SETHU INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

Pulloor, Kariapatti – 626 115

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

REGULATIONS 2021

CHOICE BASED CREDIT SYSTEM

CURRICULUM AND SYLLABUS

(I SEMESTER to VIII SEMESTER)

APPROVED BY THE ACADEMIC COUNCIL MEETING HELD ON 27.05.2023

CHAIRMAN
BOARD OF STUDIES

CHAIRMAN
ACADEMIC COUNCIL

SETHU INSTITUTE OF TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Department Vision

To achieve Excellence in Education and Research in the field of Electrical and Electronics Engineering and provide knowledge based contribution for the development of economy and society.

Department Mission

- Providing comprehensive and value based education in Electrical and Electronics engineering and related fields to meet intellectual, ethical and career challenges
- Providing state-of- the-art infrastructure and resources to promote teaching-learning and research activities
- Enriching the skills to enhance employability and entrepreneurship
- Strengthening the collaboration with academia, industry and research organizations
- Fostering Research and Development activities leading to innovation and technological growth in the overall ambit of electrical and electronics engineering
- Offering services to the society through education, science and technology through education and technology.

Program Educational Objectives (PEOs)

After few years of graduation our Electrical and Electronics Engineering graduates are expected to:	
PEO I (Core Competency)	Exhibit technical competency in Electrical and Electronics Engineering and related fields
PEO II (Life Long Learning)	Engage in life-long learning for professional development and research
PEO III (Professional and Ethical Skills)	Exhibit effective communication skills, team work and lead their profession with ethics

Program Outcomes

PO No.	**PROGRAM OUTCOMES**
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, electrical and electronics engineering fundamentals to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex electrical and electronics engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/Development of solutions:** Design and develop electrical and electronic systems that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
PO4	**Investigation of complex problems:** Investigate and analyze complex electrical and electronics engineering problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO5	**Modern tool usage:** Select and Apply modern engineering and IT tools for simulation and modeling of electrical and electronic systems.
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 to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO9	**Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO11	**Project management and Finance:** Demonstrate knowledge and understanding of 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 to engage in independent and life-long learning in the broadest context of technological change.
PSO No.	**PROGRAM SPECIFIC OUTCOMES**
PSO1	Demonstrate technical competency in the design and analysis of electrical machines.
PSO2	Design and analyze power electronic interfaces for renewable energy systems.

SETHU INSTITUTE OF TECHNOLOGY

Pulloor, Kariapatti – 626 115

B.E. Degree Programme
CBCS CURRICULUM AND SYLLABUS

REGULATIONS 2021 [Batch-2021-2025]

Bachelor of Engineering in Electrical and Electronics Engineering

OVERALL COURSE STRUCTURE

Code	Category	Total No. of Courses	Credits	Percentage
BS	Basic Sciences	9	24	14.91
ES	Engineering Sciences	8	20.5	12.73
HSS	Humanities and Social Sciences	5	9	5.59
PC	Professional Core (Including Lab Courses)	25	63.5	39.44
PE	Professional Elective	6	18	11.18
OE	Open Elective	4	12	7.45
PW	Project Work, Seminar & Internship	3	13	8.07
MC	Mandatory Courses	9	1	0.62
	TOTAL	**69**	**161**	**100**

COURSE CREDITS – SEMESTER WISE

Semester	I	II	III	IV	V	VI	VII	VIII	TOTAL
Credits	22	17	20	22	25	22	19	14	161

Semester I

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UEN101	English for Technical Communication (Common to All Branches except CSBS)	2	0	0	2	HSS
21UMA102	Matrix and Calculus (Common to All Branches except CSBS)	3	1	0	4	BS
21UPH103	Engineering Physics (Common to All Branches except CSBS)	3	0	0	3	BS
21UCY105	Applied Chemistry (Common to CSE, ECE, EEE, IT, BME,BT, AIDS, CSD, AI&ML)	3	0	0	3	BS
21UCS108	Problem Solving and Python Programming (Common to All Branches Except CSBS)	3	0	0	3	ES
21UME109	Engineering Graphics (Common to All Branches Except CSBS,AIDS& CSD)	3	1	0	4	ES
PRACTICAL						
21UCS110	Problem Solving and Python Programming Laboratory (Common to All Branches Except CSBS)	0	0	2	1	ES
21UME111	Engineering Practice Laboratory (Common to Mech, EEE, Civil, Agri Engineering)	0	0	2	1	ES
21UGS113	Basic Sciences Laboratory I (Common to All Branches Except CSBS)	0	0	2	1	BS
MANDATORY						
21UGM131	Induction Programme (Common to All Branches)	0	3	0	P/F	MC
	TOTAL	**17**	**5**	**6**	**22**	
Total No of Credits - 22						

Semester II

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UEN201	Communication Skills for Professionals(Integrated Course)(Common to All Branches except CSBS)	1	0	1	1.5	HSS
21UMA205	Calculus and Transform Techniques (Only for EEE)	3	1	0	4	BS
21UEE205	Electric Circuit Analysis(Only for EEE)	3	0	0	3	ES
21UME226	Basic Civil and Mechanical Engineering (Only for EEE)	3	0	0	3	ES
21UPH205	Physics for Information Science (Common to CSE, IT, EEE,AIDS,CSD)	3	0	0	3	BS
PRACTICAL						
21UGS210	Basic Sciences Laboratory II (Common to All Branches Except CSBS)	0	0	2	1	BS
21UEE211	Electric circuits Laboratory (Only for EEE)	0	0	3	1.5	ES
MANDATORY						
21UGM231	Environmental Science (Common to All Branches)	3	0	0	P/F	MC
	TOTAL	**16**	**1**	**6**	**17**	
Total No of Credits - 17						

Semester III

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UMA324	Probability, Statistics, Complex Analysis And Numerical Methods (Only For EEE)	3	1	0	4	BS
21UEE302	Electrical Machines - I	3	0	0	3	PC
21UEE303	Analog Electronics	3	0	0	3	PC
21UEE304	Electromagnetic Fields	3	1	0	4	PC
21UIT327	Data Structure using C (Integrated Course)	3	0	2	4	ES
PRACTICAL						
21UEE307	Electrical Machines Laboratory - I	0	0	2	1	PC
21UEE308	Analog Electronics Laboratory	0	0	2	1	PC
MANDATORY						
21UGM331	Biology for Engineers (Common to All except BME & BT)	2	0	0	P/F	MC
	TOTAL	**17**	**2**	**6**	**20**	
Total No of Credits - 20						

