100 Marks]						
Remember	10	10	20					
Understand	40	40	30					
Apply	30	30	40					
Analyse	20	20	10					
Evaluate	-	-	-					
Create	-	-	-					
Assessment based	on Continuous and Er	nd Semester Examinatior	- Practical					
Bloom's Level	Continuous A [10]	Assessment (25%) 0 Marks]	End Semester Examination (25%)					
	FA: (75 Marks)	SA: (25 Marks)	[100 Marks]					
Remember	20	10	10					
Understand	20	20	20					
Apply	40	40	40					
Analyse	20	30	30					
Evaluate	-	-	-					

Asses	Assessment based on Continuous and End Semester Examination									
	End Semester Examination (50%)									
	CA 1 (100 Mark	s)	CA 2 P (100 Marks)			Practi (100	cal Exam Marks)	Theory Examination		
	FA 1			FA 2				(25%)		
SA 1 (60M)	Component-I (20 Marks)	Component-II (20 Marks)	SA 2 (60M)	Component-I (20 Marks)	Component-II (20 Marks)	FA (75M)	SA (25M)	Practical Examination (25%)		

No. of the CO	РО 1	PO 2	РО 3	РО 4	РО 5	PO 6	PO 7	РО 8	РО 9	PO 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
C504.1	2	1													
C504.2	3	3	3	3	3			2	2	2		3	2		2
C504.3	2	1						2	2	2		2	2	2	
C504.4	3	2	1	1						2		2	2	2	
C504.5	3	3	2	2	3			2	2	2		3	3		2
1	Rea	sonab	oly Ag	reed	2	Moderately Agreed			3	ę	Strongl	y Agree	d		

22EE505	Power Electronics Laboratory 0/0/2/1									
Nature of	Course M (Practical application)									
Pre-requi	isites Analog Electronics									
Course O	ourse Objectives:									
1	To provide an opportunity to understand the operation, function and interaction between various components									
2	To impart t converter ba	he knowledge in design, modelling and simulation sed systems	of Power	electronic						
Course O	utcomes:									
Upon con	npletion of th	e course, students shall have ability to								
C505.1	Examine the components.	operation and characteristics of various power electronic	С	[AP]						
C505.2	Analyze the	working of single - phase converter.		[A]						
C505.3	Analyze the	characteristics of DC to DC chopper.		[A]						
C505.4	Illustrate the	working operation of Three phase rectifier, inverter and	AC voltage	[A]						
C505 5	Select the su	itable converter for DC and AC motor speed control		[40]						
Course C	ontents:			[, "]						
S.No		List of Experiments	CO Mapping	RBT						
1.	V-I character	istics of SCR and TRIAC.	C505.1	[AP]						
2.	V-I characteristics of MOSFET and IGBT. C505.1 [A									
3.	Switching ch	Switching characteristics of SCR and IGBT.C505.1[AP]								
4.	Single-phase half and fully controlled Rectifiers. C505.2 [A]									
5.	Single phase	e IGBT based Inverter performance verification.	C505.2	[A]						
6.	Design a buo MOSFET.	ck converter and boost converter circuit using power	C505.3	[A]						
7.	Analyze the	performance of ZVS and ZCS converter.	C505.3	[A]						
8.	Analyze the	performance of AC-AC Voltage controller.	C505.4	[A]						
9.	(a) Analyze t rectifier.	he performance of Three phase fully Controlled	C505.4	[A]						
	(b) Analyze t	he performance of Three phase bridge inverter.								
10.	Speed control	ol of DC and AC motors using power converter circuits	C505.5	[AP]						
		Total Hours	3	30						
Text Boo	ks:									
1	Ned Mohan,	Tore M. Undeland and William P. Robbins, "Power Elect	tronics – C	onverters,						
2	Applications	and Design, John Wiley and Sons edition 2011. Power Electronics" Tata McGraw-Hill 2 nd edition 2014								
3	P.S. Bhimbra "Power Electronics" Khanna Publishers edition 2018									
Reference	e Books:									
1	1 Vedam Subramanian. "Power Electronics" New age international Second edition 2018									
2	P.C. Sen, "M	odern Power Electronics", Tata McGraw-Hill, edition 201	8.							
3	Bimal K. Bos	e, "Modern Power Electronics and AC Drives", Pearson,	2015							
Web Refe	rences:									
1	https://nptel.a	ac.in/courses/108101038/								
2	https://www.t	utorialspoint.com/power_electronics/index.htm								
3	https://in.mat	hworks.com/videos/developing-dc-dc-converter-control-	with-							
	simulinkauto	matically-generating-controller-code-for-implementation-	on-embedo	Jed-						

	processor1535540362783.html
4	https://in.mathworks.com/videos/series/developing-dc-dc-converter-control- withsimulink.html

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination									
	Continuous As [100	End Semester Practical Examination							
Bloom's Level	FA (75 Marks)	SA (25 Marks)	(40%) [100 Marks]						
Remember	0	0	0						
Understand	20	20	20						
Apply	30	30	30						
Analyse	30	30	30						
Evaluate	0	0	0						
Create	20	20	20						

No. of the CO	РО 1	PO 2	РО 3	РО 4	РО 5	РО 6	РО 7	PO 8	РО 9	РО 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
C505.1	2	1			3								3	2	
C505.2	3	3	2	2	3	2	2		2		2	2	3	3	
C505.3	3	3	2	2	3	2	2		2		2	1	3	3	
C505.4	3	3	2	2	3	2	2		2		2	2	3	3	
C505.5	3	2	1	1	2	2	2				2	3	2	2	
1	Reasonably Agreed			reed	2		Mode	rately	Agree	ed	3	:	Strongly	/ Agreed	b

22EE601	Power System Analysis 3/0/0/							
Nature of	Nature of Course G (Theory Analytical)							
Course Pr	e-requisites	Transmission and Distribution						
Course Ob	ojectives:							
1	To understand the	concepts of power systems and its components.						
2	2 To apply various numerical methods to analyze a power system in steady state and fau conditions.							
3	To analyze the sta	bility concepts of power systems.						
Course Ou	utcomes:							
Upon com	pletion of the cour	se, students shall have ability to						
C502.1	Interpret the var quantities.	ious power system components and calculate the per u	nit [AP]					
C502.2	Construct the bus admittance, impedance matrices and calculate various load flow [AF conditions.							
C502.3	Analyze various sl	nort circuit conditions in generator and transmission lines.	[A]					
C502.4	Classify the types of faults and analyze different fault conditions.							
C502.5	5 Compute the stability of the power system. [AF							
Course Co	ontents:							
Module 1:	Modelling of Pov	ver System and Load Flow Analysis	15 Hrs					

Modelling of power system components - Single line diagram, per unit analysis, Formation of admittance matrix with and without mutual admittance, Z-bus building algorithm without mutual system components impedances. Load flow analysis: Classification of Buses - Formation of load flow equations. Load flow solution using Gauss-Seidel, Newton-Raphson and Fast decoupled method.

Module 2: Short Circuit Analysis

Importance of Short circuit study - Types of faults in power system - Short circuit transients in generator and transmission line - Symmetrical fault analysis using Z-bus algorithm - Sequence components, sequence networks, Unsymmetrical fault analysis - Line to Ground, Line to Line, Double Line to Ground faults.

Module 3: Power System Stability

Concepts of stability in power system - steady state, dynamic and transient stability. Single Machine Infinite Bus (SMIB) System - Swing equation, Power angle equation and power angle curve. Equal area criterion - Critical clearing angle and time. Solution of swing equation using Modified Euler's and Range-Kutta method. Multi Machine stability.

	Total Hours 45
Text Book	S:
1	Hadi Saadat, "Power System Analysis", Tata McGraw Hill, 2015.
2	John J. Grainger and William. D. Stevenson, Jr, "Power System Analysis", McGraw-Hill International Edition, 2016.
3	Kothari D. P and Nagrath I. J, "Modern Power System Analysis", 3 rd Edition., Tata McGraw Hill Publishing Company Limited, 2011.
Reference	Books:
1	J. Duncan Glover, M.S Sarma and Thomas. J. Overbye, "Power System Analysis and Design" Cengage Learning, 5 th Edition, 2011.
2	Pai M. A., "Computer Techniques in Power System Analysis", 3 rd Edition, Tata McGraw-Hill Publishing Company Limited, 2014.
3	Prabha Kundur, "Power System Stability and Control" 5 th Edition, Tata McGraw-Hill Publishing Company Limited, 2008.

15 Hrs

4	Abhijit Chakrabarti and Sunita Halder, "Power System Analysis Operation and Control", 3 rd Edition, PHI Publications, 2010.						
Web Refer	Web References:						
1	https://nptel.ac.in/courses/108105067/						
2	https://www.vlab.co.in/broad-area-electrical-engineering						
3	https://youtu.be/TdAqh20DDhE						
4	https://cosmolearning.org/courses/power-system-analysis-304/video-lectures/						
5	https://www.youtube.com/watch?v=biApXHVsRa8						

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessmer	Assessment Methods & Levels (based on Blooms' Taxonomy)						
Formative /	Formative Assessment based on Capstone Model						
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)	FA (16%) [80 Marks]				
C601.1	Apply	Quiz	20				
C601.2	Apply	Problem Solving Tutorials	20				
C601.3	Analyze	Case Study	20				
C601.4	Analyze	Case Study	20				
C601.5	Apply	Simulation Exercises	20				

Assessment based on Summative and End Semester Examination							
Bloom's Level	Summative Ass [120 N	essment (24%) larks]	End Semester Examination (60%)				
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]				
Remember	10	10	10				
Understand	20	20	20				
Apply	30	30	30				
Analyse	40	40	40				
Evaluate	-	-	-				
Create	-	-	-				

Assessment based on Continuous and End Semester Examination							
Continuous Assessment (40%) [200 Marks]						End Semester	
CA 1 : 100 Marks CA 2 : 100 Marks					arks	Examination	
• • •	FA 1 (4	0 Marks)	•••	FA 2 (4	(60%)		
SA 1 (60 Marks)	Component-l (20 Marks)	Component-II (20 Marks)	SA 2 (60 Marks)	Component-I (20 Marks)	Component-II (20 Marks)	[100 Marks]	

No. of the CO	РО 1	PO 2	РО 3	PO 4	PO 5	PO 6	PO 7	PO 8	РО 9	PO 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
C601.1	3	2	1	1	2				1				2		
C601.2	3	2	1	1	2				1				2		
C601.3	3	3	2	2	3				1				3		
C601.4	3	3	2	2	3	1			1	1			3		
C601.5	3	2	1	1	2	1			1	2			3		
1	Reasonably Agreed			reed	2	l	Mode	rately	Agree	ed	3		Strong	gly Agre	ed

22EC611	Principles of Digital Signal Processing 2/1/0/3						
Nature of	Course	G (Theory Analytical)					
Course P	re-requisites	Transforms and Numerical Methods					
Course C	bjectives:						
1	To study and a	analyse various signals and systems and their mathemati	cal operations.				
2	To study vario	us transformation techniques in signal processing.					
3	To design ana	log and digital filters for signal processing applications.					
4	To learn about	programmable digital signal processor and multi-rate sig	Inal processing				
Course C	outcomes:						
Upon cor	mpletion of the	course, students shall have ability to					
C611.1	Explain various	types of signals and systems.	[U]				
C611.2	Analyse the mat	hematical operations on signals and systems.	[A]				
C611.3	Analyse various transformation techniques. [A]						
C611.4	Illustrate various types of digital filters using IIR and FIR filter design. [AP]						
C611.5	Interpret the programmable digital signal processor and multi-rate signal processing [U]						
Course C	contents:						

Module 1: Signals and Systems

Introduction to DSP - Signals and systems - Standard signals - Classification of signals - Discrete Time (DT) signals: Deterministic and Random signals, Periodic and Aperiodic signals, Energy and Power signals, Odd and Even signals - Classification of systems - Discrete Time systems: Static and Dynamic, Causal and Non-causal, Linear and Nonlinear, Time - variant and Time - invariant, Stable and Unstable. LTI System - Convolution and Correlation.

Module 2: Transformation Techniques

Z Transform: properties, ROC - Inverse Z transforms - Stability analysis - Discrete Fourier Transforms - Properties - Circular Convolution - Fast Fourier Transform algorithms - Decimation in Time Algorithm and Decimation in Frequency Algorithm. Discrete time Fourier Transform - Relation between DFT and DTFT.

Module 3: Design of Digital Filters and Architecture of DSP

FIR filter: design of linear phase FIR filters - design of FIR filters using windowing technique -Rectangular, Hamming, Hanning windows. IIR filter: Analog low pass filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation. Architecture of DSP - Von Neumann and Harvard architecture - Architecture and features of TMS 320C55xx DSP processor. Architecture of one DSP processor for motor control. Introduction to multi rate digital signal processing - Applications in power systems.

Text Boo	ks:
1	J.G. Proakis and D.G. Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Education, New Delhi, 5th edition, 2022.
2	A.Nagoorkani, "Digital Signal Processing", Tata McGraw Hill, New Delhi, 2012.
3	S. K. Mitra, "Digital Signal Processing: A computer based approach", McGraw Hill, 2011.
Referenc	e Books:
1	A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing", Prentice Hall, 2011
2	Salivahanan, A. Vallavaraj, C. Gnanapriya, "Digital Signal Processing", Tata McGraw Hill,New Delhi, 2011.
3	Vinay K. Ingle and J.G. Proakis, "Digital Signal Processing Using MATLAB", 3rd Edition',
	Pearson Education, 2010.
Web Refe	erences:
1	http://nptel.ac.in/courses/117102060/

15 Hrs

15 Hrs

2	https://www.tutorialspoint.com/digital_signal_processing/
3	https://www.allaboutcircuits.com/projects/category/embedded/digital-signal-processing/
4	https://www.dspguide.com/ch28/3.htm
5	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-341-discrete-
	time-signal-processing-fall-2005/
6	http://www.ictacademy.in/Pages/Digital-Signal-Processing.aspx

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)							
Formative Assessment based on Capstone Model							
Course Outcome	Bloom's Level	Assessment Component	FA (16%) [80 Marks]				
C611.1	Understand	Online Quiz	20				
C611.2	Analyze	Technical Presentation	20				
C611.3	Analyze	Accimpant	20				
C611.4	Apply	Assignment	20				
C611.5	Understand	Simulation exercises	20				

Assessment based on Summative and End Semester Examination								
Bloom's Level	Summative Ass [120 M	essment (24%) larks]	End Semester Examination (60%)					
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]					
Remember	20	20	20					
Understand	30	30	20					
Apply	30	30	30					
Analyse	20	20	30					
Evaluate	-	-	-					
Create	-	-	-					

Assessment based on Continuous and End Semester Examination								
	End Semester							
	CA 1 : 100 Ma	rks		Examination				
	FA 1 (40	0 Marks)	• • •	FA 2 (4	(60%) [100 Marks]			
SA 1 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)			

No. of the CO	РО 1	PO 2	РО 3	РО 4	РО 5	РО 6	РО 7	РО 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C611.1	2	1			2						2	3	1	1	
C611.2	3	3	2	2	3							2	2	2	
C611.3	3	3	2	2	3								2	2	
C611.4	3	2	1	1	3				2		2		1	2	
C611.5	2	1			2						2	2		3	
1	Rea	sonab	oly Ag	reed	2	Moderately Agreed		3	Strongly Agreed						

22EE602	Microcontrollers 3/0/2/4							
Nature of	Nature of Course F (Theory Programming)							
Course P	re-requisites	Digital Circuits						
Course C	bjectives:							
1	Understand the	e architecture of Microcontrollers.						
2	Analyze the wo	orking of various interfacing ICs.						
3	To develop ap	plication-based Assembly Language programs.						
Course C	utcomes:							
Upon cor	npletion of the	course, students shall have ability to						
C503.1	Illustrate the a	rchitecture of 8051 Microcontroller	[U]					
C503.2	Develop asser	nbly language programs using 8051 for various applicatic	ons. [AP]					
C503.3	Analyze the architecture of PIC Microcontroller and Construct the simple [A							
C503.4	Infer the architecture of ARM controller. [A]							
C503.5	.5 Construct the simple programs using ARM. [C]							
Course Contents:								

Module 1: 8051 Microcontroller

Overview of Microprocessors - 8051: Functional block diagram - Instruction set - addressing modes -Interrupt structure - Timer - I/O ports - Serial Communication, Simple programming - Key board and display interface - DC motor control - Stepper motor control.

Module 2: PIC Microcontroller

PIC18FXXX: Architecture - Data and program memory organization - Addressing modes -Instruction set - Move / Copy instructions, Arithmetic instructions, Logic instructions, Branches instructions, Bit Manipulation instructions, Read/Write instructions, Machine Control instructions - Timers - Interrupt, ISR, priority - Speed Control of Induction Motor.

Module 3: ARM Controller

ARM7TDMI: Features - Block diagram - Architecture - Addressing modes - Instruction set - Thumb instructions - Data processing instructions, Data transfer instructions, Branch and control instructions, Register load and store instructions, Multiple register load and store instructions, Status register access instructions, Coprocessor instructions - Seven Segment Display Interfacing with ARM Controller.

	Total Theory Hours									
Course	Course Contents:									
S.No	List of Experiments	CO Mapping	BT							
1.	Arithmetic operation using 8051 Microcontroller.	C503.1	[A]							
2.	Minimum, maximum and sorting data using 8051 Microcontroller.	C503.1	[A]							
3.	Code conversion using 8051 Microcontroller.	C503.2	[A]							
4.	8279 Keyboard and display interfacing with 8051 Microcontroller.	C503.2	[AP]							
5.	Stepper motor control using 8051.	C503.3	[AP]							
6.	DC motor speed measurement and control using 8051.	C503.4	[AP]							
7.	Simple arithmetic operations: Addition/Subtraction/Multiplication/Divisionusing PIC Controller	C503.5	[A]							

20 Hrs

20 Hrs

8.	Simulation based Speed control of Induction Motor using PIC controller.	C503.5	[AP]			
9.	ARM Assembly program for Arithmetic and Logical Operations.	C503.5	[A]			
10.	Simulation based Seven Segment Display Interfacing with ARM Controller.	C5063.5	[AP]			
Total Lab Hours						
Total Hours						

Text Boo	ks:
1	Kenneth Ayala, "The 8051 Microcontroller", Cengage Learning Publications, 2 nd Edition, 2017.
2	John. B.Peatman, " Design with PIC Microcontroller", Prentice hall, 2012.
3	Subrata Ghoshal, 8051 Microcontroller Internals, Instructions, Programming and Interfacing, Second edition, Pearson Education Asia, 2014.
4	Myke Predko, "Programming and customizing the PIC microcontroller", Tata McGraw Hill Publishing Company Limited, Third Edition, 2008.
5	Steve Furber, " ARM System – On – Chip architecture ", Addision Wesley, 2009.
Reference	e Books:
1	Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems using Assembly and C", Prentice Hall Publications, 2nd Edition, 2008.
2	Krishna Kant, "Microprocessor and Microcontrollers" Eastern Company Edition, Prentice Hall of India, New Delhi, 2 nd edition, 2013.
3	Joseph Yiu, "The Definitive Guide to the ARM Cortex-M0" Newnes – Elsevier, 2011.
4	Muhammad Tahir and Kashif Javed, "ARM Microprocessor Systems - Cortex-M Architecture, Programming, and Interfacing", CRC Press, 2011.
Web Ref	erences:
1	https://onlinecourses.nptel.ac.in/noc18_ec03
2	https://nptel.ac.in/courses/108107029/
3	http://www.ti.com/microcontrollers/overview.html
4	https://swayam.gov.in/course/3490-digital-electronics-and-microprocessor
5	https://nptel.ac.in/courses/117104072/

Continuous Assessment										
Theory Practical				Total	Total	ESE	Total			
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)	(A+B)	B) Continuous Assessment		
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model - Theory							
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)	FA (10%) [80 Marks]				
C602.1	Understand	Quiz	20				
C602.2	Apply	Class Presentation	20				
C602.3	Analyze	Assignment	20				
C602.4	Analyze	Simulation Exercise	20				
C602.5	Create		20				