Semester IV

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UGS431	Reasoning and Quantitative Aptitude (Common to Mech, EEE, Agri and Chem Engineering)	1	0	0	1	BS
21UEE401	Electrical Machines - II	3	0	0	3	PC
21UEE402	Control Systems	3	1	0	4	PC
21UEE403	Principles of Digital Electronics	3	1	0	4	PC
21UEE404	Electric Power Transmission and Distribution	3	1	0	4	PC
21UEE405	Electrical Measurements and Instrumentation	3	0	0	3	PC
PRACTICAL						
21UEE406	Electrical Machines Laboratory - II	0	0	2	1	PC
21UEE407	Control and Instrumentation Laboratory	0	0	2	1	PC
21UEE408	Digital Circuits Laboratory	0	0	2	1	PC
MANDATORY						
21UGM431	Gender Equality(Common to all)	1	0	0	P/F	MC
	TOTAL	**17**	**3**	**6**	**22**	
Total No of Credits - 22						

Semester V

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UEE501	Power Electronics	3	0	0	3	PC
21UEE502	Power System Analysis	3	1	0	4	PC
21UEE503	Microprocessor and Microcontroller Programming	3	0	0	3	PC
21UEE504	Internet of Things for Electrical Automation	3	0	0	3	PC
PE1	Professional Elective–I	3	0	0	3	PE
OE1	Open Elective–I	3	0	0	3	OE
PRACTICAL						
21UGS532	Soft Skills Laboratory (Common to CSE,IT,CSBS,AIDS,EEE, CSD &AGRI)	0	0	2	1	HSS
21UEE507	Creative Thinking and Innovation	0	0	2	1	PW
21UEE508	Power Electronics Laboratory	0	0	3	1.5	PC
21UEE509	Microprocessor and Microcontroller Programming Laboratory	0	0	3	1.5	PC
MANDATORY						
21UGT140	தமிழர மரபு / Heritage of Tamils (Common to all)	1	0	0	1	MC
	TOTAL	**19**	**1**	**10**	**25**	
Total No of Credits – 25						

Semester VI

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UEE601	Electric Drives and Control	3	0	0	3	PC
21UEE602	Protection and Switchgear	3	0	0	3	PC
PE-II	Professional Elective–II	3	0	0	3	PE
PE-III	Professional Elective–III	3	0	0	3	PE
OE-II	Open Elective–II	3	0	0	3	OE
PRACTICAL						
21UEE607	Product Development Project (Common to all Branches)	2	0	4	4	PW
21UGS633	Interpersonal Skills Development Lab (Common to CSE,EEE,IT,AGRI,CSBS, AIDS,CSD)	0	0	3	1.5	HSS
21UEE608	Electric Drives and Control Laboratory	0	0	3	1.5	PC
MANDATORY						
21UGM631	Indian Constitution (Common to all Branches)	1	0	0	P/F	MC
	TOTAL	**18**	**0**	**10**	**22**	
Total No of Credits - 22						

Semester VII

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UME701	Project Management and Finance(Common to All Branches Except CSBS)	3	0	0	3	HSS
21UEE702	Power System Operation and Control	3	1	0	4	PC
PE-IV	Professional Elective–IV	3	0	0	3	PE
PE-V	Professional Elective –V	3	0	0	3	PE
OE-III	Open Elective–III	3	0	0	3	OE
PRACTICAL						
21UEE706	Renewable Energy Laboratory	0	0	3	1.5	PC
21UEE707	Power System Simulation Laboratory	0	0	3	1.5	PC
21UGE710	MDP Phase I	0	0	6	3	PW
MANDATORY						
21UGM731	Sports and Social Development (Common to all)	-	-	-	P/F	MC
21UGM732	Skill Development	-	-	-	P/F	MC
	TOTAL	**15**	**0**	**4**	**19**	
Total No of Credits - 19						

Semester VIII

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
PE-VI	Professional Elective–VI	3	0	0	3	PE
OE-IV	Open Elective–IV	3	0	0	3	OE
PRACTICAL						
21UEE801	Project work	0	0	16	8	PW
21UGE810	MDP Phase II	0	0	16	8	PW
MANDATORY						
21UGM831	Professional Ethics and Human values (Common to all branches)	2	0	0	P/F	MC
	TOTAL	**8**	**0**	**16**	**14**	
Total No of Credits - 14						

PROFESSIONAL ELECTIVE COURSES : VERTICALS

Vertical 1 Power Engineering	Vertical 2 Converters and Drives	Vertical 3 Embedded Systems	Vertical 4 Electric Vehicle Technology	Vertical 5 Diversified Courses
Utilization and Conservation of Electrical Energy	Special Electrical Machines	Embedded System Design	Electric Vehicle Architecture	Digital Control Systems
Under Ground Cable Engineering	Design of Electrical Machines	Embedded C - Programming	Design of Motor and Power Converters for Electric Vehicles	Fuzzy systems and Genetic Algorithms
Substation Engineering and Substation Automation	Multilevel Power Converters	Embedded and Real Time Systems	Electric Vehicle Design, Mechanics and Control	Sensing Techniques and Sensor Systems
HVDC and FACTS	SMPS and UPS	Embedded Control for Electrical Drives	Design of Electric Vehicle Charging System	Consumer Electronics
Energy Management and Auditing	Application of Power Electronics to Power Systems	Smart System Automation	Testing of Electric Vehicles	PCB Design
Power Quality	Control of Power Electronics Circuits	Embedded System for Automotive Applications	Grid Integration of Electric Vehicles	PLC and SCADA Applications
Smart Grid	Solid State DC Drives	Analog and Mixed Mode VLSI Design	Intelligent Control of Electric Vehicles	Advanced Control Theory
Power System Restructuring	Solid State AC Drives	Digital Signal Processing System	Energy Storage System for Electrical Vehicles	Design and Modeling of Renewable Energy Systems
Power System Transients	Analysis of Electrical Machines	MEMS and NEMS	Electric Vehicle Charging Systems	Sustainable and Environmental Friendly HV Insulation System
Grid Integration Techniques and Challenges	Power Electronics for Renewable Energy Systems	Design with PIC Microcontrollers	Introduction to Hybrid and Electric Vehicle Engineering	Energy Efficient Motors

Vertical 1 - Power Engineering

S.No.	Course Code	Course Title	L	T	P	C
1.	21EEV101	Utilization and Conservation of Electrical Energy	3	0	0	3
2.	21EEV102	Under Ground Cable Engineering	3	0	0	3
3.	21EEV103	Substation Engineering and Substation Automation	3	0	0	3
4.	21EEV104	HVDC and FACTS	3	0	0	3
5.	21EEV105	Energy Management and Auditing	3	0	0	3
6.	21EEV106	Power Quality	3	0	0	3
7.	21EEV107	Smart Grid	3	0	0	3
8.	21EEV108	Power System Restructuring	3	0	0	3
9.	21EEV109	Power System Transients	3	0	0	3
10.	21EEV110	Grid Integration Techniques and Challenges	3	0	0	3