Assessment based on Summative and End Semester Examination - Theory								
Bloom's Level	Summative A [12	End Semester Examination (25%)						
	CIA1: (60 Marks)	CIA2: (60 Marks)	[100 Marks]					
Remember	10	10	20					
Understand	40	40	30					
Apply	30	30	40					
Analyse	20	20	10					
Evaluate	-	-	-					
Create	-	-	-					
Assessment based	on Continuous and E	nd Semester Examination	- Practical					
	Continuous	Assessment (25%)	End Semester Examination					
Bloom's Level	[10	(25%)						
	FA: (75 Marks)	SA: (25 Marks)	[100 Marks]					
Remember	0	0	0					
Understand	0	0	0					
Apply	60	60	60					
Analyse	40	40	40					
Evaluate	0	0	0					
Create	0	0	0					

Asses	Assessment based on Continuous and End Semester Examination								
	End Semester Examination (50%)								
CA 1 CA 2 Practical Exam (100 Marks) (100 Marks) (100 Marks)								Theory Examination	
	F	A 1		F	A 2			(25%)	
SA 1 (60M)	Practical Examination (25%)								

No. of the CO	РО 1	PO 2	РО 3	РО 4	РО 5	PO 6	РО 7	РО 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C602.1	3	3	2	2	3									3	
C602.2	3	2	1	1	3	2	1	1	2		2	1		3	1
C602.3	3	3	2	2	3									3	
C602.4	3	3	2	2	3	2	1	1	2		2	1		3	1
C602.5	3	2	1	1	3									3	
1	Rea	sonab	ly Ag	reed	2		Moder	rately	Agree	ed	3		Strong	y Agree	d

22EE603		Power Syst	tem Simulation Laboratory		0/0/2/1		
Nature of	Course	M (Practical applicatio	n)				
Pre-requi	isites	Transmission and Dist	ribution				
Course C	bjectives:						
1	To know and	study about the transm	ission line parameters.				
2	To apply itera	tive techniques for pow	er flow analysis.				
3	To Impart Kn	owledge on stability					
Course C Upon coi	Outcomes: npletion of th	e course, students sl	nall have ability to				
C603.1	Construct the	bus admittance and ir	npedance matrices.		[AP]		
C603.2	Examine the	Load flow problems an	d calculate the load flow resul	ts.	[A]		
C603.3	Classify the t conditions.	pes of faults and anal	yze the power system on diffe	rentfaulted	[AP]		
C603.4	Illustrate the systems.	concepts of transient a	nd steady state stability in pov	ver	[A]		
C603.5	Analyze the	nulti machine stability			[A]		
Course C	contents:						
S.No		List of Expe	riments	CO Mapping	RBT		
1.	Computation	and Modelling of Trans	mission Line Parameters.	C506.1	[AP]		
2.	Formation of Bus Admittance Matrix with and without mutual C506.1						
3.	Formation of Bus Impedance Matrix. C506.1						
4.	Load Flow Analysis by Gauss - Seidel Iterative Technique. C506.2						
5.	Load Flow A	alysis by Newton Rap	hson Technique.	C506.2	[A]		
6.	Symmetrical	ault Analysis.		C506.3	[AP]		
7.	Unsymmetric	al Fault Analysis.		C506.3	[AP]		
8.	Steady State	Stability Analysis.		C506.4	. [A]		
9.	Transient Sta	bility by point by point	method.	C506.4	. [A]		
10.	Stability anal	sis of Multi-Machine Ir	ifinite Bus System.	C506.5	[A]		
11	State Estima	ion of Weighted-Least	Square State Estimation	C506.5	[A]		
			Total Hour	s	30		
Text Boo	ks:						
1	Tharangika Simulation, a Singapore Pt	Bambaravanage, As ad Control of a Mediun e Ltd, 2018.	sanka Rodrigo, Sisil Ku n-Scale Power System", Sprin	marawadu," ger Nature	Modeling,		
2	Hadi Saadat,	Power System Analy	sis", Tata McGraw Hill, 2015.				
3	John J. Grainger and Stevenson Jr. W. D, "Power System Analysis", McGraw Hill International edition, 2016						
4	4 Kothari D. P and Nagrath I. J., "Modern Power System Analysis", 3rdEd., TataMcGraw- Hill Publishing Company Limited. 2011.						
Referenc	e Books:						
1	J.Duncan Glover, M.S Sarma and Thomas J Overbye, "Power System Analysis and design" Cengage Learning, 5 th edition 2011.						
2	Pai M. A., McGraw-Hill	"Computer Techniqu Publishing Company Li	es in Power System Ana mited. 2014.	lysis", 3 ^{ra}	Ed., Tata		
3	Prabha Kund Publishing Co	ur.,"Power System Sta mpany Limited 2008.	ability and Control ^{75th Ed., Ta}	ta McGraw	-Hill		
DQQQ	<u>y</u>				D 100		

Web References:						
1	https://nptel.ac.in/courses/108105067/					
2	https://www.vlab.co.in/broad-area-electrical-engineering					
3	https://youtu.be/TdAqh20DDhE					
4	https://www.youtube.com/watch?v=BaKC7v8bRsgandt=3099s					

	Continuous Assessment								
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total				
75	25	100	60	40	100				

Assessment based on Continuous and End Semester Examination							
Bloom's Level	Continuous A [100	End Semester Practical Examination					
	FA (75 Marks)	SA (25 Marks)	(40%) [100 Marks]				
Remember	0	0	0				
Understand	20	20	20				
Apply	40	40	40				
Analyse	40	40	40				
Evaluate	0	0	0				
Create	0	0	0				

No. of the CO	РО 1	PO 2	РО 3	РО 4	РО 5	PO 6	РО 7	РО 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C603.1	3	2			3				1				3		
C603.2	3	3	2	2	3			2	1				3		2
C603.3	3	2	1	1	3				1				3		
C603.4	3	3	2	2	2			2	1				3		2
C603.5	3	3	3	3	3			2	1				3		2
1	Rea	sonat	oly Ag	reed	2		Mode	rately	Agree	ed	3	;	Strongly	/ Agreed	t

22EE701	Po	ower System Protection and Switchgear	3/0/0/3	3			
Nature of	Course	D (Theory Application)					
Course Pr	Course Pre-requisites Transmission and Distribution, Power System Analysis						
Course O	bjectives:						
1	To learn the fur	damentals of protective equipment's used in power system	ns				
2	To give a broac	l coverage on types of protective relays and circuit breakers	s.				
3	To study about	the theory of arching and protection against over voltage.					
Course O	utcomes:						
Upon com	pletion of the	course, students shall have ability to					
C701.1	Interpret the in	nportance of protective devices in power systems.		[U]			
C701.2	Examine the w	orking of various protective relays.		[A]			
C701.3	Apply suitable faults.	protection schemes for different apparatus, feeders and	bus bar	[AP]			
C701.4	Illustrate the c	auses of overvoltage and protection against overvoltage.		[U]			
C701.5 Examine the operation of various circuit breakers with arcing concepts. [A]							
Course Co	ontents:						

Module 1: Protective Relays

Fundamentals of protection and switchgear in Power systems - Causes, need of protection and types of protection, Relays - Classification of Electromechanical and induction relays, its operating principle, types and applications, Types of Overcurrent Relay - Definite Time, Inverse Time & IDMT Relays, Static relays and Numerical relays - Introduction, Block diagram, operating principle and application, Recent developments of relays and switchgear for Smart grid operations, Case study - relay coordination and importance of relay selection.

Module 2: Apparatus Protection

Generator protection - stator and rotor protection. Transformer Protection - Differential protection. Line Protection - Distance, Differential protection and Carrier current protection, Feeder and Bus bar protection. Causes of over voltage - Ground wires, Surge diverters or Lighting Arresters, Surge absorbers, Applications of artificial intelligence in Power System Protection.

Module 3: Circuit Breakers

Fault clearing process - Theory of arcing and arc quenching - Circuit breakers and its classification - Minimum oil, Air blast,SF6 and Vacuum circuit breakers - Case studies on SF6 and Vacuum circuit breaker - RRRV, current chopping, interruption of capacitive current, Resistor switching - Introduction of miniature circuit breakers, Molded case circuit breakers, Solid state and Hybrid circuit breakers.

Text Book	(S:
1	Paul M. Anderson, Charles Henville, Rasheek Rifaat, Brian Johnson and Sakis Meliopoulos, "Power System Protection", IEEE Press, Wiley, Second Edition, 2022.
2	Badri Ram, Vishwakarma "Power System Protection and Switchgear" Tata McGraw Hill, 2011.
3	B. Ravindranath and N. Chander, "Power System Protection & Switchgear", New Age Publishers, 2010.
4	Y.G Paithangar, "Fundamentals of Power System Protection" PHI learning Pvt Ltd, Second Edition, 2010.
Reference	e Books:
1	Omar Salah Elsayed Atwa, Practical Power System and Protective Relays Commissioning, Academic Press, Elsevier, 2019.

15 Hrs

15 Hrs

45

Total Hours

2	Ramesh Bansal, "Power System Protection in Smart Grid Environment", Taylor and Francis, CRC Press, 2019.
3	C.L. Wadhwa, "Electrical Power Systems", New Age International (P) Ltd., 2017.
4	V.K Mehta and Rohit Mehta, "Principle of Power System", S Chand, reprint 2010.
Web Refe	rences:
1	https://www.youtube.com/watch?v=khgdMHt9X8A
2	https://www.youtube.com/watch?v=id72r7QuGaM
3	https://www.youtube.com/watch?v=iL9m354sHWs
4	https://www.youtube.com/watch?v=8OVyLscA4fs
5	https://www.youtube.com/watch?v=oj1NwZL01io

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)								
Formative A	Formative Assessment based on Capstone Model							
Course OutcomeBloom's LevelAssessment ComponentFA (16%) [80 Marks]								
C701.1	Understand	Online Quiz	20					
C701.2	Analyse	Assignment	20					
C701.3	C701.3 Apply Technical Presentation 20							
C701.4UnderstandCase Study20C701.5AnalyseCase Study20								

Assessment based on Summative and End Semester Examination								
Bloom's Level	Summative Ass [120 M	essment (24%) larks]	End Semester Examination (60%)					
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]					
Remember	10	-	10					
Understand	40	20	30					
Apply	10	20	30					
Analyse	40	60	30					
Evaluate	-	-	-					
Create	-	-	-					

Assessment based on Continuous and End Semester Examination									
	End Semester								
	CA 1 : 100 Ma	rks		CA 2 : 100 Ma	rks	Examination			
	FA 1 (4	0 Marks)		FA 2 (4	(60%) [100 Marka]				
SA 1 (60 Marks)									

No. of	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	PSO	PSO	PSO
the CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C701.1	2	1					1						3		
C701.2	2	1					1						3		
C701.3	3	2	1	1			1						3		
C701.4	2	1								2			3		
C701.5	2	1					1			2			3		
1	Reasonably Agreed		2	Moderately Agreed			3	Ş	Strongl	y Agree	əd				

22MG701		Engineering Economics	3/0/0/3					
Nature of	Course	D (Theory Application)						
Course Pr	e-requisites	Nil						
Course Ol	Course Objectives:							
1	To make the	students understand the role of macro and micro Econom	nics for business					
	applications.							
2	To familiarize	the students about the cost behaviour in short and long run.						
3	To expose the	students to the methods of investment analysis.						
4	To provide the	students with an insight in to Indian and International Econo	omics.					
Course O	utcomes:							
Upon com	pletion of the	course, students shall have ability to						
C701.1	Understand th	e needs, roles, scope of Engineering Economics.	[U]					
C701.2	Analyse costs	and their role in pricing.	[A]					
C701.3	Understand th	e cost behaviour and cost calculations.	[U]					
C701.4	Have working	knowledge of investment analysis.	[A]					
C701.5	Understand th international b	e external environment for industries in India and the ba usiness.	asics of [U]					
Course Co	ontents:							

Module 1: Introduction to Economics

Economics - Definition, Scope; Micro Economics; Macro Economics; Law of Demand; Law of supply; Types of efficiency- Technical efficiency, Economic efficiency; Types of costs fixed cost vs variable cost, Total cost, Average cost, Marginal cost, opportunity cost, Short run cost, Long run cost, Sunk cost Break - Even analysis.

Module 2: Investment Analysis

Investment aim, purpose, considerations; Time value of money, Capital budgeting - meaning, purpose; Capital expenditure vs Revenue expenditure; Discount rate; Methods of evaluating project feasibility payback period method, Net present value method, Internal rate of return method, Profitability Index Method. Replacement and Maintenance Analysis Types of replacements, Types of maintenance, Determination of Economic life of an asset.

Module 3: Indian and International Economics

Indian Economy Salient features, Planning for Economic - Development of India Five Year Plans, Objectives and achievements; Role of small scale industry, Liberalization, Privatization and (LPG), International Economics - International trade Purchasing Power Parity Globalization Theory; Free Trade Vs Protection; Terms of trade, Balance of Trade, Balance of payment, Exchange Rate Meaning, Factors affecting exchange rates.

Text Book	S:
1	Pannerselvam, R., "Engineering Economics, Prentice-Hall of India Pvt. Ltd, New Delhi, 2nd Edition, 2013.
2	Seema Singh, Economics for Engineering Students, I.K. International Publishing House, 2nd edition, 2014.
3	James L. Riggs, David D. Bedworth and Sabah. U. Randhawa, Engineering Economics, TMH Publication, 4th edition, reprint 2004.
Reference	Books:
1	Ruddar daff and K.P.M Sundharam, Indian Economy , S. Chand and Company Ltd, 66 th revised edition, 2015.

R2022

15 Hrs

15 Hrs

45

Total Hours

2	Henry Thompson, International Economics, Cambridge University Press India Pvt Ltd, 3rd edition, 2011.
3	Ian Fraser, John Gionea and Simon Fraser, Economics for Business, Tata McGraw Hill Publication, 4th edition, 2011.
Web Refe	rences:
1	https://icmai.in/upload/Students/Syllabus2012/Study_Material_New/FoundationPaper1.pdf
2	http://fzp.ujep.cz/~vosatka/ERASMUS/Principles_of_Economics/Principles-of
2	EconomicsMankiw-(5th).pdf

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessmen	Assessment Methods & Levels (based on Blooms' Taxonomy)							
Formative A	Formative Assessment based on Capstone Model							
Course OutcomeBloom's LevelAssessment ComponentFA (16%) [80 Marks]								
C701.1	Understand	Online Quiz	20					
C701.2	Analyze	Case study	20					
C701.3	Understand	Technical Presentation	20					
C701.4	C701.4 Analyze Assignment 20							
C701.5	C701.5 Understand Assignment 20							

Assessment based on Summative and End Semester Examination								
Bloom's Level	Summative Ass [120 N	essment (24%) larks]	End Semester Examination (60%)					
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]					
Remember	10	-	10					
Understand	40	20	30					
Apply	10	20	30					
Analyse	40	60	30					
Evaluate	-	-	-					
Create	-	-	-					

Assessment based on Continuous and End Semester Examination									
	End Semester								
	Examination								
• • •	FA 1 (4	0 Marks)		FA 2 (4	(60%) [100 Marks]				
SA 1 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)				

No. of	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	РО	PSO	PSO	PSO
the CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C701.1						2		2		2	2	1			
C701.2						2		2		2	3	1			
C701.3						2		2		2	2	2			
C701.4						2		2		2	3	1			
C701.5						2		2		2	2	1			
1	Reasonably Agreed 2		2	Moderately Agreed		3	ę	Strongl	y Agree	ed					

22EI	E702	Digital S	Simulation for Electrical Systems Laboratory	0/0	/2/1				
Nature o	f Course	•	M (Practical Application)						
Course I	Pre-requi	sites	Design of Electrical Machines, Power Electronic	S					
Course	Course Objectives:								
1	1 To provide an opportunity to understand and analyze the operation and function of electrical components in the power system								
2	To impa Convert	art the knowled	dge in design, modelling and simulation of Power ems used in renewable energy generation syster	Electronic					
3	To impa	art the knowled	dge in intelligent controllers used in hybrid power	generation					
Course	Outcome	S							
Upon co	mpletion	of the cours	e, students shall have ability to						
C702.1	Examine	e the performa	ance and characteristics of transformer and DC m	otor.	[AP]				
C702.2	Analyze	the working o	of wind energy conversion system		[A]				
C702.3	Analyze the performance characteristics of solar and fuel cell power generation								
C702.4	Illustrate the working operation of standalone connected solar power system.								
C702.5	Select the suitable simulation tool for analyzing the operation of power converters suitable for Hybrid (Solar-Wind) power system with the various intelligent								
Course	Contents								
S.No			List of Experiments	CO Mapping	вт				
1	Perform software	nance analysis e.	s of Transformer and DC Motor using Motor solve	C702.1	[AP]				
2	Wind tu	rbine emulatio	on using DC motor.	C702.2	[AP]				
3	Maximu	ım power poin	t tracking of wind energy conversion systems.	C702.2	[A]				
4	Study o location	f getting Solar	r radiation data and making record for particular software.	C702.3	[A]				
5	Testing	of inverter wit	h Solar Photovoltaic Emulator input.	C702.3	[A]				
6	Perform	nance assessr	nent of 100W Fuel Cell.	C702.3	[A]				
7	VI-Char	acteristics and	d Efficiency of 1kWp Solar Photovoltaic System.	C702.4	[A]				
8	Performance assessment of Grid connected and Standalone 1kWp C702.4								
9	Simulat	ion study on H	Hybrid (Solar-Wind) Power System.	C702.5	[A]				
10	Simulat	ion study on I	ntelligent Controllers for Hybrid Systems.	C702.5	[AP]				
			Т	otal Hours	30				

Text B	ooks:
1.	Ned Mohan, Tore M. Undeland & William P. Robbins, "Power Electronics – Converters, Applications and Design", John Wiley & Sons edition 2011.
2.	Weidong Xiao, Power Electronics Step –by Step: design, Modeling, Simulation and control, McGraw Hill, 2021.
3.	P.S. Bhimbra, "Power Electronics", Khanna Publishers edition 2018.
Refere	nce Books:
1.	Hedaya Mamood Alasooly, Some power Electronics Case Studies using Matlab Simpower system Blockset, BookRix, 2020.
2.	Bimal K. Bose, "Modern Power Electronics & AC Drives", Pearson, 2015.

Web F	Web References:					
1.	https://onlinecourses.nptel.ac.in/noc20_ee28/preview					
2.	https://nptel.ac.in/courses/121106014					
3.	https://in.mathworks.com/videos/developing-dc-dc-converter-control-with- simulinkautomatically-generating-controller-code-for-implementation-on-embedded- processor1535540362783.html					
4.	https://nptel.ac.in/courses/103107157					

	Continuous Ass	sessment			
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination							
	Continuous A [100	End Semester Practical Examination					
Bloom's Level	FA (75 Marks)	SA (25 Marks)	(40%) [100 Marks]				
Remember	0	0	0				
Understand	20	20	20				
Apply	20	30	30				
Analyse	30	30	30				
Evaluate	0	0	0				
Create	20	20	20				

Course Articulation Matrix (Laboratory)															
No. of the CO	РО 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	РО 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
C702.1	2	1			3								3	2	
C702.2	3	3	2	2	3	2	2		2		2	2	3	3	
C702.3	3	3	2	2	3	2	2		2		2	1	3	3	
C702.4	3	3	2	2	3	2	2		2		2	2	3	3	
C702.5	3	2	1	1	2	2	2				2	3	2	2	
1	Reasonably agreed			ed	2	Мо	oderat	ely ag	reed	3		Strong	ly agree	d	

OPEN ELECTIVES

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22EE001	Residential Electrical Systems 3/0/0				
Nature of	f Course	G (Theory and Analytical)			
Course F	Pre-requisites	Transmission and Distribution			
Course C	Objectives:				
1	To give a basic kr	nowledge on residential, wiring systems			
2	To understand the	e different applications like heating, welding and illumination.			
3	To familiarize wit	h the Electrical System components			
Course C	Dutcomes:				
Upon co	mpletion of the co	urse, students shall have ability to			
C001 1	Understand the ele	ctrical wiring systems for residential consumers, representing the	ne _{ri n}		
0001.1	systems with stand	ard symbols and drawings, SLD.	[U]		
C001.2	Understand various	s components of residential electrical systems.	[U]		
C001 3	Evaluate the size	e, rating and cost of electrical installations for resident	ial _[Δ]		
0001.0	applications		[/]		
C001.4	Understand the el	ectrical Illumination Systems and the various components a	nd _{[[]]}		
	terms involved		[0]		
C001.5	Analyze the ener	gy saving in illumination systems, designing scheme for	a _[A]		
	residential premise	S.	[73]		
Course 0	Contents:				

Module 1: Electrical System Components

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices.