Vertical 2 - Converters and Drives

S.No.	Course Code	Course Title	L	T	P	C
1.	21EEV201	Special Electrical Machines	3	0	0	3
2.	21EEV202	Design of Electrical Machines	3	0	0	3
3.	21EEV203	Multilevel Power Converters	2	0	2	3
4.	21EEV204	SMPS and UPS	2	0	2	3
5.	21EEV205	Application of Power Electronics to Power Systems	3	0	0	3
6.	21EEV206	Control of Power Electronics Circuits	2	0	2	3
7.	21EEV207	Solid State DC Drives	3	0	0	3
8.	21EEV208	Solid State AC Drives	3	0	0	3
9.	21EEV209	Analysis of Electrical Machines	2	0	2	3
10.	21EEV210	Power Electronics for Renewable Energy Systems	3	0	0	3

Vertical 3 - Embedded Systems

S.No.	Course Code	Course Title	L	T	P	C
1.	21EEV301	Embedded System Design	2	0	2	3
2.	21EEV302	Embedded C - Programming	2	0	2	3
3.	21EEV303	Embedded and Real Time Systems	2	0	2	3
4.	21EEV304	Embedded Control for Electrical Drives	2	0	2	3
5.	21EEV305	Smart System Automation	2	0	2	3
6.	21EEV306	Embedded System for Automotive Applications.	2	0	2	3
7.	21EEV307	Analog and Mixed Mode VLSI Design	3	0	0	3
8.	21EEV308	Digital Signal Processing System	2	0	2	3
9.	21EEV309	MEMS and NEMS	2	0	2	3
10.	21EEV310	Design with PIC Microcontrollers	3	0	0	3

Vertical 4 - Electric Vehicle Technology

S.No.	Course Code	Course Title	L	T	P	C
1.	21EEV401	Electric Vehicle Architecture	3	0	0	3
2.	21EEV402	Design of Motor and Power Converters for Electric Vehicles	2	0	2	3
3.	21EEV403	Electric Vehicle Design, Mechanics and Control	2	0	2	3
4.	21EEV404	Design of Electric Vehicle Charging System	2	0	2	3
5.	21EEV405	Testing of Electric Vehicles	2	0	2	3
6.	21EEV406	Grid Integration of Electric Vehicles	3	0	0	3
7.	21EEV407	Intelligent Control of Electric Vehicles	2	0	2	3
8.	21EEV408	Energy Storage System for Electrical Vehicles	3	0	0	3
9.	21EEV409	Electric Vehicle Charging Systems	3	0	0	3
10.	21EEV410	Introduction to Hybrid and Electric Vehicle Engineering	3	0	0	3

Vertical 5 - Diversified Courses

S.No.	Course Code	Course Title	L	T	P	C
1.	21EEV501	Digital Control Systems	3	0	0	3
2.	21EEV502	Fuzzy systems and Genetic Algorithms	3	0	0	3
3.	21EEV503	Sensing Techniques and Sensor Systems	3	0	0	3
4.	21EEV504	Consumer Electronics	3	0	0	3
5.	21EEV505	PCB Design	2	0	2	3
6.	21EEV506	PLC and SCADA Applications	2	0	2	3
7.	21EEV507	Advanced Control Theory	3	0	0	3
8.	21EEV508	Design and Modeling of Renewable Energy Systems	3	0	0	3
9.	21EEV509	Sustainable and Environmental Friendly HV Insulation System	3	0	0	3
10.	21EEV510	Energy Efficient Motors	3	0	0	3

OPEN ELECTIVES FOR ELECTRICAL AND ELECTRONICS ENGINEERING STUDENTS

OPEN ELECTIVE - I

S.No.	Course Code	Course Title
1	21UEN971	English for Competitive Exam
2	21UGR974	German for Engineers
3	21UAD972	Artificial Intelligence for Engineers
4	21UCD972	Data Science Fundamentals

OPEN ELECTIVE – II

S.No.	Course Code	Course Title
1	21UAD971	Augmented and Virtual Reality
2	21UJN975	Japanese for Engineers
3	21UEN972	Speak Better, Write Better
4	21UFR973	French for Engineers
5	21UME974	Industry 4.0

OPEN ELECTIVE – III

S.No.	Course Code	Course Title
1	21UBM975	Robotics in Health Care
2	21UCB971	Digital Marketing Strategy
3	21UCB973	Strategic Management and Leadership
4	21UCS977	Mobile Application Development
5	21UEE971	Drone Technologies
6	21UME976	Lean Concepts, Tools and Practices

OPEN ELECTIVE – IV

S.No.	Course Code	Course Title
1	21UBM974	Forensic Science
2	21UCH971	Fire safety Engineering
3	21UAD974	Working with Emotional Intelligence
4	21UCD973	Digital Media and Society
5	21UCS980	Web Technologies and Applications
6	21UAI973	Urban Agriculture
7	21UIT975	Introduction to 3D Animation
8	21UME981	Quality Engineering

LIST OF OPEN ELECTIVES OFFERED TO OTHER DEPARTMENTS

S.No.	Course Code	Course Title	L	T	P	C
1	21UEE971	Drone Technologies	3	0	0	3
2	21UEE972	Renewable Energy Technology	3	0	0	3
3	21UEE973	Design of Embedded Systems	3	0	0	3
4	21UEE974	Digital Design using HDL	3	0	0	3
5	21UEE975	Introduction to Control Systems	3	0	0	3
6	21UEE976	Industrial Automation and Control	3	0	0	3
7	21UEE977	Solar Power Plants	3	0	0	3
8	21UEE978	Computer Control of Processes	3	0	0	3
9	21UEE979	Electric and Hybrid Vehicles	3	0	0	3

VERTICALS FOR MINOR DEGREE OFFERED BY OTHER DEPARTMENTS

S.No.	Name of the Vertical	Offering Department
1.	Data Science	Computer Science and Engineering
2.	Full Stack Development	AI & DS
3.	Cyber Security and Data Privacy	
4.	Creative Media	IT
5.	Ocean Engineering	Civil
6.	Modern Mobility Systems	Mechanical Engineering
7.	Clean and Green Energy Technologies	
8.	Product and Process Development	
9.	Robotics and Automation	
10.	Sensor Technologies and IoT	Electronics and Communication Engineering
11.	Advanced Healthcare Devices	Biomedical Engineering
12.	IT and Agricultural Business Management	Agri
13.	Medical Biotechnology	BT
14.	Agro Biotechnology	
15.	Media Processing	CSD
Common Verticals		
16.	Computer Technology	Computer Science and Engineering
17.	Artificial Intelligence and Data Science	AI & DS

LIST OF INDUSTRY DESIGNED COURSES

Sl. No.	Course Code	Course Title	L	T	P	C
1	21UEE861	Wind farm Development and Operation	1	0	0	1
2	21UEE862	Design of Towers and Blades Structures	1	0	0	1
3	21UEE863	Wind Turbine Blades Fabrication Technology	1	0	0	1
4	21UEE864	Solar Photovoltaic Technology	1	0	0	1
5	21UEE865	Industrial safety measures	1	0	0	1
6	21UEE866	ECO Paint Application Technology for Automobile Industry	1	0	0	1
7	21UEE867	Energy Storage Systems	1	0	0	1
8	21UEE868	Controlling and Monitoring of Electrical Equipments using Mobile	1	0	0	1
9	21UEE869	Electrical Rewinding Laboratory	0	0	2	1