Module 2: Residential Electrical Systems

Types of residential wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of residential installation, deciding lighting scheme and number of lamps, earthing of residential installation, selection and sizing of components.

Module 3: Illumination Systems

Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential premises, flood lighting

> Total Hours 45

Text Boo	ks:
1.	S. L. Uppal and G. C. Garg, "Electrical Wiring, Estimating & Costing", Khanna publishers,
	2008.
2.	K. B. Raina, "Electrical Design, Estimating & Costing", New age International, 2007.
a	S. Singh and R. D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co., 1997.
0.	Web site for IS Standards.
Referenc	e Books:
1	H. Joshi, "Residential Commercial and Industrial Systems", McGraw Hill Education, 2008.
2	E. Open Shaw Taylor, "Utilization of Electric Energy", Orient Longman, 1st Edition, 1937.
Web Refe	erences:
1	https://www.udemy.com/course/practical-home-electrical-installation/

15 Hrs

15 Hrs

2	https://www.coursera.org/courses?query=electrical
3	https://southcentral.edu/Workforce/residential-electrician-training-online-course.html

	Continuous Assessm	ent			
Formative Assessment	Formative Assessment		Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)							
Formative A	Assessment base	ed on Capstone Model					
Course OutcomeBloom's LevelAssessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)FA (16%) [80 Marks]							
C001.1	Understand	Quiz	20				
C001.2	Understand	Class Presentation	20				
C001.3	Analyze	Assignment	20				
C001.4	Understand	Assignment	20				
C001.5	Analyze	Case Study	20				

Assessment based on Continuous and End Semester Examination							
Bloom's Level	Summative Ass [120 M	End Semester Examination (60%)					
	CIA1: [12 Marks]	CIA2: [12 Marks]	[100 Marks]				
Remember	20	20	20				
Understand	30	30	20				
Apply	10	20	30				
Analyse	30	30	30				
Evaluate	-	-	-				
Create	-	-	-				

Assessment based on Continuous and End Semester Examination						
	End					
	Semester					
SΔ 1	FA 1 (40 Marks)		SA 2	FA 2 (4	0 Marks)	Examination
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	(00 <i>%)</i> [100 Marks]

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C001.1	3	1	1	1										2	
C001.2	3	2	2	1										2	
C001.3	3	2	1									3		2	
C001.4	3	3	3	2		1	1					2		3	
C001.5	3	3	3	2		1	1					2		3	
1	Reas	sonab	oly Ag	reed	2	Μ	loder	ately	Agre	ed	3	u,	Strongl	y Agree	ed

22EE002		Autonomous Vehicle	3/0/0/3						
Nature of	Course	D (Theory application)							
Course P	Course Pre-requisites Nil								
Course O	Course Objectives:								
1	1 To introduce the concepts of mobile and satellite communications.								
2	To realise the effect	of noise on communication systems.							
3	I o introduce differe	nt methods of analog and digital communication and their signi	ficance.						
Course O	utcomes:								
Upon cor	npletion of the could	rse, students shall have ability to	1 11						
C002.1	systems	damental theory of operation of electronic control	[U]						
C002.2	Understand the bas	sics of how automotive ECUs function in conjunction with the	[U]						
	vehicle data bus net	tworks and sensors							
C002.3	Understand the cor	ncept of remote sensing and the types of sensor technology	[U]						
	needed to implement	nt remote sensing.							
C002.4	Understand the ba networks	sic concepts of wireless communications and wireless data	[U]						
C002.5	Analyze the various	s types of advanced driver assistance systems and issues.	[A]						
Course C	ontents:								
Cyber-Phy and Autor Module 2 Basics of and Syste Module 3 Basics of Sensor D -Security	vsical System Theor homy. : Sensor Technolog Radar Technology ms - Camera Techn : Advanced Driver Theory of Operation ata Fusion - Driverle Issues.	y and Autonomous Vehicles - Role of Surroundings Sensing gy for Advanced Driver Assistance Systems and Systems - Ultrasonic Sonar Systems - Lidar Sensor Te ology - Night Vision Technology - Use of Sensor Data Fusion. Assistance System Technology n - Integration of ADAS Technology into Vehicle Electronics ss Car Technology - Moral, Legal, Roadblock Issues - Technic	Systems 15 Hrs chnology 15 Hrs - Role of al Issues						
Text Boo	ks:		Irs 45						
1	G. Mullett, Wirele Learning, ISNB#1-4	ss Telecommunications Systems and Networks, Thomson 018-8659-0,2006.	n Delmar						
2	2 G. Mullett, Basic Telecommunications : The Physical Layer, Thomson – Delmar Learning, ISBN#1-4018-4339-5, 2003								
Reference	e Books:								
1	Shaoshan Liu, Liyu Vehicle Systems" M	n Li, Jie Tang, Shuang Wu, Jean-Luc Gaudiot, "Creating Au lorgan & Claypool Publishers, 2020.	tonomous						
Web Refe	erences:								
1	https://freevideolect	ures.com/course/4278/nptel-advanced-iot-applications/19							
2	https://www.courser	a.org/specializations/self-driving-cars							

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessmer	Assessment Methods & Levels (based on Blooms' Taxonomy)						
Formative <i>A</i>	Formative Assessment based on Capstone Model						
Course OutcomeBloom's LevelFA (16%) [80 Marks]							
C002.1	Understand	Technical Presentation	20				
C002.2	Analyze	Online Quiz	20				
C002.3	Understand	Assignment 20					
C002.4	C002.4 Analyze Case Study 20						
C002.5	C002.5 Apply Case Study 20						

Assessment based on Summative and End Semester Examination							
Bloom's Level	Summative Ass [120 N	essment (24%) larks]	End Semester Examination (60%)				
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]				
Remember	20	20	20				
Understand	70	30	30				
Apply	-	30	30				
Analyse	10	20	20				
Evaluate	-	-	-				
Create	-	-	-				

Assessment based on Continuous and End Semester Examination									
	End Semester								
	arks	Examination							
	(60%) [100 Marks]								
SA 1 (60 Marks)Component - I (20 Marks)Component - II (20 Marks)SA 2 									

No. of the CO	РО 1	PO 2	РО 3	РО 4	РО 5	РО 6	РО 7	PO 8	РО 9	PO 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
C002.1	2	1											2	3	
C002.2	2	1											2	3	
C002.3	3	3	2	2										3	
C002.4	3	3	2	2					2				2	3	
C002.5	3	2	1	1					2	2				3	
1	Rea	sonat	oly Ag	reed	2		Mode	rately	Agree	ed	3		Strongl	y Agree	d

Nature of	ture of Course G (Theory Analytical)								
Course P	Course Pre-requisites Nil								
Course Objectives:									
1	To learn the workin	g operation and performance characteristics of Stepping and S	witched						
	reluctance motors.								
2	To realize the constructional realities of Synchronous reluctance motor.								
3	Bormonont Magnet Current reasons meters								
1	To know about the	Synchronous motors.							
	vulcomes.	real atudanta ahall hava ahilitu ta							
	Enumerate the prin	aiple of operation and performance of Stepher meters	[] []						
C003.1	Apply the principle	cipie of operation and performance of Switched Polyetaneoand	[U]						
0003.2	Servomotors		[AP]						
C003.3	Analyze the construmetor	uction and operation of Permanent Magnet BrushlessDC	[A]						
C003.4	Illustrate the constr Motors.	uction and operation of Permanent Magnet Synchronous	[U]						
C003.5	Analyze the charac	teristics and select special motors for specificapplications	[A]						
Course C	ontents:								
Stepper motors, V characteri and integ operation, Module 2 Brushless electronic DC moto characteri Synchrono diagram, I Module 3 Servomot strategies principle a systems -	motor: Construction ariable reluctance, stics - Linear actuato rated circuit fabricati , Torque equation, C : Permanent Magne , DC. Motors - C commutators, Torque , Square wave per stics. Application stics. Application ous Motor - Princip Power Controllers, To : Servomotor or - Constructional . Applications of ser and its schematic di Gear Piston and Va	hal features, Principle of operation, Special features of Permanent magnet stepping motor, Torque versus steppin fors with Stepper Motors. Application aspects related to textile indi- ons. Switched Reluctance Motor: Constructional features, Prin- haracteristics, Control Techniques and Drive Concept. et DC and Synchronous Motor Commutation in DC motors, Difference between mechanic and EMF equation, Rotor position sensors, Multiphase Br manent magnet brushless DC motor drives and their torque aspect related to vehicle and house hold-Permanent le of operation, EMF, Power input and torque expressions, orque speed characteristics.	stepper ng rate dustries aciple of 15 Hrs cal and rushless e-speed Magnet phasor 15 Hrs Control perating eumatic						
Systems -	Geal, FISION and Va	Total Hour	rs 45						
Text Boo	ks:								
1	Berker Bilgin, Jame Fundamentals to A	es Weisheng Jiang, Ali Emadi "Switched Reluctance Motor Drive pplications" CRC press, 2018	es:						
2	R.Krishnan, "Permanent Magnet Synchronous and Brushless DC Motor Drives" T&FIndia, 2016								
3	3 Dr.Duanek Hanselman, "Brushless Motors: Magnetic Design, Performance, and Control of Brushless DC and Permanent Magnet Synchronous Motors" F-Man Press LLC 2012								
Referenc	Reference Books:								
1	Ahmed Tahor, Abdel Ghani Aissabui "Switched Reluctance Motor Concept, Control and Applications" InTech Open 2017								
2	Riazollah Firoozian	"Servo Motors and Industrial Control Theory" Springer Internetition 2014	national						
3	V.V. Athani, "Step publisher,2nd editic	opper Motors: Fundamentals, Applications and Design" Ne on,2014	w Age						

Special Purpose Machines

22EE003

3/0/0/3

Web Ref	Web References:						
1	https://www.elprocus.com/stepper-motor-types-advantages-applications/						
2	https://electrical-engineering-portal.com/characteristics-and-work-principles-of-switched- reluctance-sr-motor						
3	http://machineryequipmentonline.com/hydraulics-and-pneumatics/applications-on- pneumatic air-motors/						
4	https://www.site.uottawa.ca/~rhabash/ELG2331SPM.pdf						

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessmer	Assessment Methods & Levels (based on Blooms' Taxonomy)							
Formative /	Assessment base	ed on Capstone Model						
Course Outcome	Course OutcomeBloom's LevelFA (16%) [80 Marks]							
C003.1	Understand	Assignment	20					
C003.2	Apply	Online Quiz	20					
C003.3	C003.3 Analyse Technical Presentation 20							
C003.4	C003.4 Understand							
C003.5 Analyse Case Study 20								

Assessment based on Summative and End Semester Examination							
Bloom's Level	Summative Ass [120 M	essment (24%) larks]	End Semester Examination (60%)				
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]				
Remember	50	20	40				
Understand	50	40	40				
Apply		20	20				
Analyse	-	20	-				
Evaluate	-	-	-				
Create	-	-	-				

Assessment based on Continuous and End Semester Examination									
	End Semester								
	Examination								
	FA 1 (4	0 Marks)	• • •	FA 2 (4	(60%) [100 Marks]				
SA 1 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)				

No. of the CO	РО 1	PO 2	РО 3	РО 4	РО 5	РО 6	РО 7	PO 8	РО 9	PO 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
C003.1	2	1			2										
C003.2	3	2	1	1	3								3	2	
C003.3	2	1			2										
C003.4	3	3	2	2	3								3	2	
C003.5	2	1			2										
1	Reasonably Agreed		2	Moderately Agreed			ed	3		Strongly Agreed					

Nature of Course D (Theory Application) **Course Pre-requisites** Nil **Course Objectives:** To study different non- conventional energy systems and its applications. 1 2 To enhance student's knowledge and assimilate new technologies. 3 To learn techno-economical storage methods of renewable energy systems. Course Outcomes: Upon completion of the course, students shall have ability to Enumerate the need of renewable energy and Analyze the concept of Kyoto C004.1 [A] protocol, energy scenario in India and Integrated Resource Plan C004.2 IUI Assess the role of Solar and wind energy in power plants C004.3 Apply the ideas of renewable energy sources to perform case studies AP1 [A] C004.4 Assess the role of biomass, tidal and geothermal in power plants C004.5 [U] Illustrate the operation and importance of different energy storage methods C004.6 Investigate the integration of renewable energy systems in Power plants [AP]

Renewable Energy Sources

Module1: Introduction

Course Contents:

22EE004

Importance and types of renewable sources of energy, Limitations of RE sources, PresentIndian and international energy scenario of conventional and renewable energy sources, Kyoto protocol, concept of clean development mechanism and prototype carbon funds, Integratedresource plan.

Module2: Wind Energy and Solar Energy

in the Wind, Types of Wind Power Plants (WPPs) - Components of WPPs - Working of WPPs - Site selection of WPPs, Solar Power, Solar thermal, Solar photovoltaic - Module, paneland array - series and parallel connections. Maximum PowerPoint Tracking, Applications. Casestudies on solar PV system, wind energy system.

Module3: Other Energy Sources and Storage Methods

Methods to generate - Biomass energy, tidal energy, geothermal energy and Fuel cell, applications, Storage methods of mechanical, chemical, electromagnetic, electrostatic and thermal energy - Selection and significance of Batteries - Hybrid energy systems and hybrid electric vehicles.

Text Boo	ks:									
1	JohnT widwell and Tony Weir," Renewable Energy Resources",4 th Edition,Routledge,2021.									
2	B.H.Khan, "Non-Conventional Energy Resources",3 rd Edition, Tata McGraw Hill, New Delhi,2017.									
3	G D Rai, "Non-conventional Energy sources", Khanna Publishers, 5th Edition, 2014.									
Reference Books:										
1	G.N.Tiwari, "Solar Energy", Tata McGraw Hill Publishing Company Ltd., NewDelhi, 2009.									
2	Aldo Vieira Da Rosa, "Fundamentals of Renewable Energy Processes", Academia Press, 2012.									
3	G.Masters, "Renewable and Efficient Electric Power Systems", IEEE-Wiley Publishers, 2013.									
Web Refe	erences:									
1	http://unfccc.int/kyoto_protocol/items/2830.php									
2	https://www.coursera.org/learn/wind-energy									
3	https://www.edx.org/course/solar-energy-delftx-et3034x-0									
4	http://unfccc.int/kyoto_protocol/items/2830.php									

15 Hrs

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15 Hrs

15 Hrs

3/0/0/3

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)									
Formative Assessment based on Capstone Model									
Course Outcome	Bloom's Level	Assessment Component	FA (16%) [80 Marks]						
C004.1	Analyze	Online Quiz	20						
C004.2	Understand	Technical Presentation	20						
C004.3	Apply	Assignment	20						
C004.4	Analyze	Assignment							
C004.5	Understand	Copp Study	20						
C004.6	Apply	Case Sludy							

Assessment based on Summative and End Semester Examination										
Bloom's Level	Summative Ass [120 N	essment (24%) larks]	End Semester Examination (60%)							
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]							
Remember	10		5							
Understand	60	10	15							
Apply	-	50	30							
Analyse	30	40	50							
Evaluate	-	-	-							
Create	-	-	-							

Assessment based on Continuous and End Semester Examination									
	End Semester Examination								
	FA 1 (4	0 Marks)		FA 2 (4	(60%) [100 Marks]				
SA 1 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)				

No. of the CO	РО 1	PO 2	РО 3	РО 4	PO 5	PO 6	PO 7	PO 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C004.1	2	1				2	2	2				1			1
C004.2	3	3	2			2	З	1				3	1	2	2
C004.3	3	3	2	1		2	3	1		1		3	1	2	1
C004.4	3	3	2			2	3	1				3	1	2	1
C004.5	2	1				2	3	1				3	1	1	1
C004.6	3	3	2	2		2	3	2		1		3	1	2	2
1	Reasonably Agreed 2					Moderately Agreed				3	Strongly Agreed				
22EE005	Servo and Robot Drives														
--	--	---	-------	--	--	--	--								
Nature of	Course	D (Theory application)													
Course P	re-requisites	Nil													
Course Objectives:															
1 To impart the knowledge of servo motors drives and power transmission.															
2	To understand the	concepts sensors and vision systems.													
3	To understand the	concepts of robots in various industries for automation													
Course C	Outcomes:														
Upon cor	npletion of the cou	rse, students shall have ability to													
C005.1	Interpret the basic	laws and concepts of robots.	[U]												
C005.2	Explain the classif	cation of robots and degrees of freedom ofserial and	ri 11												
	parallel manipulato	Drs	[0]												
C005.3	Analyze the senso	r systems to the robotic system.	[A]												
C005.4	Analyze the power	transmission systems in the robotic system.	[A]												
C005.5	Apply the Robots in Manufacturing and Processing Industries.														
Course C	Course Contents:														

Module 1: Introduction to Fundamental Concepts of Robotics

History, Present status and future trends in Robotics and automation - Laws of Robotics- Robot definitions - Robotics systems and robot anatomy - Structure of a Robot, Classification of Robots: Cartesian, Cylindrical, Spherical, Articulated, SCARA - Specification of Robots - Degrees of Freedom of Serial and Parallel Manipulators- resolution, repeatability and accuracy of a manipulator.

Module 2: Sensors and Vision Systems

Principle of operation, types and selection of position and velocity sensors, Potentiometers, Encoders, Resolvers, LVDT, Tacho-generators, Internal and External State Sensors, Proximity sensors. Limit Switches-Tactile sensors -Touch sensors -Force and torque sensors, Robot End Effectors. Vision Systems. Vision Systems for Robotics: Robot vision systems, Image capture-Solid State Cameras-Image Representation-Grey scale and colour images, image sampling and quantization - Image processing and analysis - Image data reduction Segmentation - Feature extraction — Object Recognition.

Module 3: Motors Drives and Factory Automation

Types Constructional features — Principle of operation- Feedback system - Robot drive mechanisms, hydraulic-electric servomotor- stepper motor - pneumatic drives. Control of Electrical Drives: Introduction-Parts of Electrical Drives- Fundamental Torque Equations- Speed Torque Conventions and Multi - quadrant Operation-Nature and Classification of Load Torques - Modes of Operation-Closed - Loop Control of Drives. Factory Automation: Flexible Manufacturing Systems concept - Automatic feeding lines, transfer lines, automatic inspection - Computer Integrated Manufacture-CNC, intelligent automation HMI Systems, DCS and SCADA, Wireless controls.

Text Boo	ks:
1	Deh SR., "Robotics Technology and Flexible Automation", Tata Mc Graw Hill
'	Publishing, CompanyLtd.,2 ^{na} edition, 2017.
0	Mikel IP Grooveret.al.," Industrial Robots- Technology, Programming and
2	Applications", Mc Graw Hill, NewYork, 2017.
3	Saeed B Niku,"Introduction to Robotics Analysis, Systems, Applications", PHI Pvt Ltd,
	NewDelhi,2016.
4	Peter Corke, "Robotics, Vision and Control: Fundamental Algorithms In MATLAB" first
4	Edition 2011.
Referenc	e Books:

15 Hrs

15 Hrs

15 Hrs

1	SK Saha-Introduction to Robotics, Tata Mcgraw Hill, 2010				
2	Mittal RK, Nagrath IJ, ""Robotics and Control, Tata McGrawHill, 2010				
3	Richard D Klafter, Thomas A Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Eastern Economy, Prentice Hall of India Pvt Ltd., 2010.				
Web Refe	Web References:				
1	https://ocw.mit.edu/courses/mechanical-engineering/2-12-introduction-to-robotics-fall-				
	2005/				
2	https://www.edx.org/course/robotics-columbiax-csmm-103x				
3	https://www.futurelearn.com/courses/begin-robotics				

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)								
Formative Assessment based on Capstone Model								
Course OutcomeBloom's LevelFA (16%) [80 Marks]								
C005.1	Understand	Online Quiz	20					
C005.2	Understand	Technical Presentation	20					
C005.3	Analyze	Assignment	20					
C005.4	Analyze	Assignment	20					
C005.5	Apply	Case Study	20					

Assessment based on Summative and End Semester Examination							
Bloom's Level	Summative Ass [120 N	essment (24%) larks]	End Semester Examination (60%)				
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]				
Remember	40	20	20				
Understand	60	40	40				
Apply	-	20	20				
Analyse	-	20	20				
Evaluate	-	-	-				
Create	-	-	-				

Assessment based on Continuous and End Semester Examination							
	End Semester						
	Examination						
•••	FA 1 (4	0 Marks)		FA 2 (4	10 Marks)	(60%) [100 Marks]	
SA 1 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)		

No. of the CO	РО 1	PO 2	РО 3	РО 4	РО 5	РО 6	РО 7	PO 8	РО 9	PO 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
C005.1	2	1			2								3		
C005.2	2	1					1						2		
C005.3	3	3	2	2			1						3	1	
C005.4	3	3	2	2									3		
C005.5	3	2	1	1	2								3	1	
1	Reasonably Agreed		reed	2		Mode	rately	Agree	ed	3		Strong	y Agree	d	

22EE006	Industrial Safety Management 3/0/0/3								
Nature of	Course	C (Theory Concept)							
Course Pre	e-requisites	NIL							
Course Ol	Course Objectives:								
1 To equip with knowledge of basic maintenance of industrial electrical systems in a safe and environmentally sound manner									
2	To imbibe kno	wledge on protection systems.							
3	To study abou	t protective devices to protect from electrical hazards.							
4	To know abou	t the automation in electrical systems.							
Course Ou	utcomes:								
Upon com	pletion of the	course, students shall have ability to							
C006.1	Illustrate the e connected with	xtreme importance of observing all safety requirements ar h electricity	nd practices	[R]					
C006.2	Summarize ab electrical accid	oout various electrical hazards and demonstrate what to do dent.	o during an	[U]					
C006.3	Analyze variou	us protection methods for hazardous electrical equipment.		[A]					
C006.4	Enumerate va	rious components of industrial electrical systems.		[U]					
C006.5	Paraphrase the role of automation in electrical systems.								
Course Co	ontents:								

Module 1: Concepts and Statutory Requirements

Working principles of electrical equipment - Indian electricity act and rules-statutory requirements from electrical inspectorate-international standards on electrical safety - first aid - cardio pulmonary resuscitation (CPR).

Module 2: Electrical Hazards

Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity, Safety in handling of war equipment, hazardous conditions, control, electrical causes of fire and explosion.

Module 3: Protection Systems

Protection components- Fuse, MCB, MCCB, ELCB -Personal protective equipment - safety in handling hand held electrical appliances tools and medical equipment. Industrial Electrical Systems-DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks. Industrial Electrical System Automation-Study of basic PLC, Role of PLC in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

	Total Hours 45
Text Book	S:
1	Mary Capelli-Schellpfeffer, Dennis Neitzel, John Cadick, Al Winfield "Electrical Safety Handbook", McGraw-Hill Education,4th Edition,2012.
2	Hemant Joshi," Residential, Commercial and Industrial Electrical Systems: Equipment and Selection, McGraw Hill Education, 2008
3	S. L. Uppal and G. C. Garg, "Electrical Wiring, Estimating & Costing", Khanna publishers, 2008.

18 Hrs

15 Hrs

12 Hrs

Referenc	e Books:					
1	Power Engineers – Handbook of TNEB, Sixth Edition, Chennai, 2002.					
2	Indian Electricity Act and Rules, Government of India, The Electricity Act, 2003.					
3	Martin Glov Electrostatic Hazards in powder handling, Research Studies Pvt. LTd., England, 2003.					
Web References:						
1	www.osha.gov https://library.e.abb.com					

	Continuous Assessment								
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total				
80	120	200	40	60	100				

Assessme	Assessment Methods & Levels (based on Blooms' Taxonomy)								
Formative	Formative Assessment based on Capstone Model								
Course Outcome	Bloom's Level	Assessment Component	FA (16%) [80 Marks]						
C006.1	Remember	Online Quiz	20						
C006.2	Understand	Case Study	20						
C006.3	Analyze	Assignment	20						
C006.4	Understand	Tachnical Procontation	20						
C006.5	Understand		20						

Assessment based on Summative and End Semester Examination									
Bloom's Level	Summative Ass [120 M	essment (24%) larks]	End Semester Examination (60%)						
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]						
Remember	30	10	10						
Understand	30	20	40						
Apply	60	20	20						
Analyse	-	50	30						
Evaluate	-	-	-						
Create	-	-	-						

Assessme	ent based on (Continuous and	d End Seme	ester Examina	ation	
	(Continuous As: [200 N	sessment (4 Marks]	40%)		End Semester
	arks	Examination				
	FA 1 (4	0 Marks)		FA 2 (4	0 Marks)	(60%) [100 Marke]
SA 1 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	

No. of the CO	РО 1	PO 2	РО 3	РО 4	РО 5	PO 6	РО 7	РО 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C006.1	3	3	2	2									3	2	
C006.2	3	3	2	2									3	2	
C006.3	3	3	3	3						2			3	2	
C006.4	3	3	3	3							3	2			
C006.5	3	3	2	2						2			3	2	
1	Rea	sonat	oly Ag	reed	2		Moderately Agreed			3		Strong	y Agree	d	

EMERGING ELECTIVES

М

22EE007	Machine Learning Applications in Energy Systems	3/0/0/3						
Nature of	f Course D (Theory Application)							
Course P	Pre-requisites Power System Analysis, Python Programming							
Course C	Objectives:							
1	Understand the concept of Machine Learning (ML).							
2	Recognize the applications in Renewable energy sources.							
3	To investigate the effectiveness of ML in power systems.							
4	To Study about load forecasting and fault detection in power system using ML t	topics.						
5	To accomplish the approach of machine learning based Artificial Neural N	Vetwork						
5	(ANN) and Genetic Algorithm (GA) in power system.							
Course C	Outcomes:							
Upon cor	mpletion of the course, students shall have ability to							
C007.1	Perceive knowledge about Machine learning concepts and its classifications.	Perceive knowledge about Machine learning concepts and its classifications. [U]						
C007.2	Analyze load forecasting and fault detection in power system using Machine [A]							
C007.3	Understand the concept of GA and ANN in power system.							
C007.4	Demonstrate Machine learning applications in smart grid.							
C007 F	Analyze the concepts of machine learning in Renewable energy generation	<u>ر</u> ۲۷۱						
C007.5	and monitoring.	[A]						
Course C	Contents:							
Introduction types of Neighbou	ion to Machine learning - History and early works - Theoretical aspects of ML - D Machine Learning algorithms - Linear regression, Logistic regression, K - I ur, Artificial Neural Networks, Random Forest, and Support Vector.	Different Nearest						
Operation studies - and secur and NN ir	n and control problems of load forecasting - Renewable energy forecasting - Lo Economic load dispatch, Unit commitment, power plant monitoring, fault identi irity assessment - Unconstrained and constrained optimization using Genetic Alg n power system - Machine learning applications in smart grid.	ad flow ification gorithm						
Module 3	3: Machine learning in Renewable Energy Systems	15 Hrs						
Machine Forecasti location, accuracy power for	learning techniques for renewable energy generation - Machine learning applicating renewable energy sources (Wind, Solar and Hydro power) - Determining size and configuration, Managing renewable energy integrated smart grid - Fore of algorithms - Battery Management Using Machine Learning. Case Study recasting based on daily mean wind speed and standard deviation.	ations in ng plant ecasting y: Wind						
Toxt Boo	l otal Hou	rs 45						
1	Andrew Kelleher, Adam Kelleher, 'Machine Learning in Production- Develo Optimizing Data Science Workflows and Applications, 1 st Edition, Pearson pub 2020.	ping & lishers,						
2	Saifullah Khalid, 'Applications of Artificial Intelligence in Electrical Engineeri Edition, GI Global Knowledge publisher, 2020.	ing', 1 st						
3	Rakesh Sehgal, Neeraj Gupta, Anuradha Tomar, Mukund Dutt Sharma and Kumaran, 'Smart Electrical and Mechanical Systems: An Application of A Intelligence and Machine Learning' Elsevier Science, 2022.	l Vigna Artificial						
Referenc	ce Books:							
1	Mohssen Mohammed, Muhammad Badruddin Khan, Eihab Bashier Moha Bashier ,"Machine Learning: Algorithms and Applications", CRC Press Tayl Francis group, 1 st edition, 2020	ammed lor and						
2	Morteza Nazari-Heris, Milad Sadat-Mohammadi, Houtan Jebelli, Abdar, Somayeh Asadi, Behnam Mohammadi-Ivatloo, 'Application of M Learning and Deep Learning Methods to Power System Problems' S International Publishing, 1 st edition, 2021.	Moloud Iachine Springer						

Web Ref	erences:
1	https://nptel.ac.in/courses/106105152
2	https://www.datarevenue.com/en-blog/machine-learning-for-energy-distribution
3	https://www.mdpi.com/journal/energies/special issues/Machine Learning Optimizati
	on_Power_System

	Continuous Assessn	nent			
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessme	Assessment Methods & Levels (based on Blooms' Taxonomy)								
Formative	Formative Assessment based on Capstone Model								
Course OutcomeBloom's LevelFA (16%) [80 Marks]									
C007.1	Understand	Technical Quiz	20						
C007.2	Analyze	Case Study	20						
C007.3	Understand	Class Presentation	20						
C007.4	Apply		20						
C007.5	Analyze	Assignment	20						

Assessment bas	ment based on Summative and End Semester Examination									
Bloom's Level	Summative Ass [120 N	essment (24%) larks]	End Semester Examination (60%)							
	CIA1 : [60 Marks]	[100 Marks]								
Remember	20	10	20							
Understand	40	30	20							
Apply	20	40	20							
Analyse	20	20	40							
Evaluate	-	-	-							
Create	-	-	-							

Assessm	Assessment based on Continuous and End Semester Examination								
		Continuous As: [200 N	sessment ([,] Marks]	40%)		End Semester			
	Examination								
	FA 1 (4	0 Marks)		FA 2 (4	40 Marks)	(60%) [100 Marks]			
SA 1 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)				

No. of the CO	РО 1	PO 2	РО 3	РО 4	РО 5	РО 6	РО 7	PO 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C007.1	3	3	2	2									3	2	
C007.2	3	3	2	2									3	2	
C007.3	3	3	3	3						2			3	2	
C007.4	3	3	3	3									3	2	
C007.5	3	3	2	2						2			3	2	
1	Rea	sonat	oly Ag	reed	2	Moderately Agreed			3		Strong	y Agree	d		

22EE008	Big Data Analytics for Smart Grid	3/0/0/3
Nature of	f Course D (Theory application)	
Course P	Pre-requisites Power System Analysis, Python Programming	
Course C	Objectives:	
1	To learn the infrastructure and technologies used in Smart Grid.	
2	To realize the challenges in Power System and futuristic technologies for impr	oving
2	power system stability.	0
2	To impart knowledge on Intelligent data collection devices, Machine learning	
3	algorithms for Big Data Analytics.	
4	To know about the Cloud and Edge Computing for Smart Grid Applications.	
Course C	Dutcomes:	
Upon cor	mpletion of the course, students shall have ability to	
C008 1	Examine the Challenges and provide Solutions in Power Systems	[A]
C008 2	Describe the necessity for Smart Grid, its structure, tools and technologies	
C008.3	Implement the Machine learning algorithms for Big Data Analytics	
C008.4	Illustrate the Potential Applications of Big Data Applytics in Smart Gride	
C008.4	Investigate the Edge and Cloud computing solutions for the Smart Crid	
C008.5		[A]
Course C	,oments.	
Module 1	: Data Analysis and Data Science in Smart Grid	15 Hrs
Basics of	Smart Grid - Use of Satellite Communication in Modern Power System - Ch	allenges
and Solut	ions in Power Systems - Need for Big Data Analytics in Smart Grid - Role of	DMIL in
	id Emerging Trends and Dig Data Analytics in Smart Ord - Role of	
Smart Gr	ia - Emerging Trends and Big Data Analytics at Distribution level Grid - L	PIVIUS:
Design ar	nd Prototyping - Data Science Pertaining to field of Smart Grid - Smart Grid Us	e Cases
- Analytics	s in Smart Grids Tools and Technologies for Smart Grid.	
	Mashina Lasmina Algarithma far Din Data Analytica	45 11
wodule 2	: Machine Learning Algorithms for Big Data Analytics	15 Hrs
Introduction	on to machine learning - Logistic Regression - Support Vector Machine - Su	pervised
and Unsu	upervised Learning - Artificial Neural Network and Models - Demonstration	n of NN
implemen	tation of Time Series of Data in the Google Colab using Python - Implemen	tation of
	IDB Data in Google Colab using Python	
	De Data in Google Golab daing i ython	
Module 3	: Cloud and Edge Computing for SG Applications	5 Hrs
Cloud cc	proputing and cloud Analytics - Cloud Analytics - Edge Computing for Sn	nart Grid
Applicatio	ons - Application of CC and FC in the field of system optimization fault of	letection
intelligent	t protection load analysis and forecasting, security and data management	.0.000.011,
intelligen	Total Ho	urs 45
Text Boo	ks:	
	Shady S. Refaat, Omar Ellabhan, Sertac Bayhan, Haitham Abu-Rub, Frede I	Blaabiero
1	and Miresley M. Begovia, "Smart Crid and Enabling Technologies", Wiley 202	1
		1.
	Bernd M. Buchholz, Zbigniew A. Styczynski "Smart Grids Fundamen	tals and
2	Technologies in Electric Power Systems of the Future", Springer Berlin He	eidelberg,
	2020.	
	Carol L Stimmel "Big Data Analytics Stratagies for the Smart Grid" CD	C Proce
3	Toulor and Francia 2010	0 11033,
	rayor and Francis, 2016.	
Referenc	e Books:	
1	Chun Sing Lai, Loi Lei Lai, Qi Hong Lai, "Smart Grids and Big Data Analytics	for Smart
I	Cities", Springer International Publishing, 2021.	on onnant
	Vi Mana Oisia Ohan and Ohan anian Kana (Onant Mater Data Analytica)	
	YI wang, Qixin Chen, and Chongqing Kang Smart Meter Data Analytics.	Springer
2	Singapore, 2020.	Springer
2	Singapore, 2020. Pethuru Rai, S. Koteeswaran, "Novel Practices and Trends in Grid ar	Springer
2 3	Singapore, 2020. Pethuru Raj, S. Koteeswaran, "Novel Practices and Trends in Grid ar Computing" IGI Global 2019	Springer nd Cloud
2 3 Web Refe	Provide and Smart Meter Data Analytics, Singapore, 2020. Pethuru Raj, S. Koteeswaran, "Novel Practices and Trends in Grid ar Computing", IGI Global, 2019.	Springer nd Cloud
2 3 Web Refe	Pethuru Raj, S. Koteeswaran, "Novel Practices and Trends in Grid ar Computing", IGI Global, 2019. erences: https://online.courses.swayam2.ac.in/arp19ap60/proview.	Springer nd Cloud
2 3 Web Refe	Pethuru Raj, S. Koteeswaran, "Novel Practices and Trends in Grid ar Computing", IGI Global, 2019. erences: https://onlinecourses.swayam2.ac.in/arp19_ap60/preview	Springer nd Cloud

3	https://online.stanford.edu/courses/xeiet137-smart-grid-sensing-data-analytics-and-
	control

Formative Summative Assessment Assessment		Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)								
Formative	Formative Assessment based on Capstone Model							
Course Outcome	CourseBloom'sOutcomeLevel							
C008.1	Analyse	Online Quiz	20					
C008.2	Understand	Technical Presentation	20					
C008.3	Apply	Assignment	20					
C008.4	Apply	Assignment	20					
C008.5	Analyse	Case Study	20					

Assessment based on Summative and End Semester Examination							
Bloom's Level	Summative Ass [120 N	essment (24%) larks]	End Semester Examinatior (60%)				
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]				
Remember	20	20	20				
Understand	30	30	30				
Apply	20	30	30				
Analyse	30	20	20				
Evaluate	-	-	-				
Create	-	-	-				

Assessment based on Continuous and End Semester Examination								
	End Semester Examination							
CA 1 : 100 Marks CA 2 : 100 Marks								
	FA 1 (40 Marks)			FA 2 (40 Marks)		(60%) [100 Marks]		
SA 1 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)			

No. of the CO	РО 1	PO 2	РО 3	РО 4	РО 5	РО 6	РО 7	PO 8	РО 9	РО 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C008.1	3	3	3	3	1	1	1						3		
C008.2	3	3	3	3	2	1	1	1				2	3	1	
C008.3	3	3	3	3	3				2			3		3	3
C008.4	3	3	3	3	3	1	1		2			3	1	3	3
C008.5	3	3	3	3	3	1	1		2			3	1	3	3
1	Reasonably Agreed			2		Mode	rately	Agree	ed	3		Strong	y Agree	d	

22EE009		High Voltage Insulation Technology	3/0/0/3
Nature o	f Course	G (Theory and Analytical)	
Course F	Pre-requisites	Generation, Transmission and Distribution	
Course C	Objectives:		
1	To understand	the concept of insulation systems in various power apparatus.	
2	To understand	the concepts of high voltage testing.	
3	To describe the and gas at high	e fundamentals of breakdown and partial discharge in insula voltages.	ting solid
4	Gain knowledge well as the testi	e on the generation and measurement of high voltages and cu ing of high voltage equipment.	rrents as
Course C Upon co	Dutcomes: mpletion of the	course, students shall have ability to	
C009.1	Interpret the baccomponents.	asic concepts of insulation systems in various power system	י [U]
C009.2	Examine the dif	fferent methods for high voltage testing and standards.	[A]
C009.3	Illustrate variou	s insulating materials and electrical insulation design concepts.	[AP]
C009.4	Examine the c currents	different methods of generating various high voltages and	[A]
C009.5	Illustrate the c currents with di	different methods of measuring various high voltages and gital techniques.	[AP]
Course C	Contents:		

Module 1: Insulation Engineering and High Voltage Testing

Introduction to HV engineering - Challenges & opportunities in electric power equipment industry - insulation materials - Stresses on power apparatus insulation & insulation systems of various power apparatus - Interconnection of HV power system components - Insulation coordination. High voltage testing of electrical power apparatus – Power frequency, Impulse voltage and DC testing – Testing of circuit breakers. IEC, ANSI, IEEE - International and Indian standards.

Module 2: Insulating Materials Utilized in Power-System Equipment

Review of insulating materials (Solid, Liquid and Gases and Vacuum) - Characterization of insulation - Deterioration and failure insulation - Electrical breakdown and operating stresses - insulation applications. Introduction to Electrical Insulation Design Concepts: Overview of insulation design requirements - Electric stress distributions in simple insulation systems - Electric stress control.

Module 3: Generation and Measurement of High Voltages

Generation of high DC, AC, Impulse voltages and currents - Multistage impulse generator circuit -Triggering of impulse generator - High voltage DC: Rectifier circuits, Voltage Multipliers - Van-degraph generators. High Voltage AC: Cascaded transformers and Tesla coils. Measurement of high voltages and high currents and impulse current using sphere gaps - Peak voltmeters, Potential dividers - Digital techniques in high voltage measurement - Partial discharge measurement

 Text Books:

 1.
 Naidu, M.S. and Kamaraju,V., 'High Voltage Engineering', McGraw- Hill Publishing Company, New Delhi,6th Edition, 2020.