Semester I

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UEN101	English for Technical Communication (Common to All Branches except CSBS)	2	0	0	2	HSS
21UMA102	Matrix and Calculus (Common to All Branches except CSBS)	3	1	0	4	BS
21UPH103	Engineering Physics (Common to All Branches except CSBS)	3	0	0	3	BS
21UCY105	Applied Chemistry (Common to CSE, ECE, EEE, IT, BME,BT, AIDS &CSD)	3	0	0	3	BS
21UCS108	Problem Solving and Python Programming (Common to All Branches Except CSBS)	3	0	0	3	ES
21UME109	Engineering Graphics (Common to All Branches Except CSBS,AIDS& CSD)	3	1	0	4	ES
PRACTICAL						
21UCS110	Problem Solving and Python Programming Laboratory (Common to All Branches Except CSBS)	0	0	2	1	ES
21UME111	Engineering Practice Laboratory (Common to Mech, EEE, Civil, Agri Engineering)	0	0	2	1	ES
21UGS113	Basic Sciences Laboratory I (Common to All Branches Except CSBS)	0	0	2	1	BS
MANDATORY						
21UGM131	Induction Programme (Common to All Branches)	0	3	0	P/F	MC
	TOTAL	**17**	**5**	**6**	**22**	
Total No of Credits - 22						

21UEN101	ENGLISH FOR TECHNICAL COMMUNICATION (Common to ALL Branches except CSBS)	L	T	P	C
		2	0	0	2

PRE-REQUISITE:

COURSE OBJECTIVES :

- To enhance the vocabulary of students
- To strengthen the application of functional grammar and basic skills
- To improve the language proficiency of students

UNIT I PRESENTING ESSENTIALS OF CORRESPONDENCE 6

Listening –Formal and informal conversations and comprehension. **Speaking-** introducing oneself – exchanging personal and social information. **Reading** – Skimming and Scanning. **Writing –** Sentence Formation, Formal Letters (Permission/Requisition).**Grammar**- Parts of Speech. **Vocabulary Development** – Technical Word Formation- Prefix- suffix - Synonyms and Antonyms- Phrases and Clauses.

UNIT II COMMUNICATION SKILLS 6

Listening– Telephonic Conversations**. Speaking** – Pronunciation rules with Stress pattern. **Reading** – comprehension-pre-reading, post-reading- comprehension questions **Writing** – Punctuation rules, paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions, - **Grammar** – Tense. **Vocabulary Development**- Words from other languages in English.

UNIT III CORRESPONDENCE AND VOCATION IMPROVEMENT 6

Listening – Motivational speech by Great Speakers **Speaking** –Narrating daily events.**Reading** – Newspaper reading. **Writing** – Job application letter - Transformation of Information (Transcoding) – **Grammar –** Voice. –**Vocabulary Development –**Same word in different parts of speech

UNIT IV PORTRAYAL AND SUMMATION 6

Listening – Understating the instruction. **Speaking** -Intonation and preparing dialogue on various formal and informal situation**Reading** –Note Making from given text - **Writing** –Creating coherence, Essay writing with proper introduction and conclusion, Giving Instruction (Guidance/Procedure) - **Grammar** – Subject-Verb Agreement (Concord), **VocabularyDevelopment** – One word substitution.

UNIT V CRITICAL THINKING 6

Listening –Listening important messages based on news report. Speaking- retelling short stories.Reading- Organization Profile, news report. Writing – Precise writing, Developing Hints - Report Writing (Industrial, Accident). Grammar – Spot the Errors in English

TOTAL : 30 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

S.No	21UEN101 – TECHNICAL ENGLISH	Bloom's Level
CO-1	Apply grammar effectively in writing meaningful sentences and paragraphs.	Responding A2
CO-2	Exhibit reading skills and comprehension to express the ideas in the given text.	Responding A2
CO-3	Develop writing skills to present the ideas in various formal situations.	Responding A2
CO-4	Develop oral fluency to express the ideas in various formal situations.	Responding A2
CO-5	Prepare Reports for various purpose	Responding A2

TEXT BOOK:

1.KN Shoba, Lourdes Joavani Rayen, Communicative English, New Delhi, Cambridge University Press, 2017

REFERENCE BOOKS:

1. Raman, Meenakshi, Sangeetha Sharma, **Business Communication**, New Delhi, Oxford University Press, 2014.
2. Lakshminarayanan. K.R, **English for Technical Communication**, Chennai, Scitech Publications (India) Pvt. Ltd, 2004.
3. Rizvi. Asraf M, **Effective Technical Communication**, New Delhi, Tata McGraw-Hill Publishing Company Limited, 2007.

21UMA102 **MATRIX AND CALCULUS**

(Common to ALL Branches – Except CSBS)

L	T	P	C
3	1	0	4

OBJECTIVES :

- To make the students capable of identifying linear equations based problems (Eigen Value) from practical areas and obtain the Eigen value oriented solutions in certain cases.
- To widen the students' knowledge base on linear algebra, growth rate computation and application of integrals.
- Able to integrating various types of functions using various integration methods.
- To familiarize the students with the basic rules of differentiation and use them to find derivatives of products and quotients of functions
- To apply these mathematical concepts (matrix theory, differentiation and integration) in engineering field.

UNIT I **MATRICES** **8 + 3**

Eigen value and eigenvector of a real matrix – Characteristic equation – Properties – Cayley-Hamilton theorem (excluding Proof) – Orthogonal reduction –(transformation of a symmetric matrix to diagonal form) – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation

UNIT II **DIFFERENTIAL CALCULUS** **9 + 3**

Introduction – Definition of derivatives – Limits and Continuity – Differentiation techniques (Product rule, Quotient rule, Chain rule) – Successive differentiation (n^{th} derivatives) – Leibnitz theorem (without proof) – Maclaurin's series – Physical Applications (Newton's law of cooling – Heat flow problems, Rate of decay of radioactive materials - Chemical reactions and solutions, Ohm's law, Kirchoff's law – Simple electric circuit problems)

UNIT III **FUNCTIONS OF SEVERAL VARIABLES** **9 + 3**

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Differentiation of implicit functions – Jacobian – Taylor's expansion – Maxima and Minima – Method of Lagrangian Multipliers.

UNIT IV **INTEGRAL CALCULUS** **8 + 3**

Definitions and concepts of integrals – Methods of integration (Decomposition method, Substitution method, Integration by parts) – Definite integrals – Properties and problems – Reduction formulae – Beta and Gamma functions.

UNIT V **MULTIPLE INTEGRALS** **8 + 3**

Double integration – Cartesian and Polar coordinates – Change of order of integration – Area as a double

integral - Change of variables between Cartesian and Polar coordinates – Triple integration in Cartesian coordinates – Volume as triple integral.