 2.
 C.L.Wadhwa, "High Voltage Engineering", New Age Internationals Pvt. Ltd, 6th edition, 2020.

 3.
 Ravindra Arora & Wolfgang Mosch: High voltage Insulation Engineering, New Age International Publishers, 2011.

 Reference Books:

18 Hrs

9 Hrs

18 Hrs

Total Hours 45

1.	L.L. Alston, "High Voltage Technology", Oxford University Press, First Indian Edition, 2011.						
2.	E. Kuffel, W.S. Zaengl, J. Kuffel, High voltage Engineering Fundamentals, Newnes Publishers 2011						
3.	R.E. James and Q. Su, "Condition Assessment of High Voltage Insulation in Power System Equipment", The Institution of Engineering and Technology, London, United Kingdom, 2008.						
Web Ref	Web References:						
1.	https://www.youtube.com/watch?v=ga8moSgeO34						
2.	https://archive.nptel.ac.in/courses/108/104/108104048/						
3.	https://www.digimat.in/nptel/courses/video/108104013/L29.html						

Formative Summative Assessment Assessment		Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessme	Assessment Methods & Levels (based on Blooms' Taxonomy)						
Formative	Assessment ba	sed on Capstone Model					
Course OutcomeBloom's LevelAssessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)							
C009.1	Understand	Quiz	20				
C009.2	Analyze	Assignment	20				
C009.3	Apply	Class Presentation	20				
C009.4 C009.5	Analyze Apply	Case Study	20				

Assessment based on Continuous and End Semester Examination							
Bloom's Level	Summative As [120 I	End Semester Examination (60%)					
	CIA1 : [12 Marks]	CIA2 : [12 Marks]	[100 Marks]				
Remember	20	10	20				
Understand	30	30	20				
Apply	30	30	30				
Analyse	20	30	30				
Evaluate	-	-	-				
Create	-	-	-				

Assessment based on Continuous and End Semester Examination							
	End						
	Examination						
SA 1	FA 1 (4	FA 1 (40 Marks)		FA 2 (40 Marks)		(60%)	
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	[100 Marks]	

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C009.1	2	2											1		1
C009.2	3	3	2	2	2							1	3		3
C009.3	3	2	3	2									3		2
C009.4	3	3	2	2									3		3
C009.5	3	2	3	2	1								3		3
1	Rea	sonab	oly Ag	reed	2	Moderately Agreed			3		Strongl	y Agree	d		

22EE010	Internet of Things for Electrical Systems	3/0/0/3								
Nature of	Course C (Theory Concept)									
Course O	Course Objectives:									
1	To introduce evolution of internet technology and need of IoT.									
2	2 I o discuss about IoT reference layer, various protocols and software. To train the atualante to build by T									
3	3 To train the students to build IoT systems using sensors, single bard computers and open source IoT platforms.									
4	To make the students to apply IoT data for business solution in various manner.	domain in secured								
Course O	utcomes:									
Upon con	pletion of the course, students shall have ability to									
C010.1	Identify the IoT networking components with respect to OSI layer.	[U]								
C010.2	Design and develop IT based sensor systems.	[AP]								
C010.3	Evaluate the wireless technologies for IoT.	[E]								
C010.4	Appraise IoT applications in industrial and real world.	[AP]								
Course C	ontents:									
Review of Networks architectu Cloud and infrastruct	computer communication concepts: OSI layers - Components - Packet - TCP-IP - Subnetting - IPV4 addressing and challenges - IPV6 re reference layer. IoT components: Characteristics IoT sensor nodes a peripheral cloud - Single board computers - Open source hardware ure.	 addressing - IoT Edge computer - Examples of IoT 								
gateway p technolog Evolution - Cloud da Module 3 Need for model for cities - He	protocols - IoT Communication Pattern - IoT protocol Architecture - Se ies - 6LoWPAN, Zigbee, WIFI, BT, BLE, SIG, NFC, LORA, Lifi, Widi. Clo of Cloud Computation - Commercial clouds and their features - Open so ashboards. • IoT Security and Applications encryption - Standard encryption protocol - Lightweight cryptography IoT A - Threat analysis and model for IoT A - Cloud security Case stud alth care - Agriculture - Smart meters - M2M - Web of things - Cellular Io	lection of Wireless bud Computation: burce IoT platforms 15 Hrs - Quadruple trust dies: IoT for smart burce IoT - Industrial IoT -								
Industry 4	0 - IoT standards.	45								
Taxt Bool	101	ai nours 45								
1 Vijay Thing 2 Jan Boyle	Madisetti, Arshdeep Bahga, Adrian McEwen (Author), Hakim Cas s A Hands-on-Approach" Arshdeep Bahga and Vijay Madisetti, 2014. Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Ste , "From Machine to Machine to Internet of Things", Elsevier Publications	ssimally "Internet o fan Avesand, Davio 5, 2014.								
3 Barri	e Sosinsky, "Cloud Computing Bible", Wiley-India, 2010.									
Reference	e Books:									
1 LuY	an, Yan Zhang, Laurence T. Yang, Huansheng Ning, The Internet of Thi Next-Generation Pervasive Network, Aurbach publications, March, 2008.	ings: From RFID to								
2 Asol	Ke K Talukder and Roopa R Yavagal, "Mobile Computing," Tata McGraw	Hill, 2010.								
3 Rona Clou	aldL. Krutz, Russell Dean Vines, Cloud Security: A Comprehensive Guid d Computing, Wiley-India, 2010.	e to Secure								
Web Refe	rences:									
1 <u>https</u>	://onlinecourses.nptel.ac.in/noc19_cs65/preview									

Formative Assessment	Summative Assessment	Total Continuous Assessment	End Semester Examination	Total	
80	120	200	40	60	100

Assessmer	Assessment Methods & Levels (based on Blooms' Taxonomy)						
Formative	Assessment bas	sed on Capstone Model					
Course OutcomeBloom's LevelAssessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)FA (16%) [80 Marks]							
C010.1	Understand	Online Quiz	20				
C010.2	Apply	Technical Presentation	20				
C010.3	C010.3 Evaluate Assignment 20						
C010.4	C010.4 Apply Case Study 20						

Assessment based on Summative and End Semester Examination								
Bloom's Level	Summative Ass [120 M	essment (24%) arks]	End Semester Examination (60%)					
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]					
Remember	-	-	-					
Understand	-	-	-					
Apply	50	-	40					
Analyse	-	60	30					
Evaluate	50	40	30					
Create	-	-	-					

Assessment based on Continuous and End Semester Examination									
	End Semester								
	arks	Examination							
	FA 1 (40 Marks) FA 2 (40 Marks)								
SA 1 (60 Marks)									

No. of the CO	РО 1	PO 2	РО 3	РО 4	РО 5	РО 6	РО 7	PO 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C010.1	2	1											2		
C010.2	3	2	1	1									2		
C010.3	3	3	2	2									3		
C010.4	3	2	1	1		1							2		
1	Rea	sonat	oly Ag	reed	2	Moderately Agreed			3		Strong	y Agree	d		

22EE011		Rapid System Prototyping With FPGAs	3/0/0/3
Nature o	f Course	G (Theory)	
Course F	Pre-requisites	Digital Electronics, Microcontrollers	
Course C	Objectives:		
1	To study the ba	isic concepts of FPGAs.	
2	To understand	the architecture and analyze the design process of FPGA.	
3	Understand cor	nfiguring and implementing digital embedded system on FPGA	
Course C	Dutcomes:		
Upon co	mpletion of the	course, students shall have ability to	
C011.1	Interpret the ba	sic concepts of Field Programmable Gate Arrays.	
C011.2	Analyze the cor	ncepts on device level FPGA design process	
C011.3	Analyze the var	ious techniques used for board level FPGA design process	
C011.4	Implementation	of the various digital circuits in FPGA	
C011.5	Develop test be	enches to simulate combinational and sequential circuits	
Course C	Contents:	new tala	-
Module	E FPGA Fundan) Hrs
SRAM B	ased FPGA Arc	hitecture - Advanced FPGA Features - Optimizing the Dev	elopment
Cycle - F	PGA Design Flo	ow - System Engineering - Common Design Challenges and	Mistakes
- Defined	FPGA Design F	Process - Project Engineering and Management – Training -	- Support
- Design	Configuration M	anagement.	
	-		
Module 2	2: FPGA DESIGN	N 15	5 Hrs
FPGA D	evice-Level De	sign Decisions - FPGA Selection Categories - Design De	cisions -
Device S	election Checkli	st st	
Board-L	avel Design	Decisions and Allocation - Packaging - BGA Co	mnonent
Consider	etione I/O Acc	pignment Iteration EDCA Device Schematic Symbol Con	aration
Consider		Signment iteration - FPGA Device Schematic Symbol Gen	eration -
Inermal	- Board Layout -	Signal Integrity – Power.	
Module 3	B: DESIGN IMPL	EMENTATION AND SIMULATION	15 Hrs
Design I	mplementation	- Design Architecture - Design Entry - RTL - Synthesis - F	'lace and
Route.			
Design S	Simulation - St	ages of Simulation - Types of Simulation Files - Design C	Constraint
Managen	nent - Desian Or	ptimization.	
		Total Ho	urs 45
L			

Text Boo	oks:
1.	R. C. Cofer, Benjamin F. Harding, "Rapid System Prototyping with FPGAs", Newnes
	Publishers, 2005.
2.	V. Sklyarov, L. Skliarova, A. Barkalov, L. Titarenko. Synthesis and Optimization of
	FPGA-Based Systems. Springer; 2014.
3.	Clive Maxfield, The Design Warriors's Guide to FPGAs, Elsevier, 2004.
4	Wayne Wolf, "FPGA Based System Design", Prentices Hall Modern Semiconductor
4.	Design Series, 2004.
Reference	e Books:
1	D. Amos, Au. Lesea, R. Richter. "FPGA-Based Prototyping Methodology Manual",
I	2011.
2	Spartan-3A/3AN EPGA Starter Kit Board User Guide, 2010
_	
Web Ref	erences:
1	https://nptel.ac.in/courses/117108040
2	https://www.udemy.com/course/inexpensive-fpga-development-and-prototyping-by-
	example/
3	https://www.coursera.org/learn/intro-fpga-design-embedded-systems
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Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessme	Assessment Methods & Levels (based on Blooms' Taxonomy)							
Formative	Assessment ba	sed on Capstone Model						
Course Outcome	Course OutcomeBloom's LevelAssessment Component (Choose and map components from the list - Quiz, Assignment, 							
C011.1	Understand	Quiz	20					
C011.2	Analyze	Class Presentation	20					
C011.3	C011.3 Analyze Assignment 20							
C011.4	C011.4 Apply Case Study 20							
C011.5	Apply	Case Olddy	20					

Assessment based on Continuous and End Semester Examination							
Bloom's Level	Summative As [120	End Semester Examination (60%)					
	CIA1 : [12 Marks]	[100 Marks]					
Remember	20		20				
Understand	30	20	20				
Apply	-	40	30				
Analyse	50	40	30				
Evaluate	-	-	-				
Create	-	-	-				

Assessm	Assessment based on Continuous and End Semester Examination								
	End Semester Examination								
SA 1	FA 1 (40 Marks)		SA 2	FA 2 (4	(60%)				
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	[100 Marks]			

No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C301.1	3	2	1	1									3		
C301.2	3	2	2	1									3		
C301.3	3	2	2	1									3		
C301.4	3	3	3	2	2	1	1					1		3	1
C301.5	3	3	3	2	2	1	1		2			1		3	1
1	Rea	sonab	ly Ag	reed	2	I	Moder	rately	Agree	ed	3	Strongly Agreed			

22EE012		Grid Integration of EV	3/0/0/3	•
Nature of	Course	G (Theory Analytical)		
Course Pr	e-requisites	Power Electronics		
Course O	bjectives:			
1	To impart the Power Semice	knowledge on switched mode power supplies and the onductor devices.	characteristic	s of
2	To provide ac reactive elem	dequate knowledge of isolated converters and design contents.	onstraints of	
Course O	utcomes:			
Upon con	npletion of the	e course, students shall have ability to		
C012.1	Analyze the c isolation.	operation of Switched Mode DC Power Supplies with an	nd without	[A]
C012.2	Implement sv	vitching technique for switched mode AC-DC converters	S.	[AP]
C012.3	Examine the	operation of push-pull and fly back converter.		[A]
C012.4	Illustrate the	working principle of Matrix Converter.		[U]
C012.5	Acquire the d systems.	esign constraints of reactive elements in power electron	nic	[AP]
Course C	ontents:			
reduced in isolation -	nput current ha Performance i	armonic distortion. Improved efficiency - with and with ndices design examples.	nout input-ou	utput
Module 2: Forward co Commutat Matrix con with and w Module 3: Design of	Single-phase onverter, Push- ion - current p- verter AC-DC vithout resonan : Design of Re inductor- Trar	AC-DC single-switch Bidirectional boost converter -pull converter, Fly back converter - Matrix converters ath - Modulation techniques - Scalar modulation - Indi application. AC-AC converter with DC link - topologies ce link. eactive Elements in Power Electronic Systems insformer and capacitors for power electronic applicat	5 - Basic topole irect modulat s and operat 15 ions - Input	Hrs ogy - tion - tion - 5 Hrs filter
requireme	nt. State space	e averaging of converters - Transfer function of conve	erters - Desig	gn of
Teeuback	compensators	- voltage and current loop.		45
Text Bool	ks:	186		45
1	Fang Lin Luo.	"Advanced DC/DC Converters", CRC Press, NewYork	k, 2016.	
2	Simon Ang, A Edition, 2010.	Alejandro Oliva, "Power Switching Converters", Taylor	and Francis	s, 3ro
3	Ned Mohan, Converters, A	Tore M. Undeland and William P. Robbins, "Poupplications and Design", John Wiley and Sons edition 2	wer Electror 2011.	nics
4	M.H. Rashid Education, Inc	, "Power Electronics Circuits, devices and application. Edition 2014.	ons", Pearso	n

Reference Books:

1	P.S. Bhimbra, "Power Electronics", Khanna Publishers edition 2018.
2	Agarwal, "Power Electronics: Converters, Applications, and Design", 3rd edition, Jai P, Prentice Hall, 2000.

3	Andrzej M. Trzynadlowski, "Introduction to Modern Power Electronics", 3rd Edition, Wiley Publication, 2015.
Web Ref	erences:
1	https://nptel.ac.in/courses/108107128
2	https://www.tutorialspoint.com/power_electronics/index.htm
3	https://in.mathworks.com/videos/developing-dc-dc-converter-control-with-simulink.html
4	https://in.mathworks.com/videos/series/developing-dc-dc-converter-control-with simulink.html

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessmer	Assessment Methods & Levels (based on Blooms' Taxonomy)						
Formative	Assessment ba	sed on Capstone Model					
Course OutcomeBloom's LevelAssessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)FA (16%) [80 Marks]							
C012.1	Analyze	Online Quiz	20				
C012.2	Apply	Simulation exercises	20				
C012.3	Analyze	Technical Presentation	20				
C012.4	Understand						
C012.5	Apply	Assignment	20				

Assessment based on Summative and End Semester Examination							
Bloom's Level	Summative Ass [120 N	essment (24%) larks]	End Semester Examination (60%)				
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]				
Remember	-	-	10				
Understand	20	20	20				
Apply	30	30	30				
Analyse	50	50	40				
Evaluate	-	-	-				
Create	-	-	-				

Assessment based on Continuous and End Semester Examination								
	End Semester Examination							
	FA 1 (4	0 Marks)		FA 2 (4	(60%) [100 Marks]			
SA 1 (60 Marks)								

No. of the CO	РО 1	РО 2	РО 3	РО 4	РО 5	РО 6	РО 7	PO 8	РО 9	РО 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
C012.1	3	3	2	2			1						3	2	
C012.2	3	2	1	1	2		2				1	2	3	3	
C012.3	3	3	2	2	2		2				1	2	3	3	
C012.4	2	1	1	1			1				1	2	3	3	
C012.5	3	2	1	1	2		2				1	2	3	3	
1	Rea	sonat	oly Ag	reed	2	Moderately Agreed 3 Strongly Agree			y Agree	d					

MANDATORY COURSES

4

22MC101	Induction Programme 1/0/0/								
Neture of	(FOR ALL BRANCHES OF B.E / B.TECH PROGRAMMES) of Course Induction Programme								
Nature of	Course	Induction Programme							
Pre requis	Pre requisites Nil								
Course Ob	jectives:								
1	To have b	road understanding of society and relationships							
2	To nurture human be	e the character and fulfil one's responsibility as an engineer, a citizing	zenand a						
3	To incorpo	prate meta skills and values							
Course Ou	itcomes:								
Upon com	pletion of	the course, students shall have ability to	Γ						
C101.1	Explore ac	cademic interest and activities	[AP]						
C101.2	Work for e	excellence	[AP]						
C101.3	Promote b	oonding and give a broader view of life and character	[AP]						
Course Co	ontents:								
CREATIVE Paint UNIVERSA Enha	ACTIVITY ARTS (stu ing, sculptu AL HUMAN ncing soft s	udents can select any one of their choice) are, pottery, music, dance, craft making and so on VALUES skills							
LITERARY Read and c	LITERARY AND PROFICIENCY MODULES Reading, writing, speaking – debate, role play etc.Communication and computer skills								
LECTURES Gues	LECTURES BY EMINENT PEOPLE Guest lecture by subject experts								
VISIT TO L Medit	VISIT TO LOCAL AREAS Meditation centre/orphanage/Hospital								
FAMILIAR Lectu	FAMILIARIZATION TO DEPARTMENT/BRANCH INNOVATION Lectures by Department's Head and senior faculty members								

22MC102Environmental Sciences1 /0										
Natu	re of (Course	Theory Concept							
Prei	equis	ites	Basics in Environmental Studies							
Cou	rse Ob	jectives:								
1	1 To learn the integrated themes on various natural resources.									
2	Tog	gain knowledg	ge on the type of pollution and its control methods.							
3	Toł	have an awar	eness about the current environmental issues and the socialpr	oblems.						
Cou Upo	rse Ou n com	itcomes: pletion of the	e course, students shall have ability to							
C10	C102.1 Recall and play an important role in transferring a healthy environment for [R] future generation.									
C102	2.2 L k	Jnderstand th biodiversity.	e importance of natural resources and conservation of	[U]						
C102	2.3 L s	Inderstand ar	nd analyze the impact of engineering solutions in a global and xt.	[U]						
C10	2.4 <i>F</i>	Apply the gain	ed knowledge to overcome pollution problems.	[AP]						
C102	2.5 A s	Apply the gain sustainable de	ed knowledge in various environmental issues and evelopment.	[AP]						
Cou	rse Co	ontents:								
Intro reso explo prob reso reso	duction urces- pitation lems, o urces- urces.	n-Forest resc over utilizatio n, environme case study. E Soil erosion	burces: Use and abuse, case study-Major activities in form of water, dams-benefits and problems. Mineral resources ental effects of mining- case study–Food resources- We inergy resources -Renewable and non-renewable energy sour and desertification — Role of an individual in conservation	est-Water -Use and orld food rces Land of natural						
Mod Defir effec pollu and study	ule 2: nition - ct-Gloc tion c. contro y-Che ule 3:	Environmen - causes, effe bal warming- Solid waste I measures of rnobyl nuclea Social issue	 tal Pollutions ects and control measures of: a. Air pollution-Acid rain - Gree Ozone layer depletion — case study- Bhopal gas traged management-Recycling of plastics-Pyrolysis method- cause of municipal solid wastes d. Noise pollution. e. Nuclear haza ar disaster-Role of an individual in prevention of pollution. s and the Environment 	5 Hrs eenhouse ly. Water s, effects ards-case 5 Hrs						
Susta Envir frien	ainable onme dly pro	e developmer ntal ethics: 1 oducts (Eco m	nt-water conservation, rain water harvesting, E-Waste Mana 2 Principles of green chemistry-Scheme of labelling of envir nark) – Emission standards – ISO 14001 standard. HIV AIDS	gement – ronmental S.						
Tarat	Deck	<u>.</u>	Total Hours	6 15						
1 1	Anub Newa	s: haKaushik ai age Internatio	nd C P Kaushik "Perspectives in Environmental Studies"4 th E nal (P) Limited, Publisher Reprint 2014. New Delhi	Edition,						
2	 Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press 2015. 									
Refe	rence	Books:								
1	Tyler	Miller, Jr., "Er	vironmental Science", Brooks/Cole a part of Cengage Learning	g, 2014.						
2	Willia Hill,20	m Cunningha 015.	am and Mary Cunningham, "Environmental Science", 13 th Editio	on,McGraw						
3	Gilbe Editio	rt M. Master n, Pearson E	s, "Introduction to Environmental Engineering and Science' ducation, 2014.	′, Third						
2000		-								

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Web	Web References:						
1	http://	nptel.ac.in/courses/1041	03020/20				
2	http://	nptel.ac.in/courses/1201	08002				
3	http://	nptel.ac.in/courses/1221	06030				
4	http://	nptel.ac.in/courses/1201	08004/				
5	http://	/nptel.ac.in/courses/1221	02006/20				
Onli	ne Res	sources:					
1	https:	//www.edx.org/course/su	bject/environmental-studies				
2	WWW.	environmentalscience.or	g				
Ass	essme	nt Methods and Levels	(based on Bloom's Taxonomy)				
Form	native	assessment based on (Capstone Model (Max. Marks:100)				
Cou	Course Bloom's Lovel Accessment Component						
Outo	Outcome Biodili's Level Assessment Component Marks						
C102.1 Remember Quiz 3				30			
C102.2 Understand Mini project based on environmental aspect				30			
C102.3 Understand Class Presentation 20							
C10	C102.4 Apply Group Assignment 20						
C10	C102.5						

22MC103		Soft Skills	1/0/0/0			
Nature of Course		Theory Concept				
Pre requis	Pre requisites Technical Communication Skills					
Course Ob	ojectives:					
1.	To develo	op the students competency level and their capabilities.				
2.	To teach	the students to be effective in workplace and social environmen	ts.			
3.	To create themselv	e self confidence among the students and to resolve stress and c es.	conflictwithin			
4. To help the students to enhance their career skills by increasing their productivity and performances.						
5. To conce		entrate more on conversation skills, presentation skills, verbal ab ad creative thinking.	ility,			
Course Ou Upon com	utcomes: pletion of	the course, students shall have ability to				
C103.1	Rememb	er the principles of soft skills required for their profession.	[R]			
C103.2	Understa among ir	nd the importance of Interpersonal communication Skills advision of the second states and cultures.	[U]			
C103.3	C103.3 Apply verbal and non-verbal communication skills in corporate environment.		[AP]			
C103.4	C103.4 Analyze and apply creativity skills, critical thinking skills and problem [A solving skills.					
C103.5	Articulate persuasiv work place	e oral and written messages in an appropriate and ve manner to suit specific purposes, audiences and contextsat ce.	[AP]			
C103.6	Apply go	od teamwork skills and Leadership Skills	[AP]			
Course Co	ontents:					

Module 1: Professional Communication Skills

5 Hrs

Introduction to the Soft Skills, Performance Evaluation 1 –Significance of Soft Skills-Understanding the basic Communication Principles –Listening Skills- Listening Exercises-Speaking Skills- How to start and Sustain a Conversation- Speaking in Groups- Understandingself and Personal Branding, attitude, types of attitude, Positive Attitude, Self Confidence and Self-Motivation - Personal Application/Action Taken.

Advanced Writing Skills-Principles of Business Writing- E mails- Writing Reports- Types of Reports- Strategies for Report Writing- Personal Application/Action Taken.

Verbal Ability- Analogy- Classification- Odd One Out- Idioms and Phrases- Sentence Correction-Empathy and its importance in career -Personal Application/Action Taken.

Module 2: Interpersonal Communication

5 Hrs

Nonverbal Communication- Individual, Groups and Cultures- Body Language- Attire and Etiquettes- Interpersonal Skills- dealing with diverse People- Networking- Emotional Intelligence and its importance. Personal Application/Action Taken. Developing Creativity- Critical Thinking and Problem Solving Skills- Making the Right Choice- Never Give Up- Begin to Grow- Personal Application/Action Taken.

Interviews- Facing Job Interviews - Planning and Preparing- Effective Resume along with Covering Letter- Planning and Preparing- Personal Application/Action Taken. Self-Discipline - Self Presentation - Personal Application/Action Taken.

Module 3: Teamwork and Leadership Skills

5 Hrs

Industry Expectations- Universal Hiring Rule- Personal Application/Action Taken.

Importance of Human Values-Importance of Team Work- Developing Key Traits in Motivation, Persuasion, Negotiation and Leadership Skills- Being an Effective Team Player- Personal Application/Action Taken. Planning- Prioritization – Delegation - Conflict Management - Decision and its necessity in crucial situations- Group Discussion - Personal Application/Action Taken. Essential Skills in working Strategies- Presentation and Interaction Skills- What to Present and How- Being Assertive- Multimedia Presentation-Making Effective Presentations. Interview Skills - Do's and Don'ts - Body Language - Answering the Common Questions of Interview- Performance Evaluation 2 - Mock Interview

			Total Hour	s 15		
Text Bo	oks:					
4	Business C	communication for r	nanagers: An advanced approach, by Pe	enrose,		
١.	Cengage le	Cengage learning.				
0	Profession	al Communication i	n Engineering. by H.E. Sales. Palgrave I	Macmillan		
2.	2009.					
	Communic	ation for profession	al engineers by W. P. Scott. Bertil Billing	. Thomas		
3.	Telford, 19	98.	5 <i>y</i> , 5			
Referen	ce Books:					
	Reason an	d professional ethic	s by Peter Dayson-Galle. Ashgate Publi	shina.		
1.	Ltd., 2009.		,	- <u></u> ,		
	Cross Cult	ural and Inter Cultur	ral Communication. by William B. Gudyk	unst.		
2.	Sage Publi	Sage Publications India Pvt I td. New Delbi 2003				
	Corporate	Corporate Communications: Theory and Practice, By JoepCornelissen, Sage				
3.	Publication	Publications India Pvt I td. New Delhi 2004				
Web Re	ferences:					
1	https://onlir	necourses.nptel.ac.	in/noc16 hs15/preview			
	https://wwv	https://www.getinternship.switchidea.com/NTAT/svllabus/Interpersonal-				
2	Communic	Communication.				
3	https://smu	de.edu.in/smude/pi	rograms/bca/soft-skills.html			
Online	Resources:	<u></u>				
1 h	ttps://swayam.c	nov in/course/4047	developing-soft-skills-and-personality			
2 h	https://www.clea	rias com/internerso	nal-skills-including-communication-skills	-for-ceat/		
2 I 3 h	ttps://www.clea	has.com/soft_skills	-training/	-101-0341/		
	ment Methods	and Levels (based	l on Revised Bloom's Taxonomy)			
Formati		t based on Cansto	ne Model (Max, Marks:100)			
TOrmati		Povisod				
Course Outcome		Rioom's Level	Assessment Component	Marks		
		Remember	Group Discussion	30		
C103 (2 and C103 3	Linderstand and	Listening Skills	20		
0103.2		Apply		20		
(C103.4	Analyze	Interview	20		
C103.5	5 and C103.6	Apply	Formal Presentation	30		

22MC104		Management Organizational Behaviour		1/0/0/0	
Nature of Course Theory Concept					
Pre requisites Nil					
Course Ob	ectives:				
	The obj	ective of the course is to provide basic knowledge about ma	anageme	ent to	
1.	familiar	ize the students with the management principles and organia	zational		
		Dr. wrse is designed to enable the students to adapt and s	opply th	oorotioo	
2.		ts in husiness	apply th	eorenca	
3.	To know	w about the role of manager in the area of management.			
4.	To crea	te and implement team building strategies for organization b	ouilding.		
Course Out	comes:				
Upon comp	pletion of	the course, students shall have ability to			
C104.1	Identify	and understand different management principles technique	es in	[U]	
••••	busines	ss environment.		[•]	
C104.2	problem	nanagement fundamentals and planning to solve organizations and make effective decisions.	n	[AP]	
C104.3	Understand and analyze the changes within an individual will change			[A]	
	the group as well as the organization				
C104.4	Understand and analyze the leadership style and organization theories		ries	[A]	
	Analyze the organizational climate and change management strategies				
C104.5	and tac	ics		[A]	
C104.6	Apply th	ne empowerment strategy and tactics for productivity		[AP]	
Course Co	ntents:				
Module 1: F Introduction Principles of Scientific, Ad Vision, Miss Planning in making style Participative	Fundame to Manage dministrat sion and g Dynamic es, Behave decision	ntals of Management, Planning and Decision Making agement- Concept and functions- Thought Managerial rol ement - Levels of Management- Theories of Manageme tive, Behavioral, Management Sciences Theories. Organizati goals, Types of plans, steps in planning process, Approach c Environment. Decision making process, types of decisivioural influences on decision making - Group decision ma -making model.	es and ent - Cla ional pla ies to pla sions, de iking - V	5 Hrs styles- assical, nning - anning, ecision room's	
Module 2: I Definition, r Learning- In Styles and	ndividual need and ntroductio Theories	I, interpersonal and group behavior importance of Organizational behavior –Learning-Nature on and theories Motivation: Content and process theori - Perception-Personality — Attitudes- Definition, need and	5 Hr Importa- ies-Lead d import	r s Ince of Iership: tance -	

Styles and Theories - Perception-Personality — Attitudes- Definition, need and importance - Nature and scope-Importance of Groups and Teams- Role relationships and conflict-Group dynamics- Work values. Organization Theories: Maslow's needs hierarchy theory, two factor theory of motivation, McGregor's theory, ERG theory, McClelland's needs theory, Valance Theory.

Module 3: Organizational Development

Organizational culture: Elements - Organizational climate– Factors affecting organizational climate-Organizational Commitment, Organizational change- Importance- Stability Vs Change-Proactive Vs Reaction change- Change process– Resistance to change- Managing changes-Managing International Workforce - Productivity- Alternative change management approaches and cultural contingencies - power to manage effectively; Empowerment and Participation strategies and tactics.

Total Hours:

5 Hrs

15 Hrs

	2016.					
2.	Williams	Williams, Tripathy, "Principles of Management", Cengage Learning, 2016.				
3.	Aswatha	Aswathappa, K, "Organizational Behavior", 12th Edition, Himalaya Publication, 2016.				
4.	Stephen Hall Indi	Robbins, Timothy A. a Pvt. Ltd, 2014.	Judge, "Organizational Behavior", 16th edition	, Prentice		
Refere	ence Books	S:				
1.	Chandran Organizat	Chandrani Singh, Aditi Khatri, "Principles and Practices of Management and				
2.	Richard L Cengage	. Daft, "Understanding Learning, 2013.	the Theory and Design of Organizations", 11	th edition,		
3.	John M Iva McGraw-H	ancevich and Robert k Hill Education, 2013.	Konopaske, "Organizational Behavior and Mana	agement",		
4.	UdaiParee 2012.	ek, Sushama Khanna,	"Organization Behavior", 3rd edition, Oxford P	ublishing,		
Web F	References	:				
1.	https://ied	unote.com/fundament	al-concepts-of-organizational-behavior			
2.	https://nso	polteksby.ac.id/ebook				
3.	https://ebo PRACTIC	https://ebooks.lpude.in/management/mba/term_1/DMGT402_MANAGEMENT				
4.	https://ww behaviour	w.studocu.com/in/doc /lecture-notes/ob-note	cument/vellore-institute-of-technology/organiza	tional-		
Online	Resource	es:				
1.	https://npt	el.ac.in/syllabus/1101	05034/			
2.	https://npt	el.ac.in/courses/110/1	05/110105033/			
3.	https://free	evideolectures.com/cc	ourse/3502/organizational-behaviour-i			
4.	https://npt	el.ac.in/courses/110/1	06/110106145/			
Tenta	tive Assess	sment Methods and	Levels (based on Revised Bloom's Taxonor	my)		
Forma	ative asses	sment based on Cap	ostone Model (Max. Marks:100)			
Co Ou	ourse tcome	Revised Bloom's Level	Assessment Component	Marks		
C	104.1	Understand	Online Quiz	30		
C104.2 C104.3		Apply and Analyze	Listening Skills	20		
C104.4		Analyze	Group Discussion	20		
C104.5 C104.6		Analyze and Apply	Formal Presentation	30		

22MC105		General Aptitude 1			
Nature of Cour	se	Theory Concept			
Pre requisites NIL					
Course Objecti	ves:				
1 To i	mprove the	verbal ability.			
	mprove the	mathematical skills.			
	3 To develop problem solving skills.				
4 10 e	nculcate cri	tical thinking process			
Course Outcor					
Upon completi	on of the c	ourse, students shall have ability to			
C105 1 To t	each the ha	asics of Quantitative Techniques in a graded manner	[R]		
C105.2 Und	orstand the	verbal and non-verbal nature of problems in reality and now the			
shor	tcut methor	ds of solving it	[0]		
C105.3 Solv	e problems	s using their general mental ability	[AP]		
C105.4 To (nive intense	e focus on improving and increasing the ability of solving real	[/ II] [AP]		
prot	olems		[, .,]		
C105.5 Thir	k critically	about mathematical models for relating different quantities to	[AP]		
read	h conclusio	on <u> </u>			
C105.6 Ena	ble effective	e use of data interpretation, formulas, graphs and assumptions	[AP]		
Course Conten	ts:				
Module 1: Num	ber Theory	y and Statistic 5 H	rs		
Ratio and Proportion – Divisibility – Mixtures – Averages- Polynomials – Solving Equations and Inequalities – Discard's rule of signs – Problems on ages – Chain rule – Time and Work –Time and Distance – Problems on Trains – Problems on Boats and Streams- Measures of central tendency – Mean, Median and Mode – Variance and Standard deviation Logarithms –Profit and Loss – Simple Interest – Compound Interest. Module 2: Logic and Decision Making Analogy – Classification – Series completion – Coding and Decoding – Blood Relations – Puzzle Test – Direction Sense test – Logical Venn Diagrams - Number Ranking and Time Sequence Test – Decision Making – Assertion and Reason– Inserting the missing one – Logical Sequence of words – Syllogisms. Module 3: Reasoning Logic – Statement and Arguments – Statements and Assumptions – Statements and Course of Action – Statements and Conclusions – Deriving conclusions from passages – Functions – Different kinds of functions – Miscellaneous sets- Series – Analogy – Classifications – Analytical Reasoning – Problems on Cubes and Dice – Mirror Images – Water Images – Rule Detection.					
Text Books:					
1 Agg	arwal R. S.	"Quantitative Aptitude" Revised Edition, S. Chand Publication.			
2 Abh	2 Abhijit Guha "Quantitative Aptitude" 5 th Edition, McGraw Hill Education.				
Reference Boo	Reference Books:				
1 Edgar Thorpe "Mental Ability and Quantitative Aptitude" 3" Edition, McGraw Hill Education.					
Web References:					
1 http: vide	s://www.wiz o-lectures	riq.com/tutorial/815468-quantitative-aptitude-reasoning-data- inter	pretation-		
2 http:	2 https://learningpundits.com/contest?referrer=harsh.cse15@nituk.ac.in				
3 http:	3 https://nptel.ac.in/courses/114106041/8				

4	https://nptel.ac.in/courses/111103020/2			
Online Res	sources:			
1	http://aptitudetrain	ing.in/home/index.php		
2	https://www.udem	y.com/vedicmaths/		
3	https://www.youtu	be.com/channel/UCtmn-DsF4BhPug-ff9LiDAA?disable_polymo	er=true	
Poforonco	Books			
Reference		and the time And time is 10. Of an all Duck links are		
1	R.S. Aggarwal, "Qu	Jantitative Aptitude", S.Chand Publishers		
2	R.S. Aggarwal,"A Publishers	Modern Approach to Verbal and Non-verbal reasoning", S.Cha	nd	
3	Face Aptipedia - A	Aptitude Encyclopedia - Wiley		
4	Dinesh Khattar, "T	he pearson guide to Quantitative Aptitude for Competitive		
	examinations, Pea	arson Education		
Web Refe	rences:			
1	https://www.geeksforgeeks.org/placements-gg/			
2	https://www.indiab	ix.com/aptitude/questions-and-answers/		
Assessme	ent Methods and L	evels (based on Bloom's Taxonomy)		
Formative	assessment base	d on Capstone Model (Max. Marks:100)		
Course				
Outcome	Bloom's Level	Assessment Component	Marks	
C105.1	Remember	Quiz	30	
C105.2 C105.3	Understand and Apply	Formal presentation	20	
C105.4.				
C105 5				
and	Apply	Formal interview tests	50	
C105 6	, viddi,		50	
0.0010				

22MC106			Life Skills and Ethics			
Nature of C		Course	Theory Concept			
Pre	Pre requisites NIL					
Cou	rse Ob	jectives:	unication competence in prospective engineers			
1		evelop comm	nunication competence in prospective engineers.			
3	Tod	evelop repor	t writing skills.			
4	To e	quip them to	face interview and Group Discussion.			
5	Toir	nculcate critic	al thinking process.			
0	Top	rovide symbo	on problem solving skills.	a problem		
7	desc	ription.				
Cou	rse Ou	tcomes:				
Upo	n com	oletion of the	e course, students shall have ability to			
C10	6.1 D	efine and Ide	entify different life skills required in personal and professi	ionallife. [U]		
C10	6.2 D c	evelop an av	vareness of the self and apply well-defined techniques to otions and stress.	[AP]		
C10	6.3 E th	xplain the ba nese through	sic mechanics of effective communication and demonstra presentations.	ate [A]		
C10	6.4 U p	se appropria roblems.	te thinking and problem solving techniques to solve new	[AP]		
C10	6.5 U	nderstand th	e basics of teamwork and leadership	[U]		
Cou	rse Co	ntents:				
Mod Criti Intell Tear Dyna	lule 2 cal Th ligence nwork: amics, l	inking and I , Problem S Groups, Tea Managing Te	Problem Solving: Creativity, Lateral thinking, Critical th Solving, Six thinking hats Mind Mapping and Analy ms, Group Vs Teams, Team formation process, Stages o am Performance and Team Conflicts.	5 Hrs hinking, Multiple ytical Thinking of Group, Group		
Mod Ethic Engi ASM Type Leac	lule 3 cs, Mo neering IE, AS(es of la dership	oral and Pro g as Social E: CE, IEEE. Le eadership, T , Leadership	ofessional Values: Human Values, Civic Rights, Engi xperimentation, Environmental Ethics, Global Issues, Coo eadership Skills: Leadership, Levels of Leadership, Mak Transactions Vs Transformational Leadership, VUCA L Grid and leadership Formulation	5 Hrs neering Ethics de of Ethics like ting of a leader Leaders, DAR1		
Defe		Daalaa	Total F	lours 15		
	Porus	BOOKS:	111) "Dereonality Development and Soft Skills" First Editi	ion: Oxford		
I						
2	Kalya	na; (2015) "S	oft Skill for Managers"; First Edition; Wiley Publishing Ltd			
3 4	 3 Larry James (2016); "The First Book of Life Skills"; First Edition; Embassy Books. 4 ShaliniVerma (2014); "Development of Life Skills and Professional Practice"; First Edition: Sultan Chand (G/L) and Company. 					
5	5 John C. Maxwell (2014); "The 5 Levels of Leadership", Centre Street, A division of Hachette Book Group Inc					
R2022	2	Departmen	it of Electrical and Electronics Engineering	Page 180		
Web	Web References:					
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1	1 https://www.coursera.org/courses?query=ethics					
Asse	essme	nt Methods and Levels	(based on Bloom's Taxonomy)			
Form	native	assessment based on	Capstone Model (Max. Marks:100)			
Course		Bloom's Loval	Assessment Component	Marke		
Outc	ome	DIODITI S LEVEL	Assessment Component	Ivial K5		
C10)6.1	Understand	Online Quiz	20		
C10)6.2	Apply	Assignment	20		
C106.3 Analyse		Analyse	Technical Presentation	30		
C10)6.4	Apply		30		
C106.5 Understand		Understand		50		

22MC107			Stress Management	1/	0 /0 /0
Nature of Course		ourse	Theory Concept		
Pre requisites NIL					
Cou	rse Obj	ectives:			
1	Unde	erstand the b	asic principles of stress management		
2	Recognize your stress triggers and how to manage them				
3	Develop proactive responses to stressful situations				
4	Use coping tips for managing stress both on and off the job				
5	Lean	n to manage	stress through diet, sleep and other lifestyle factors		
6	Deve	lop a long te	rm action plan to minimize and better manage stress		
7	Unde	erstand the b	asic principles of stress management		
Cou	rse Out	comes:			
Upoi	n comp	letion of the	e course, students shall have ability to		
C10	7.1 Ui	nderstand th	e basic principles of stress management		[U]
C10	7.2 Ap m	oply the conc anage them.	cept of recognizing your stress triggers and find was to		[AP]
C10	7.3 De	evelop proac	tive responses to stressful situations		[A]
C10	7.4 De	evelop a long	g term action plan to minimize and better manage stress		[AP]
Cou	rse Cor	ntents:			
Scie Pers Stres on In diso	ntific F onality ss and r nmune rders.	Foundations Factors and nervous system – He	s of Stress: What is stress? – Sources of Stress – Ty d stress – Stress and the college student. Stress Psy tem – Hypothalamic – Pituitary – Adrenal (HPA) Axis – ealth risk associated with chronic stress – Stress and M	pes of Si chophys Effect of lajor Psy	tress – iology: Stress chiatric
Mod Deve patte Lifes	ule 2 eloping ern, Sel situation	J Resilienc f-esteem, L n Intraperso	e to Stress: Understanding you stress level – Role ocus of control – Role of Thoughts Beliefs and Emotio onal: (Assertiveness, Time Management).	5 of pers ons – I a	i Hrs onality nd II –
Mod Strat imag strat	Module 3 5 Hrs Strategies for Relieving Stress: Developing cognitive coping skills – Autogenic training, imagery and progressive relaxation – Other relaxation techniques – Exercise and Health – DIY strategies stress management.				
Defe	Total Hours 15				
1	Jonath Techn	an C. Smi iques and St	th; (2011), "Stress Management: A Comprehensive rategies", First Edition; Springer Publishing Company.	Handbo	ook of
2	Bob S reduct	Stahl, Elisha ion workbool	a Goldstein, Jon Kabat-Zinn (2019); "A mindfulness k"; Second Edition; New Harbinger Publications.	s-based	stress
3	3 Ryan M. Niemiec (2019), "The Strengths-based workbook for stress relief", First edition, New Harbinger Publications.				
Web	Refere	nces.			