SUPPLEMENT TOPIC (for internal evaluation only-) 3

Evocation /Application of Mathematics, Quick Mathematics – Speed Multiplication and Division Applications of Matrices.

TOTAL : 45 (L) + 15 (T) = 60 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Apply the knowledge of Matrices to solve Engineering problems(CO1) AP – K3
- Analyze Engineering problems using limits, continuity and derivatives (CO 2) A – K4
- Applythe knowledge of differentiation techniques to predict the extreme values of the Engineering problems with constraints (CO3) AP – K3
- Apply the knowledge of Beta and Gammafunction and their relation to evaluate the Engineering problems involving definite integrals. (CO4) AP – K3
- Apply the concept of Multiple integralsto compute the graphical representation in Engineering problems(CO5) AP – K3
- Explain the basic concepts of Matrix, Differentiation and Integration (CO6) U – K2

TEXT BOOKS:

1. Bali N. P and Manish Goyal, “A Text book of Engineering Mathematics”, Laxmi Publications (P) Ltd, New Delhi, 8th Edition, (2011).
2. Veerarajan.T “Engineering Mathematics” Tata McGraw Hill Publishing Company, New Delhi, vol 15.
3. Grewal. B.S, “Higher Engineering Mathematics”, Khanna Publications, New Delhi, 42nd Edition, (2012).

REFERENCE BOOKS:

1. Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, 11th Reprint, (2010).
2. Glyn James, “Advanced Engineering Mathematics”, Pearson Education, New Delhi, 7th Edition, (2007).
3. Jain R.K and Iyengar S.R.K,” Advanced Engineering Mathematics”, Narosa Publishing House, New Delhi, 3rd Edition, (2007).
4. Bharati Krishna Tirthaji, “Vedic Mathematics - Mental Calculation”, Motilal Banarsi Dass Publications, New Delhi, 1st Edition, (1965).
5. Kreyszig. E, “Advanced Engineering Mathematics”, John Wiley & Sons, New York, 10th Edition, (2011).
6. P.Sivaramakrishna Das, E.Rukmangadachari “Engineering mathematics”, volume1, Pearson Edison New Delhi, 2nd Edition, (2013).

21UPH103	ENGINEERING PHYSICS (Common To All Branches except CSBS)	L	T	P	C
		3	0	0	3

PRE-REQUISITE:

COURSE OBJECTIVES :

- To develop the research interest in crystal physics
- To use the principles of Lasers and its types
- To apply principles of Quantum physics in engineering field
- To develop knowledge on properties of materials

UNIT I CRYSTAL STRUCTURE **9**

Introduction – Classification of solids –Space lattice –Basis-Lattice parameter – Unit cell – Crystal system –Miller indices –d-spacing in cubic lattice - Calculation of number of atoms per unit cell – Atomic radius-Coordination number – Packing factor for SC, BCC, FCC and HCP structures - Applications.

UNIT II SOLID DEFECTS AND HOLOGRAPHY **9**

Introduction – Solid defects - Crystal imperfection –Point defects-Line defects-Surface defects-Volume defects Burger vector –Holography–Construction and Reconstruction of hologram – Industrial and Medical Applications

UNIT III PHOTONICS **9**

Introduction- Principles of Laser- Characteristics of laser -Spontaneous and stimulated emission – Population inversion – Einstein's A and B coefficients - Pumping methods – Basic components of Laser - Types of lasers – Nd -YAG laser - CO2 laser – Applications.

UNIT IV INTRODUCTION TO QUANTUM MECHANICS **9**

Introduction - Black body radiation – Planck's law of radiation- Wien's displacement la Rayleigh Jeans law- – Compton Effect – Theory and experimental verification – Matter waves-Schrodinger's wave equation – Time dependent – Time independent equati Particle in 1-D dimensional box

UNIT V PROPERTIES OF SOLIDS **9**

introduction - Elasticity- Stress and Strain - Hooke's law – Three moduli of elasticity –str strain curve – Poisson's ratio –Factors affecting elasticity –Bending moment – Depressio a cantilever –Young's modulus by uniform bending –I- shaped girders.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Classify the types of crystals, lasers, elasticity and quantum behavior of solids(Understand)
- Apply the basic knowledge of crystal, quantum mechanics and mechanical behavior of solids to solve engineering problems(Apply)
- Apply the principle of laser to estimate the wavelength of emitted photons. (Apply)
- Analyze the dual nature of matter using the concepts of quantum mechanics(Analyze)
- Analyze the structural and optical properties of crystals in industrial and medical applications (Analyze)
- Analyze the properties of materials for specific Engineering Applications. (Analyze)

TEXT BOOKS:

1. Dr. Mani.P, “Engineering Physics”, Dhanam Publications, Edition ,2018, Chennai.

2. Rajendran.V, “Engineering,Physics”, Tata Mc-Graw Hill Publishing Company limited, New Delhi, Revised Edition 2018.

3. Palanisami P.K., “Physics For Engineers”, Scitech Publications (India), Pvt Ltd., Chennai, 2018.

REFERENCE BOOKS:

1. Raghuvenshi G.S., “Engineering Physics”, PHI Learning Private Limited, New Delhi, Revised Edition 2018.

2. Arul doss .G., “Engineering Physics”, PHI Learning Limited, New Delhi, Revised Edition 2018.

3. Marikani .A., “Engineering Physics”, PHI Learning Private Limited, New Delhi, Revised Edition 2017. 4. Sankar B.N., and Pillai .S.O., “A Text book of Engineering Physics”, New Age International Publishers Private Limited, New Delhi, Revised Edition 2017.

5. Avadhanulu M.N. and Kshirsagar P.G., “A Textbook: of Engineering Physics”, S.Chand& Company Ltd., New Delhi, 2018.

APPLIED CHEMISTRY

		L	T	P	C
21UCY105	**(Common to CSE, ECE, EEE, IT, BME, BT, AI&DS, CSD, CSE(AI&ML))**	**3**	**0**	**0**	**3**

PRE-REQUISITE:

COURSE OBJECTIVES :

- To gain the knowledge on Chemical bonding and types.
- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To know the importance of smart material and green chemistry.
- To acquire knowledge on energy storage devices

UNIT I CHEMICAL BONDING 9

Chemical Bonding: Electronic Configuration– Ionic Bond - Covalent Bond – Metallic bond –Aufbau principle, Pauli Exclusion principle, Valence bond theory application and its limitations, Various types of hybridization (sp, sp2,sp3) (C2H2, C2H4, CH4) -bond strength and bond energy - Hydrogen bonding, Vander Waals forces.