l	web References:		
	1	https://thiswayup.org.au/courses/coping-with-stress-course/	
	2	https://www.classcentral.com/course/swayam-stress-management-14309	

Assessment Methods and Levels (based on Bloom's Taxonomy)					
Formative	Formative assessment based on Capstone Model (Max. Marks:100)				
Course Bloom's Level Assessment Component					
Outcome	DIOOIII S Level	Assessment component	walks		
C107.1	Understand	Online Quiz	20		
C107.2	Apply	Group Discussion	30		
C107.3 Analyse Class		Class Presentation	30		
C107.4 Apply Assignment 20					

22MC108 Constitution of Ind	ia 1/0/0/0			
Nature of Course Theory				
Pre Requisites NIL				
Course Objectives:				
1 To familiarize with basic information ab	out Indian constitution			
2 To understand the fundamental rights a	and duties as citizens of India			
Course Outcomes:				
Upon completion of the course, students shall	have ability to			
C108.1 Explain the objectives of the Constitution	1 of India and its formation [U]			
C108.2 Recall state and central policies (Union and State Executive), fundamental				
Rights and their duties.	a colutions to essistal issues			
C108.3 Wake use of legal directions in developin	res knowledge of Indian Constitution			
Citos.4 Otilized for competitive exams that requi				
Module 1	5 Hrs			
Historical perspective, The making of the Consti Preamble and Salient features of the Constitu Principles of State Policy, Fundamental Duties, C	tution, The Role of the Constituent Assembly - ution of India. Fundamental Rights, Directive Ditizenship Article 5-11.			
Module 2	5 Hrs			
Federal structure, Powers of the Union and the s - President, Prime Minister, Union Cabinet, Parlia - Governor, Chief Minister, State Cabinet, State L Elections, Electoral Process, and Election Com Functions of Municipalities and Panchayat	states, Centre-State Relations, Union Executive ment, Supreme Court of India, State Executives Legislature, High Court and Subordinate Courts, Immission of India, Election Laws. Powers and			
Module 3 Amendments - Methods, Emergency Pro Rule, Financial Emergency, Provisions for SC a classes, Right to Property, Freedom of Trade and	5 Hrs visions, National Emergency, President and ST, OBC, women, children and backward d Commerce. Agricultural Law			
	Total Hours: 15			
Text Books:				
Edition, 2016.	lution of India", LexisNexis, New Deini, 22"			
2 "Bare act-constitution of India", The univer India.	sal Publications, LexisNexis 2020, New Delhi,			
Reference Books:				
1 Subhash.C.Kashyap, "Our Constitution: A	In Introduction to India's Constitution and			
Constitutional Law", National Book Trust,	India, 5 th edition, 2019.			
2 M. Laxmikanth, "Constitution of India", Ce	2 M. Laxmikanth, "Constitution of India", Cengage Learning India. 1 st edition 2018.			
Web References:				
1 https://unacademy.com/course/the-indian-constitution/NSKQ8XXQ				
	constitution/NSKQ8XXQ			
2 https://unacademy.com/goal/upsc-civil-sei	constitution/NSKQ8XXQ vices-examination-ias-preparation/KSCGY			
2 https://unacademy.com/goal/upsc-civil-sei Assessment Methods and Levels (based on Blo	constitution/NSKQ8XXQ vices-examination-ias-preparation/KSCGY poms' Taxonomy)			
2 https://unacademy.com/goal/upsc-civil-sei Assessment Methods and Levels (based on Blo Formative assessment based on Capstone Mod	constitution/NSKQ8XXQ vices-examination-ias-preparation/KSCGY coms' Taxonomy) del (Max. Marks:100)			
2 https://unacademy.com/goal/upsc-civil-sei Assessment Methods and Levels (based on Ble Formative assessment based on Capstone Mod Course Outcome Bloom'sLevel Asses	constitution/NSKQ8XXQ vices-examination-ias-preparation/KSCGY coms' Taxonomy) del (Max. Marks:100) ssment Component Marks			
2 https://unacademy.com/goal/upsc-civil-sei Assessment Methods and Levels (based on Ble Formative assessment based on Capstone Mod Course Outcome Bloom'sLevel Asses C108.1 Understand Online C108.4 Remember Online	constitution/NSKQ8XXQvices-examination-ias-preparation/KSCGYpoms' Taxonomy)del (Max. Marks:100)ssment ComponentAuiz60			
2 https://unacademy.com/goal/upsc-civil-sei Assessment Methods and Levels (based on Ble Formative assessment based on Capstone Mod Course Outcome Bloom'sLevel Assessment C108.1 Understand Online C108.4 Remember Online C108.3 Apply Class	constitution/NSKQ8XXQvices-examination-ias-preparation/KSCGYpoms' Taxonomy)del (Max. Marks:100)ssment Componente Quiz60Presentation20			

	09	Essence of Inc	lian Traditional Knowledge	1/0/0/0	
Nature of Course		heory Concept			
Pre Rec	Pre Requisites NIL				
Course	Objectives:				
1	1 To make understand the contribution of Indian mind in various fields.				
2	To cultiva	te critical appreciation	n of the thought content and provide insigh	nts	
relevant for promoting cognitive ability, health, good governance, aesthetic			ic		
_	appreciat	ion and right values.			
Course	Outcomes:	he course students	shall have ability to		
C109 1	Relate class	ical Indian traditions w	vith contemporary traditions and culture	[R]	
C109.2	Outline the t	houghts of Indians in c	different disciplines.		
C109.3	Apply the kr	owledge to the preser	nt context.		
C109.4	Develop a b	etter appreciation and	understanding of Indian traditions.	[C]	
Course	Contents:				
Module	1 11			05 Hrs	
	thics: Individu	al and Social - Socie	ty state and Polity (Survey) - Education	systems –	
Agricult	lie (Survey) –	Early and Classical A	achitecture – Medieval and Colonial Arch	necture.	
Module	2			05 Hrs	
Astrono	my in India	 Martial Arts Tra 	aditions (Survey) - Indian Literatures	- Indian	
Philosop	phical Systems	- Indian Traditional Kr	nowledge on Environmental Conservation	l	
Module	3			05 Hrs	
Ayurved	a for Life, He	alth and Well-being	- The Historical Evolution of Medical T	radition in	
Ancient	Ancient India- Music in India - Classical and Folk				
	Total hours 15				
Text Books:					
I ext Bo	oks:			ours 15	
1 ext Bo	oks: Kapil Kapoor	and Michel Danino. Te	I otal no	cticesof	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	oks: Kapil Kapoor India", Centra	and Michel Danino, Te I Board of Secondary	extbook of "Knowledge Traditions and Prace Education, 2017.	cticesof	
1 ext Bo	oks: Kapil Kapoor India", Centra Yogesh Ata	and Michel Danino, Te I Board of Secondary I, "Indian Society: Co	extbook of "Knowledge Traditions and Prace Education, 2017. Continuity and Change", Pearson Education	cticesof ationIndia,	
1 ext Bo	oks: Kapil Kapoor India", Centra Yogesh Ata 2016.	and Michel Danino, Te I Board of Secondary I, "Indian Society: Co	extbook of "Knowledge Traditions and Prace Education, 2017. Intinuity and Change", Pearson Educa	cticesof ationIndia,	
1 2 Referen	oks: Kapil Kapoor India", Centra Yogesh Ata 2016. ce Books:	and Michel Danino, Te I Board of Secondary I, "Indian Society: Co	extbook of "Knowledge Traditions and Prace Education, 2017. Intinuity and Change", Pearson Educa	cticesof ationIndia,	
Iext Bo 1 2 Referent 1	oks: Kapil Kapoor India", Centra Yogesh Ata 2016. ce Books: Douglas Osto	and Michel Danino, Te I Board of Secondary I, "Indian Society: Co o, "An Indian Tantric	Education, 2017. Tradition and Its Modern Global Reviv	cticesof ationIndia, val",	
Iext Bo 1 2 Referen 1	oks: Kapil Kapoor India", Centra Yogesh Ata 2016. ce Books: Douglas Osto Routledge pul	and Michel Danino, Te I Board of Secondary I, "Indian Society: Co o, "An Indian Tantric plications, 2020.	Extbook of "Knowledge Traditions and Prace Education, 2017. Intinuity and Change", Pearson Education Tradition and Its Modern Global Review	cticesof ationIndia, val",	
Iext Bo12Referen12	oks: Kapil Kapoor India", Centra Yogesh Ata 2016. ce Books: Douglas Osto Routledge pul Rao C.N. Sh	and Michel Danino, Te I Board of Secondary I, "Indian Society: Co o, "An Indian Tantric plications, 2020. ankar, "Sociology: Pr	Extbook of "Knowledge Traditions and Prace Education, 2017. Intinuity and Change", Pearson Education Tradition and Its Modern Global Review	cticesof ationIndia, val", on toSocial	
Iext Bo 1 2 Referent 1 2	oks: Kapil Kapoor India", Centra Yogesh Ata 2016. ce Books: Douglas Osto Routledge pul Rao C.N. Sh Thoughts", S	and Michel Danino, Te I Board of Secondary I, "Indian Society: Co o, "An Indian Tantric olications, 2020. ankar, "Sociology: Pr Chand Publisher, 201	Extbook of "Knowledge Traditions and Prace Education, 2017. Tradition and Change", Pearson Educa Tradition and Its Modern Global Revie inciples of Sociology with an Introductio 9.	cticesof ationIndia, val", on toSocial	
I ext Bo12Referen12Web Re	oks: Kapil Kapoor India", Centra Yogesh Ata 2016. ce Books: Douglas Osto Routledge pul Rao C.N. Sh Thoughts", S ferences:	and Michel Danino, Te I Board of Secondary I, "Indian Society: Co o, "An Indian Tantric plications, 2020. ankar, "Sociology: Pr Chand Publisher, 201	Education, 2017. Tradition and Change", Pearson Education Tradition and Its Modern Global Review inciples of Sociology with an Introduction 9.	cticesof ationIndia, val", on toSocial	
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Iext Bo12Referen12Web Re12AssessFormula	oks: Kapil Kapoor India", Centra Yogesh Ata 2016. Ce Books: Douglas Osto Routledge pul Rao C.N. Sh Thoughts", S ferences: http://nopr.nis https://nptel.a ment Methods	and Michel Danino, Te I Board of Secondary I, "Indian Society: Co o, "An Indian Tantric plications, 2020. ankar, "Sociology: Pr Chand Publisher, 201 cair.res.in/handle/123 c.in/courses/109/104/ and Levels (based of	Total no extbook of "Knowledge Traditions and Prace Education, 2017. Tradition and Change", Pearson Educa Tradition and Its Modern Global Review inciples of Sociology with an Introduction 9. 456789/43 109104102/ on Blooms' Taxonomy)	ours 15 cticesof ationIndia, val", on toSocial	
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22MC110		Spoken English	1/0/0/0
Nature of Course		Theory Concept	
Course P	Pre-requisites	Nil	
Course C	Objectives:		
1	To understand	I the techniques for analyzing the computer algorithms.	
2	To learn the pa	aradigms for designing the algorithms.	
3 To analyze the efficiency of various algorithm design techniques / paradigms for same problem.		ams for the	
4	4 To understand the graphical algorithms for solving problems.		
Course Outcomes:			
Upon co	mpletion of the	e course, students shall have ability to	
C110.1	Illustrate the s	earching and sorting algorithms.	[U]
C110.2	2 Interpret the design principles of greedy and pattern searching algorithms [AP] with examples.		[AP]
C110.3	Explain the problem-solving methodology used in Backtracking. [A]		
C110.4	Analyze the strategy in solv	time and space complexities of dynamic programming ving complex problems	[A]
C110.5 Employ range		query and graph algorithms in real world problems.	[AP]
Course C	Contents:		

Module - I: Sorting, Searching and String Algorithms

Searching & Sorting, Divide and Conquer- Bubble sort, Insertion sort, Selection sort, Binary search, quick sort, merge sort - Heaps & Hashing -Binary heap, heap sort - Greedy Algorithms-Activity selection problem, Fractional knap sack - String algorithms - Naive algorithm, Rabin Karp algorithm, KMP algorithm, Z algorithm, Manachers algorithm - Tries-Making a trienode, Insert, Search and Remove operation in Tries, Huffman coding.

Module - II: Greedy and Dynamic Programming

Backtracking - Rat in a maze, Permutation and Combination, N Queen problem and Problems on Backtracking, Knight's Tour Problem, Subset Sum, M-Coloring Problem, Hamiltonian Cycle Problem, Sudoku Solver, Sieve of Sundaram, Prime Numbers after P with SumS. Dynamic Programming-Greedy vs Dynamic programming, Top down and bottom – up approach, Longest Common Subsequence, Longest increasing subsequence, Edit distance, 0-1 Knapsack, Coin change problem, Minimum Cost Path, Subset Sum Problem, Maximum Size Square Sub Matrix with all 1s, Longest Palindromic Subsequence.

Module – III: Tree and Graph Algorithms

Range query Algorithms –Range Minimum Query (Brute Force Approach). Segment Tree, Range Minimum Query on the Constructed Segment Tree, Range Minimum Query Using Sparse Table. Graph Algorithms - Dijkstra's Algorithm, Floyd warshall Algorithm, Kruskal's Algorithm for Minimum Spanning Tree, Prim's Algorithm for Minimum Spanning Tree.

Text Boo	oks:
1	Anany Levitin, "Introduction to Design and Analysis of Algorithms", Pearson
	Publications, 3rd Edition, 2012.
2	Thomas H.Cormen, Charles E.Leiserson, R.L.Rivest, "Introduction to Algorithms",
	Prentice Hall of India Publications, 3rd Edition, 2009.
Reference	ce Books:
1	Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, "Computer Algorithms/
	C++", 2nd Edition, Universities Press, 2019.

5 Hrs

5 Hrs

15

5 Hrs

5 Hrs

Total Hours

2				
	Sara Baase and Allen Van Gelder, "Computer Algorithms:			
	Introduction to Design and Analysis", Pearson Publications, 3rd			
	Edition, 2008.			
Web Re	eferences:			
1.	https://www.cs.usfca.edu/~galles/visualization/Algorithms.html			
2.	https://www.coursera.org/learn/introduction-to-algorithms			
3.	https://timroughgarden.org/videos.html			
Online	Resources:			
1.	https://onlinecourses.nptel.ac.in/noc19_cs47/preview			
2.	https://www.csa.iisc.ac.in/~barman/daa18/E0225.html			
3.	https://freevideolectures.com/course/2281/design-and-analysis-of-algorithms			
A = = = = =				

Assessment methods & Levels (based on bloom s Taxonomy)				
Formative assessment based on Capstone Model(Max.Marks:100)				
Course	Assessment Component			
Outcome	Bioom 3 Ecver	Assessment component		
C111.1	Understand	Quiz		
C111.2	Apply	Group Discussion		
C111.3	Analyze	Class Procentation		
C111.4	Analyze			

Assignment

C111.5

Apply

Marks

20 30

30

20

VALUE ADDED COURSES

A

22VA301	Solar Energy Technology		2/0/0/2	
Nature of Course		Theory Practical	-	
Pre requisites Nil				
Course Ol	ojectives:			
1.	To provide com data, fundament energy required	To provide comprehensive knowledge on solar radiation, analysis of solar radiation data, fundamentals of the solar thermal and photovoltaic system along with storage of energy required for effective design of efficient solar energy conversion devices.		
2.	To illustrate the wherever require	concept with practical examples, schematics and block	< diagrams	
Course Ou	utcomes:			
Upon com	pletion of the co	urse, students shall have the ability to		
C301.1	Understand the s	solar energy scenario and PV cells.	[U]	
C301.2	Analyze the worl	king principle of stand alone system.	[A]	
C301.3	Distinguish the s	tandalone and grid connected system	[AP]	
C301.4	Apply the concepts of solar energy conversion system in practical applications.			
Course Co	ontents:			
Module 1: Energy So propagatio Terrestrial different cli and perform Module 2: PV standa connected collectors, Performan Module 3: Performan concentrat Application technologie	Module 1: Solar Energy10 HrsEnergy Scenario, overview of solar energy conversion devices and applications, physics of propagation of solar radiation from the sun to earth. Sun-Earth Geometry, Extra-Terrestrial and Terrestrial Radiation, Solar energy measuring instruments. Estimation of solar radiation under different climatic conditions, Estimation of total radiation. Fundamentals of solar PV cells, principles and performance analysis, modules, arrays, theoretical maximum power generation from PV cells.Module 2: PV system12 HrsPV standalone system components, Standalone PV-system design. Components of grid- connected PV system, solar power plant design and performance analysis. Fundamentals of solar collectors, Snails law, Bougers law, Physical significance of Transmissivity - absorptivity product. Performance analysis of Liquid flat plate collectors and testing.8 HrsPerformance analysis of Solar Air heaters and testing. Solar thermal power generation (Solar concentrators). Thermal Energy Storage (sensible, latent and thermochemical) and solar pond- Applications: Solar Refrigeration, Passive architecture, solar distillation, and emerging			
		Total Hours 3	0 Hrs	
Text Book	s:			
1.	G. N. Tiwari, Sol 2016.	ar Energy, Fundamentals, Design, Modeling and Applicatior	ıs, Narosa,	
2.	S. P. Sukhatme Storage, Tata Mo	S. P. Sukhatme and J. K. Nayak, Solar Energy: Principles of Thermal Collection and Storage, Tata McGraw Hill, 2006.		