UNIT II WATER AND ITS TREATMENT TECHNOLOGIES 9

Hardness of water–types–expression of hardness(Problems)–units–estimation of hardness of water by EDTA – boiler troubles (scale and sludge) – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) – External treatment Ion exchange process - Zeolite process – desalination of brackish water – Reverse Osmosis

UNIT III SMART MATERIALS 9

Introduction to smart materials and their structure - Organic Light Emitting Diodes – Principles and applications, Liquid crystals – definition and applications.

UNIT IV GREEN CHEMISTRY 9

Introduction to Green Chemistry, the 12 Principles of Green Chemistry, toxicology and Green Chemistry, Environmental Issues, Climate and Green Chemistry, Energy and Green Chemistry, e-waste disposal.

UNIT V ENERGY STORAGE DEVICES 9

Batteries, fuel cells and super capacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery)fuel cells–H2-O2fuel cell and application.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Describe the basic concept of chemistry involved in chemical bonding, water treatment methods, smart materials, e-waste management and energy storage devices. (Understand-K2)
- Explain the principles and application of organic light emitting diodes, liquid crystals and green chemistry (Understand- K2)
- Apply the knowledge of chemical bonding to identify the types of bonds in molecules. (Apply- K3)
- Apply the knowledge of the basic electrochemical cell terminology to select suitable type of energy storage devices for engineering application (Apply-K3)
- Analyze the impurities of water to find its hardness and remove the hardness causing substances. (Analyze-K4)
- Write a report on chemical application for Industries (Respond-A2)

TEXT BOOKS:

1. JainP.C.andMonicaJain,"EngineeringChemistry",DhanpatRaiPublishingCompany (P) Ltd, New Delhi, 2002.
2. Dr.Sunita Rattan, "A Textbook of Engineering Chemistry" S.K.Kataria & Sons., New Delhi, 2013.
3. Pradeep. T "A textbook of Nano science and Nanotechnology", Tata McGraw - Hill education private ltd, 2012.

REFERENCE BOOKS:

1. DerekPletcherandFrankC.Walsh,"IndustrialElectrochemistry",ChapmanandHall, New York, 1993.
2. Peter Grundler, " Chemical Sensors – An introduction for Scientists and Engineers", Springer, New York, 2007.

21UCS108	PROBLEM SOLVING AND PYTHON PROGRAMMING (Common to ALL Branches except CSBS)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To impart the concepts in problem solving for computing
- To familiarize the logical constructs of programming
- To illustrate programming in Python.

UNIT I INTRODUCTION **9**

Definition and basic organization of computers – classification of computers – Software – Types of software – types of programming paradigms - Translators: compiler and interpreter – Problem solving tools: Algorithms – Flowchart – Pseudo code.

UNIT II INTRODUCTION TO PYTHON **9**

Introduction to python – features of python – modes of working with python. Values and data types: numbers, Boolean, strings; variables, expressions, statements, tuple assignment, precedence of operators, comments – print function- conversion of algorithm in to program – Solving simple problems involving arithmetic computations and sequential logic to solve.

UNIT III CONTROL CONSTRUCTS **9**

Flow of execution – control structures: conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass – Solving problems involving decision making and iterations

UNIT IV FUNCTIONS AND PACKAGES **9**

Functions - function definition and use, flow of execution, parameters and arguments; parameters, local and global scope, function composition-Anonymous or Lambda Function, recursion -packages.

UNIT V LISTS, TUPLES, DICTIONARIES AND STRINGS **9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, listparameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension - Strings: string slices; immutability, string functions and methods, string module

TOTAL: 45Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Explain the concepts of Python used to solve the computing problems [Understand]
- Apply the knowledge of arithmetic & sequential logic to solve problems related to mathematical expressions. [Apply]
- Apply the concepts of Python to solve computer applied complex engineering problems that meet specified needs. [Apply]
- Analyze the suitable control constructs to provide solutions to computer applied complex engineering problems. [Analyze]
- Formulate problems to provide solutions to computer applied complex engineering problems using modularity.[Analyze]
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation [Affective Domain]

TEXT BOOKS :

1. Ashok NamdevKamthane&Amit Ashok Kamthane, “Problem solving and python programming”, McGraw Hill Education, 2018 (copyright)
2. Anurag Gupta & G P Biswas, “Python Programming – Problem solving, packages and libraries”, McGraw Hill Education, 2020 (copyright).

REFERENCE BOOKS :

1. John V Guttag, “ Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, “Exploring Pythonǁ, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, “Fundamentals of Python: First Programsǁ, CENGAGE Learning, 2012.
5. Charles Dierbach, “ Introduction to Computer Science using Python: A Computational ProblemSolving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, “Practical Programming: An Introduction to Computer Science using Python 3ǁ, Second edition, Pragmatic Programmers, LLC, 2013.

21UME109 **ENGINEERING GRAPHICS**

(Common to ALL Branches except CSBS, AI&DS,CSD)

L	T	P	C
3	1	0	4

PRE-REQUISITE:

COURSE OBJECTIVES :

- To develop student's graphic skill for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.
- To impart knowledge in development of surfaces, isometric and perspective projections.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) **4**

Importance of Graphics in Engineering Applications – Use of Drafting Instruments – BIS Conventions and Specifications – Size, Layout and Folding of Drawing Sheets – Lettering and Dimensioning - Introduction to Plane Curves, Projection of Points, Lines and Plane Surfaces.

UNIT I PROJECTION OF SOLIDS **12**

Projection of simple solids like prisms, pyramids, cylinder and cone with axis is parallel, perpendicular and inclined to one of the plane.

UNIT II SECTION OF SOLIDS **10**

Section of solids - simple position with cutting plane parallel, perpendicular and inclined to one of the plane.

UNIT III DEVELOPMENT OF SURFACES **10**

Development of lateral surfaces of simple and truncated solids - Prisms, pyramids and cylinders and cones - Development of lateral surfaces of sectioned solids.

UNIT IV ISOMETRIC PROJECTIONS **12**

Principles of isometric projection – isometric scale – isometric view - isometric projections of simple solids and cut solids.

UNIT V ORTHOGRAPHIC PROJECTION **12**

Representation of Three Dimensional objects – General principles of orthographic projection- Need for importance of multiple views and their placement – First angle projection – layout views – layout views – Developing visualization skills of multiple views (Front, top and side views) from pictorial views of objects.

TOTAL 45 (L) + 15 (T) = 60 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Draw orthographic projections of basic geometrical entities in various positions and translate the Geometric information of engineering objects into engineering drawings. (Understand)
- Apply the principles of orthographic projections to draw projections of solids and sections of solids. (Apply)
- Develop lateral surfaces of regular and sectioned solids. . (Apply)
- Prepare isometric drawings of simple solids from orthographic views. (Apply)
- Construct orthographic projection from the given pictorial view. (Apply)
- Analyze the projections of various solid models using different resting conditions. (Analyze)

TEXT BOOKS:

1. Natarajan K.V., “A Text book of Engineering Graphics”, Dhanalakshmi Publishers, (2006).
2. Bhatt N.D., “Engineering Drawing”, 46th Edition, Charotar Publishing House,(2003).

REFERENCE BOOKS:

1. Venugopal K., and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited,(2008).
2. Gopalakrishnan K.R., “Engineering Drawing” (Vol.I&II), Subhas Publications.(1998).

3.DhananjayA.Jolhe, “Engineering Drawing with an introduction to Auto CAD”,Tata McGraw Hill Publishing Company Limited,(2008).

4.Saravanan M,Bensan Raj J,Ganesh Kumar S,,”Engineering Graphics”,JBR Trisea Publishers,Nagercoil.2020.

21UCS110	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY (Common to ALL Branches except CSBS)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES :

- To familiarize with programming environment
- To familiarize the implementation of programs in Python

LIST OF EXPERIMENTS

Problems involve Sequential logic and Decision making

1. Develop a computing solution to process the mark processing system (Record has the following fields: Name, Reg_no, Mark1, Mark2, Mark3, Mark4, Total, average). Generate student information with total and average marks.
2. Provide a software solution to compute the +2 Cutoff mark, given the Mathematics, physics and Chemistry marks. A college has decided to admit the students with a cut off marks of180. Decide whether the student is eligible to get an admission in that college or not.
3. A pizza in a circular shape with 8 inches and which is placed in a square box whose side length is 10 inches. Find how much of the box is “empty”?
4. A person owns an air conditioned sleeper bus with 35 seating capacity that routes between Chennai to Bangalore. He wishes to calculate whether the bus is running in profit or loss state based on the following scenario:

   Amount he spent for a day for diesel filling is: Rs. 15,000

   Amount he spent for a day for Driver and cleaner beta is: Rs. 3,000

   Ticket amount for a Single person is Rs: 950

   If all the seats are filled, what would be the result?

   If only 15 seats are filled, what would be the result?
5. Consider the person ‘X’ has some amount in his hand and the person ‘Y’ has some amount in his hand. If they wish to exchange the amount among them, how they can exchange the amount by using the third party ‘Z’.

Problems involve iterations

6. A man is blessed with a duck that can lay golden eggs. First day it lays one egg, in second day it lays two eggs, in third day it lays three eggs, and it continues to lay eggs in an incremental manner day by day. Now calculate how many golden eggs that duck lays till ‘n’th day.
7. Four People A,B,C,D are sitting in a Circular arrangement. In how many ways their seating can be arranged.

8. The Greek theater shown at the right has 30 seats in the first row of the center section. Each row behind the first row gains two additional seats.How many seats are in the 5^{th} row in the center section?

Problem involve functions and recursive functions

9. Develop a solution to identify the right angle triangle while giving the sides of a triangle. (Recall from the Pythagoras theorem that in a right triangle, the square of one side equals the sum of the squares of other two sides)
10. A game has to be made from marbles of five colors, yellow, blue, green, red and Violet where five marbles has to be kept one upon another. Write a python program using recursion, to find how many ways these marbles can be arranged.
11. Tower of Hanoi is a mathematical puzzle where we have three rods and n disks. The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules:
    Here is a high-level outline of how to move a tower from the starting pole, to the goal pole, using an intermediate pole:
    1. Move a tower of height-1 to an intermediate pole, using the final pole.
    2. Move the remaining disk to the final pole.
    3. Move the tower of height-1 from the intermediate pole to the final pole using original pole

Problems involve List and Nested List

12. In a class of 50 numbers of students, 6 students are selected for state cricket academy. Sports faculty of this school has to report to the state cricket academy about the selected students' physical fitness. Here is one of the physical measures of the selected students'; Height in cm is given for those 6 selected students [153,162,148,167,175,151]. By implementing functions, do the following operations.
    (i) State academy selector has to check whether the given height is present in the selected students list or not.
    (ii) State academy selector has to order the height of students in an incremental manner.
    (iii) State academy selector has to identify the maximum height from the list.

Problems involve Dictionary and Tuples

Dictionary

13. A university wishes to create and maintain the details of the students such as Rollno, Regno, Name, Dept, Batch, Contact_no, Nativity(Indian/NRI) as key value pairs. Do the following operations:
    (i) Display the complete student details on giving Rollno as input.
    (ii) Display the complete student details whose nativity belongs to NRI.
    (iii) Display the complete student details whose department is CSE.

Tuples

14. A librarian wishes to maintain books details such as ISBN, Book Name, Author Name, Year published, Publisher Name. He wishes to retrieve the book details in the following scenario:

(i) Retrieve the complete details of the book on giving ISBN.

(ii) Retrieve the details of the book which published after the year 2015.

(iii) Retrieve the details of the book whose author name is 'Andrew'.

(iv) Retrieve the details of the book that name of the book is 'Python'

Problems involve Strings

15. A musical album company has 'n' number of musical albums. The PRO of this company wishes to do following operations based on some scenarios:

(i) Name of the album starts with 's' or 'S'.

(ii) Name of the album which contains 'jay' as substring.

(iii) Check whether the album name presents in the repository or not.

(iv)Count number of vowels and consonants in the given album name.

TOTAL: 30 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Formulate algorithms for simple problems and translate the algorithms to a working program [Apply]
- Formulate algorithms and programs for arithmetic computations and sequential logic[Apply]
- Develop programs using functions, packages and use recursion to reduce redundancy[Apply]
- Manipulate data using lists, tuples, dictionaries through a program[Analyze]
- Analyze the suitable control constructs to provide solutions to computer applied complex engineering problems that meet specified needs. [Analyze]
- Work individually or in teams and demonstrate the solutions to the given exercises through presentation [Affective Domain]

21UME111	ENGINEERING PRACTICES LABORATORY (Common to Mech, EEE, Civil, Chemical and Agriculture)	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To demonstrate the plumbing and carpentry works.
- To train the students to perform welding, fitting and drilling operations.
- To demonstrate residential house wiring, fluorescent lamp wiring, measurement of earth resistance, colour coding of resistors, logic gates and soldering.

GROUP A (CIVIL & MECHANICAL)

CIVIL ENGINEERING PRACTICE

LIST OF EXPERIMENTS:

1) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.

2) Preparation of plumbing line sketches for water supply and sewage works.

3) Hands-on-exercise: Basic pipe connections–Mixed pipe material connection Pipe connections with different joining components.

4) Demonstration of plumbing requirements of high-rise buildings.

5) Study of the joints in roofs, doors, windows and furniture.

6) Hands-on-exercise: Wood work, cutting, planning and joints by sawing –Half lap joint

MECHANICAL ENGINEERING PRACTICE

LIST OF EXPERIMENTS:

1) Preparation of arc welding of butt joints, lap joints and tee joints.

2) Drilling Practice.

3) Sheet metal model making – Trays, funnels, etc.

4) Different type of fittings-‘V’ type, ‘L’ Type

5) Study of Lathe Machine tool.

6) Study of Plastic Injection Moulding.

7) Study of Moulding.