3.	C. S. Solanki, Solar Photovoltaics: Fundamentals, Technologies and Applications, Prentice Hall India, 2nd Edition, 2011.			
Suggested	Readings:			
1.	J. A. Duffie and W. A. Beckman, Solar Engineering of Thermal Processes, John Wiley, 2006.			
2.	A. Goetzberger and V. U. Hoffmann, Photovoltaic Solar Energy Generation, Springer verlag, 2010.			
3.	T. C. Kandpal and H.P. Garg, Financial Evaluation of Renewable Energy Technologies, McMillan India Ltd., 2013			
4.	K. Jager, O. Isabella, A. H. M. Smets, R.A.C.M.M. Van Swaaij, and M. Zeman, Solar Energy – fundamentals, technology and systems, Delft University of Technology, 2014.			
Web Refer	ences:			
1.	https://www.edx.org/course/solar-energy-delftx-et3034x-0			
2.	https://www.nrel.gov/research/re-solar.html			
3.	https://www.azocleantech.com/article.aspx?ArticleID=1593			
Online Res	sources:			
1.	https://onlinecourses.nptel.ac.in/noc20_ph14			

22VA302	Industry 4.0 using Industrial Internet of Things2/0/0/		2/0/0/2
Nature of Course		Theory Practical	
Pre requis	Pre requisites NIL		
Course Ob	ojectives:		
1.	To provide known processes thro communication,	wledge about Industry 4.0 concerns the transformatic ugh the integration of modern technologies such and computational processing.	n of industrial as sensors,
2.	To apply IoT dat	a for business solution in various domain in secured ma	nner.
Course Ou Upon com	Itcomes: pletion of the co	urse, students shall have the ability to	
C302.1	Identify the IoT r	networking components with respect to OSI layer.	[U]
C302.2	Design and deve	elop IT based sensor systems.	[AP]
C302.3	Industrial Internet modify the variou	et of Things (IIoT) is an application of IoT in industries us existing industrial systems.	to [E]
C302.4	IoT links the au lifecycle	utomation system with enterprise, planning and produ	ICT [AP]
Course Co	ontents:		
Factories. Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artifical Intelligence, Big Data and Advanced Analysis.Module 2: Cybersecurity in Industry 4.012 HrsBasics of Industrial IoT: Industrial Processes-Part I, Part II, Industrial Sensing and Actuation,			Platform and elligence, Big 12 Hrs nd Actuation,
Module 3:	Industrial IoT		8 Hrs
Layers: IIo study - I : N	T Sensing-IIoT P /lilk Processing ar	Processing Introduction, Machine Learning and Data S and Packaging Industries.	cience. Case
		Total Hours	30 Hrs.
Text Books	5:		
1.	1. S. Misra, A. Mukherjee, and A. Roy, 2020. Introduction to IoT. Cambridge University Press.		
2.	2. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Thing and Industry 4.0. CRC Press.		ernet of Things
Suggested	Readings:		
1.	Vijay Madisetti "Internet of Thing	, Arshdeep Bahga, Adrian McEwen (Author), Hak gs A Hands-on-Approach" Arshdeep Bahga and Vijay Ma	im Cassimally adisetti, 2014.
2.	Jan Holler, Vla Avesand, David	asios Tsiatsis, Catherine Mulligan, Stamatis Karno Boyle, "From Machine to Machine to Internet of Th	uskos, Stefan ings", Elsevier

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Т

	Publications, 2014.	
3.	LuYan, Yan Zhang, Laurence T. Yang, Huansheng Ning, The Internet of Things: From RFID to the Next-Generation Pervasive Network, Aurbach publications, March, 2008.	
Web Refer	ences:	
1.	https://www.amazon.in/dp/1032146753/ref=sr_1_3?dchild=1andkeywords=sudip+misra andqid=1627359971andsr=8-3	
2.	https://www.amazon.in/Introduction-IoT-Sudip Misra / dp / 1108959741 /ref = sr _1 _1 ? dchild = 1andkeywords=sudip+misraandqid=1627359928andsr=8-1	
Online Resources:		
1.	https://onlinecourses.nptel.ac.in/noc22_cs95/preview	

22VA303	Microgrid Technology 2/0/0/2		2/0/0/2
Nature of (ture of Course Theory Practical		-
Pre requis	ites	NIL	
Course Ob	jectives:		
1.	To know Advan the grid moder operation.	ced modeling, control, resilience and security technologie nization from a unique angle of microgrid design, a	s useful for nalysis and
2.	To develop Smart inverters, microgrid architectures, distributed energy resources modeling, microgrid hierachical control, microgrid stability, fault management, resilient microgrids through programmable networks, reliable networked microgrids, and cyber security.		
Course Ou	tcomes:		
Upon com	pletion of the co	urse, students shall have the ability to	ſ
C303.1	Understand the	concepts of microgrids, and networked microgrids;.	[U]
C303.2	Model PV power	systems and standard grid-tied inverter;	[A]
C303.3	Analyze distribut	ion grid power flow;	[A]
C303.4	Understand cer especially prima	ntralized control and distributed control in microgrids, ry, secondary and tertiary control;	[U]
C303.5	Conduct power networked micro	flow analysis for droop-control-based microgrids and grids;	[AP]
C303.6	Understand basics of cybersecurity in microgrids and active defense [U] strategy.		
Course Contents:			
Module 1: Microgrid Modelling and Analysis10 HrsIntroduction - The concept of microgrids - Distributed energy resources (DERs) modelling I: PVsystem, MPPT, and grid-tied interface - Distributed energy resources modelling II: Microturbine,energy storage and other DERs - Microgrid inverter structures - Distribution power flow - Stabilitymodelling and computation			
Module 2:	Microgrid Contro	ol and Enhanced Microgrid Power Flow	12 Hrs
Centralized control - Hierarchical principle: Primary, secondary and tertiary control – Distributed control - Microgrid power flow – Networked microgrid power flow - Formal analysis of microgrid dynamics - Stability margin analysis on networked microgrids.			Distributed of microgrid
Module 3:	Cyber Security i	n Microgrids	8 Hrs
Introductior	n to cyber-attacks	- Active detection of cyber attacks	
	Total Hours 30 Hrs		
Text Books	S :		
1.	P. Zhang, Netwo	orked Microgrids. Cambridge University Press, 2020.	
2.	Fusheng Li, Ruisheng Li, Fengquan Zhou, Microgrid Technology and Engineering Application, Elsevier, 2015		
Suggested	Readings:		
1.	Manuela Sechila	riu, Fabrice Locment, Urban DC Microgrid: Intelligent Cont	rol and

	Power Flow Optimization, Butterworth-Heinemann, 2016		
2.	Hassan Bevrani, BrunoFrançois, Toshifumi Ise, Microgrid Dynamics and Control John Wiley Sons, 2017		
3.	Gevork B. Gharehpetian, S. Mohammad Mousavi Agah, Distributed Generation Systems: Design, Operation and Grid Integration, Butterworth Heinemann, 2017		
Web Refer	Web References:		
1.	https://www.sgrwin.com/basic-understanding-iec-61850/.		
2.	https://www.alstom.com/press-releases-news/2015/1/alstoms-substation-automation- solutions-sas-business-unveils-new-dap-io-modules-for-smart-grid-applications.		
Online Resources:			
1.	https://indianinstituteofsolarenergy.com/courses/microgrid-certification-training/		
2.	https://onlinecourses.nptel.ac.in/noc20_ee84/preview		

22VA304	FPG	GA-based Switched Mode Power Converters	2/0/0/2	
Nature of Course		Theory Practical		
Pre requis	ites	Nil		
Course Ob	jectives:			
1.	To develop skille and developmer	ed manpower and to facilitate academic as well as corporant.	te research	
2.	To know about I	atest digital control trends in power electronics industries.		
Course Ou	itcomes:			
Upon com	pletion of the co	ourse, students shall have the ability to		
C304.1	Understand the	digital control in switched mode power converters.	[U]	
C304.2	Analyze frequen	cy and time domain digital control design approaches	[A]	
C304.3	Model Digital co	ntrol implementation blocks.	[AP]	
C304.4	Apply modeling digital circuits.	concepts of Verilog HDL programming for the design of	[AP]	
Course Co	ontents:			
Module 1:	Introduction		10 Hrs	
Introduction digital cont control.	n to digital contro trol architectures	ol in switched mode power converters - Fixed and variable - MATLAB custom model development for simulation u	frequency nder digital	
Module 2:	Modeling Techn	iques	12 Hrs	
Modeling to control des	echniques and m sign approaches	odel validation using MATLAB - Frequency and time dom - Digital control implementation blocks and steps for FP	ain digital GA based	
Module 3:	Verilog HDL		8 Hrs	
Introduction to Verilog HDL and simulation using Xilinx Webpack - Digital controller implementation using fixed point arithmetic and Verilog HDL - Digital Control Implementation using STM32 and C2000 Series Microcontrollers - Hardware case studies of advanced digital control techniques.			controller mentation ced digital	
		Total Hours	30 Hrs	
Text Books	6:			
1.	 Kapat and P. T. Krein, "A Tutorial and Review Discussion of Modulation, Control and Tuning of High Performance DC-DC Converters based on Small-Signal and Large- Signal Approaches" IEEE Open Journal of Power Electronics, vol. 1, pp. 339 - 371, Aug. 2020. 			
2.	2. R. W. Erickson and D. Maksimovic, Fundamentals of Power Electronics, 3rd Ed., Springer, 2020			
Suggested Readings:				
1.	Samir Palnitkar, Pearson 2013.	"Verilog HDL: A Guide to Digital Design and Synthesis", 2 nd	edition,	
2.	Volnei A. Pedroi 2010.	ni, "Circuit Design and Simulation with VHDL", MIT Press,2 ^r	^d edition	
3.	S.H.Gerez,"Algo	prithms for VLSI Design Automation", John Wiley and Sons, 2	2011.	

Web References:		
1.	https://nptel.ac.in/courses/117101058	
2.	https://www.tutorialspoint.com/vlsi_design/index.htm	
3.	https://www.edaplayground.com/	
Online Resources:		
1.	VLSI Classroom Training Online VLSI Course -VLSIGuru.com	

22VA305		Phase-Locked Loop Circuit Design	2/0	/0/2
Nature of C	ure of Course Theory Practical			
Pre requisi	ites	Nil		
Course Ob	jectives:			
1.	To expose the integer-N PLLs.	state-of-the-art frequency synthesis techniques used	in analog/di	gital
2.	To equip studen and transistor level	ts with skills to analyze, debug, and evaluate a PLL de vels both.	sign at analy	rtical
Course Ou	tcomes:			
Upon com	pletion of the cou	urse, students shall have the ability to		
C305.1	Understand the E	Basic concepts in PLL.	[l	U]
C305.2	Design of PLL bu	uilding blocks for charge pump	[/	A]
C305.3	Design of PLL bu	uilding blocks for supply regulated oscillators	[A	\P]
C305.4	Analyze Noise ar	nalysis in digital PLLs	[A	۱P]
Course Co	ntents:			
Module 2: PLL building Blocks 12 Hrs Design of PLL building blocks: PFD - Design of PLL building blocks: Charge-pump - Design of PLL building blocks: Ring oscillators - Design of PLL building blocks: Supply regulated oscillators.				Hrs
Introduction	of Digital PLLs -	Noise analysis in digital PLLs.	•	
		Total Hours:	30 Hrs.	
Text Books	5:			
1.	R.E. Best, "Pha Publication, 6th E	se Locked Loops Design, Simulation and Application Edition, Revised edition 2017.	s," McGraw-	-Hill
2.	W. Egan, Phase-	Lock Basics, John Wiley and Sons, 2008.		
Suggested	Readings:			
1.	F. Gardner, Pha	selock Techniques, John Wiley and Sons, 2005.		
2.	Dan H Wolaver,	"Phase-Locked Loop Circuit Design," Prentice hall,2001		
Web Refere	ences:			
1.	https://web.ece.u	ucsb.edu/~long/ece594a/PLL_intro_594a_s05		
2.	https://ewh.ieee.	org/r5/denver/sscs/Presentations/2007_05_Fischette		
Online Res	ources:			
1.	https://onlinecou	rses.nptel.ac.in/noc22_ee92/		

22VA306		Substation Designing		2/0/0/2
Nature of C	f Course Theory Practical			
Pre requisi	Pre requisites Power System Analysis			
Course Ob	jectives:			
1.	To model the cor distributed gener	ponents (feeders, distribution transfor tion, storage, etc.)	mer, regulators, capaci	ors, loads,
2.	To analyze the distribution syste	nethods (load flow, short-circuit, e n.	tc.), specially develop	ed for the
Course Ou	tcomes:			
Upon com	oletion of the cou	se, students shall have the ability t	0	
C306.1	Understand the s	ucture of a distribution system.		[U]
C306.2	Illustrate the cond	pt of distribution, Feeders, Substation	n layout.	[U]
C306.3	Analyze the role	single and three phase transformers	in distribution system.	[AP]
C306.4	Analyze the load methods.	uration curve, economic aspects and	power tariff calculation	[AP]
Course Co	ntents:			
Calculations, Distribution of loads and various geometric configurations.Module 2: Modeling of distribution system components8 HrsOverhead lines, feeders and cables - Single and three phase distribution transformers-Voltage regulators - Load models - Capacitor banks-Distributed generation.8 HrsModule 3: Distribution system analysis12 HrsLoad flow analysis: Backward/forward sweep, Load flow analysis: Direct approach, Load flow analysis: Direct approach for weakly meshed systems, Load flow analysis: Gauss Implicit Z-matrix			8 Hrs s-Voltage 2 Hrs .oad flow : Z-matrix	
	Total Hours 30 Hrs		0 Hrs	
Text Books	:			
1.	B. Das, Power D	tribution Automation, IET Power and	Energy Series, 75, Lond	lon,2016
2.	A. A. Sallam and 0 2011.	. P. Malik, Electric Distribution System	n, IEEE Press, Piscatav	/ay, NJ,
Suggested	Readings:			
1.	W. H. Kresting, Distribution System Modeling and Analysis, CRC Press, New York, 2002.			
2.	A. A. Sallam and O. P. Malik, Electric Distribution System, IEEE Press, Piscataway, NJ, 2011			
Web Refere	ences:			
1.	http://nptel.ac.in/video.php?subjectId=108102047			
2.	http://textofvideo.nptel.iitm.ac.in/108102047/lec20.pdf			
Online Res	ources:			
1.	https://onlinecour	es.nptel.ac.in/noc19_ee61		
	-			

22VA307	Contemporary Digital Techniques		2/0/0/2	
Nature of Course		Theory Practical		
Pre requis	Pre requisites Analog and Digital Electronics			
Course Ol	ojectives:			
1.	To present the to the successful	engineering principles, theories and practices, which are full design of a digital communication system.	Indamental	
2.	To equip the m communication.	ethods of systematic representation, analysis and design	of a digital	
Course O	utcomes:			
Upon com	pletion of the co	ourse, students shall have the ability to		
C307.1	Understand the	concepts of microgrids, and networked microgrids.	[U]	
C307.2	Model PV powe	r systems and standard grid-tied inverter.	[A]	
C307.3	Analyze distribu	tion grid power flow.	[A]	
C307.4	Understand cerespecially prima	ntralized control and distributed control in microgrids, ary, secondary and tertiary control.	[U]	
C307.5	Conduct power networked micro	flow analysis for droop-control-based microgrids and ogrids.	[AP]	
C307.6	Understand bas strategy.	sics of cybersecurity in microgrids and active defense	[U]	
Course Co	ontents:			
Module 1: Introductio Communic	Module 1: Introduction 10 Hrs Introduction to digital communication systems - Source Coding - Characterization of Communication Signals and Systems			
Module 2:	Signal represen	tation	10 Hrs	
Representation of Memory less Modulation Methods - Nonlinear modulation methods - Optimal receivers of AWGN - Receiver for non-ideal channel - Probability of error of different modulation schemes.				
Module 3:	Synchronization	n Techniques	10 Hrs	
Carrier phatechniques	ase and symbol tin , Power Adaptatio	ming synchronization techniques - Channel estimation and e on methods for colored noise channel.	qualization	
		Total Hours	30 Hrs	
Text Book	s:			
1. M. Morris R. Mano, Michael D. Ciletti, "Digital Logic Design", Prentice Hall,5th Edition,2013.			n,2013.	
2. Floyd,	Floyd, "Digital Fundamentals", Pearson education, 11th edition, 2015.			
3. A.Ana 2016.	A.Anand kumar, "Fundamental of Digital Circuits", PHI Learning Private Ltd, 4th edition, 2016.			
Suggested	Readings:			
1. R. P	Jain, "Modern Digi	ital Electronics", McGraw Hill Education, 4th Edition, 2009.		

2.	Tocci R.J., Neal S. Widmer, "Digital Systems: Principles and Applications", Pearson Education Asia, 2014.
3.	Donald P Leach, Albert Paul Malvino, Goutam Sha, "Digital Principles and Applications", Tata McGraw Hill, 7th Edition, 2010.
We	b References:
1.	http://www.ni.com/example/14493/en/
2.	http://electronics-course.com/
On	line Resources:
1.	https://onlinecourses.nptel.ac.in/noc21_ee11

22VA308	8 Recent Power Electronics and Control		2/0/0/2
Nature of	Course	Theory Practical	-
Pre requi	sites	Analog and Digital Electronics	
Course C)bjectives:		
1.	To provid	de current updates in DC choppers.	
2.	To impar	rt the concepts of PWM inverters and controllers.	
Course C Upon co	outcomes: npletion of	f the course, students shall have the ability to	
C308.1	Understa	and the multiphase converters and effect of source impedance.	[U]
C308.2	Examine	the operation of DC-DC converter and isolated converters.	[A]
C308.3	Examine	the operation of VSI, CSI, MLI and ZSI converters.	[A]
C308.4	Design th	ne suitable controller for power converters.	[A]
Course C	ontents:		
Module 1: Introduction10 HrsDevice Physics, Application and Analysis of Switches and Single-Phase Converter - Single Phase Converter, Three Phase Converter, Multipulse Converter and Effect of Source Inductance and PWM Rectifiers.Module 2: DC-DC Converters10 HrsPWM Rectifiers and Power Factor Improvement Techniques and non- isolated DC- DC converters - Non- isolated and isolated DC- DC Converters and Choppers - Isolated DC- DC Converters IV and VSI and CSI, MLI and ZSI.Module 3: Controllers10 Hrs			
Electronic	s, Nonlinea	ar Control in Power Electronics, Applications.	
		Total Hours:	30 Hrs.
Text Boo	ks:		
1. Ned Conv	Mohan, Tor erters,Appli	e M. Undeland and William P. Robbins, "Power Electronics - ications and Design", John Wiley andamp; Sons edition 2011.	
2. M.H. Editio	Rashid, "Po on 2014.	ower Electronics Circuits, devices and applications", Pearson Educ	ation, Inc.
3. P.S.	3. P.S. Bhimbra, "Power Electronics", Khanna Publishers edition 2018.		
Suggeste	d Reading	S:	
1. Veda	Vedam Subramanian, "Power Electronics" New age international Second edition 2018.		
2. ^{M.D.}	M.D.Singh, "Power Electronics", Tata McGraw-Hill, 2 nd Edition 2014.		
3. Bima	Bimal K. Bose, "Modern Power Electronics and amp; AC Drives", Pearson, 2015.		
Web Refe	erences:		
1. https	https://www.tutorialspoint.com/power_electronics/index.htm		
2. https	://in.mathwo	orks.com/videos/developing-dc-dc-converter-control-with-	

3.	https://in.mathworks.com/videos/developing-dc-dc-converter-control-with- simulinkautomatically-generating-controller-code-for-implementation-on-embedded- processor1535540362783.html
On	line Resources:
1.	https://onlinecourses.nptel.ac.in/noc20_ee28

Nature of Course

Pre requisites

Course Objectives:

1.

To provide exposure to Neuroscience and its importance in the real world

Course Outcomes:

Upon completion of the course, students shall have the ability to

Nil

Theory Practical

C309.1	Understand EEG and Event-Related Potentials (ERPs).	[U]
C309.2	Understand n to Brain-Computer Interface (BCI) and its applications.	[U]
C309.3	Apply ERPs to screen for disorders of Cognition.	[AP]
C309.4	Understand ERP stimulators and signal conditioning circuits.	[U]
C309.5	Demonstrate EEGLab and ERPLab for EEG and ERP signal processing	[AP]
Course Contents:		

Module 1: Introduction

10 Hrs Introduction to Neurophysiology, Basic Operation of Human Brain - EEG introduction, EEG recording systems, Understanding EEG waveforms, Applications of EEG analysis - Epilepsy a classic Neurophysiological disorder, Types of Epilepsy, Role of EEG Signal Processing for Epilepsy Classification/ Screening.

Module 2: Signal Processing

Signal Conditioning for EEG and ECG signal processing with demonstration of ECG signal processing circuits - Cortical Auditory Event Potential (CAEP), Different Event Related Potentials and their applications: MMN and P300. EEGLAB and ERPLAB Signal Processing Demo using MATLAB - Brain Computer Interface: Introduction, Applications, Existing BCI Sensors

Module 3: Electrodes

Completing the BCI Loop in Humans without Neurosurgery: Designing Magnetic stimulators -: Invasive Techniques to acquire neurological signals, Types of implants and signal conditioning systems - Tetrodes Fabrication, Microneedle Fabrication, Implanting Tetrodes and microneedles on a rat model.

	Total Hours 30 Hrs		
Тех	Text Books:		
1.	The Art of Electronics 3rd Edition, 2015 Horowitz and Hill.		
2.	Principles Of Neural Science, 2012 Kandel and Schwartz.		
Suggested Readings:			
1.	Samson Wright's Applied Physiology, 2008 Keele A. Cyril.		
2.	Matews G.G, Neurobiology, Second Edition, Blackwell Science, UK, 2000.		
Web References:			
1.	https://www.technicalsymposium.com/alllecturenotes_biomed.html.		
2.	https://ocw.mit.edu/courses/biology/7-28-molecular-biology-spring-2005/		
Onl	Online Resources:		
1.	https://onlinecourses.nptel.ac.in/noc20_ee95		

10 Hrs

10 Hrs