A minimum of five experiments shall be offered in GROUP A (CIVIL & MECHANICAL)

GROUP B (ELECTRICAL & ELECTRONICS)

ELECTRICAL ENGINEERING PRACTICE

LIST OF EXPERIMENTS:

(a) Residential house wiring using switches, fuse, indicator, lamp and energy meter and Stair case wiring.

(b) Fluorescent lamp wiring.

(c) Measurement of resistance to earth of electrical equipment.

ELECTRONICS ENGINEERING PRACTICE

LIST OF EXPERIMENTS:

(a) Study of Electronic components and equipments – Resistor, colour coding

Measurement of AC Signal parameter (peak-peak, rms, period, frequency) usingCRO.

(b) Study of logic gates AND, OR, EX-OR and NOT Gate.

(c) Soldering practice – Components, Devices and Circuits – Using general purpose

PCB.

Total: 30 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

1. Apply the basic knowledge of plumbing to make simple house hold pipe line connections. (Apply)

2. Fabricate the given components using carpentry, sheet metal, fitting& welding equipment/tools. (Understand)

3. Perform the drilling operations. (Apply)

4. Apply basic electrical engineering knowledge for house wiring practice. (Apply)

5. Apply the knowledge of basic electrical engineering to practice soldering using general purpose PCB. (Apply)

21UGS113	BASIC SCIENCES LABORATORY-I	L	T	P	C
		0	0	2	1

PRE-REQUISITE :

COURSE OBJECTIVES:

- To create scientific Temper among the students.
- To know how to execute experiments properly, presentation of observations and arrival of conclusions.
- To view and realize the theoretical knowledge acquired by the students through experiments
- To impart knowledge on basic concepts in applications of chemical analysis
- To explain the knowledge of various instruments.
- To explain the knowledge on the chemical analysis of various metal ions.

PHYSICS LABORATORY

LIST OF EXPERIMENTS

1. Laser – Determination of particle size and wavelength of Laser source. using Diode Laser.
2. Ultrasonic Interferometer - Determination of velocity of sound in liquid and compressibility of liquid.
3. Poiseuille's method - Determination of Coefficient of viscosity of liquid.
4. Spectrometer – Determination of dispersive power of a prism.
5. Air Wedge method - Determination of thickness of a thin wire.
6. Uniform bending method – Determination of Young's modulus of the given rectangular beam.

CHEMISTRY LABORATORY

LIST OF EXPERIMENTS

1. Preparation of molar and normal solutions of the following substances – Oxalic acid , Sodium Carbonate , Sodium Hydroxide and Hydrochloric acid
2. Conductometric Titration of strong acid with strong base
3. Conductometric Titration of Mixture of Acids
4. Estimation of Iron by Potentiometry
5. Determination of Strength of given acid using pH metry
6. Determination of molecular weight of polymer by Viscometry

7. Comparison of the electrical conductivity of two samples- Conductometric method
8. Estimation of copper in brass by EDTA method

TOTAL : 30 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Apply the principles of Optics, Laser physics and Elasticity to determine the Engineering properties of materials (Apply)
- Analyze the given liquid sample to determine the viscosity and compressibility of the liquid. (Analyze)
- Apply the principles of spectroscopy to determine the properties of materials (Apply)
- Apply the knowledge of Molarity and Normality to prepare standard solution for chemical analysis. (Apply)
- Apply the knowledge of electrochemical techniques to study various ions present in the industrial effluents. (Apply)
- Analyze the given solution quantitatively using titration.(Analyze)

A minimum of FIVE experiments shall be offered for every course

Laboratory classes on alternate weeks for Physics and Chemistry

21UGM131	INDUCTION PROGRAMME	L	T	P	C
		0	3	0	P/F

COURSE OBJECTIVES :

- To rejuvenate the Body and Mind
- To strengthen Attitude and soft skills
- To practice Moral values of life.

UNIT I PHYSICAL ACTIVITY **10 Hrs**

Zumba - Bokwa Fitness – Yoga – Mediation – Fine Arts

UNIT II CREATIVE ARTS **5 Hrs**

Painting – Class Painting – Wall Painting – Art from waste

UNIT III UNIVERSAL HUMAN VALUES & EMINENT SPEAKERS **5 Hrs**

Ethical values – Ambition and Family Expectation, Gratitude, Competition and Excellence – Belief – Morality of life – Guest Lecture by Eminent personality

UNIT IV LITERARY

Elocution - Essay writing Competition - Impromptu Session - Dance and singing competition

UNIT V PROFICIENCY MODULES **15 Hrs**

Toastmaster club meet

UNIT VI INDUSTRIAL & LOCAL VISIT **8 Hrs**

Vaigai Dam – Theni - VOC- Port-Tuticorin - Madurai Radio City-Madurai - Aavin Milk –Madurai-NSS Activities.

UNIT VII FAMILIARIZATION OF THE DEPT. AND INNOVATION **2 Hrs**

Department Introduction and Purpose of Course - Eminent speakers – Scope and Feature of the Course - Latest Innovation

TOTAL : 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Practice physical activities regularly.
- Implement creativity in drawing and waste material.
- Communicate their ideas effectively.
- Identify inputs and outputs of different industry process.
- Describe the scope and features of their programme of study

REFERENCE BOOK:

1. Student Induction Programme: A Detailed Guide by AICTE, New Delhi.

Semester II

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UEN201	Communication Skills for Professionals (Integrated Course) (Common to All Branches except CSBS)	1	0	1	1.5	HSS
21UMA205	Calculus and Transform Techniques (Only for EEE)	3	1	0	4	BS
21UEE205	Electric Circuit Analysis(Only for EEE)	3	0	0	3	ES
21UME226	Basic Civil and Mechanical Engineering (Only for EEE)	3	0	0	3	ES
21UPH205	Physics for Information Science (Common to CSE, IT, EEE,AIDS,CSD)	3	0	0	3	BS
PRACTICAL						
21UGS210	Basic Sciences Laboratory II (Common to All Branches Except CSBS)	0	0	2	1	BS
21UEE211	Electric circuits Laboratory (Only for EEE)	0	0	3	1.5	ES
MANDATORY						
21UGM231	Environmental Science (Common to All Branches)	3	0	0	P/F	MC
	TOTAL	**16**	**1**	**6**	**17**	
Total No of Credits - 17						

COMMUNICATION SKILLS FOR PROFESSIONALS

		L	T	P	C
21UEN201	**(INTEGRATED COURSE) (Common to ALL Branches except CSBS)**				
		1	**0**	**1**	**1.5**

COURSE OBJECTIVES :

- To improve the communication skills
- To develop the public speaking skills
- To develop their confidence and ability to speak in public
- To develop the leadership capacity

UNIT I ERROR FREE LANGUAGE 3 HOURS

Parliamentary English words, Pronounce the words with stress, Words often confused. Finding Common Errors.

UNIT II LUCID WRITING 3 HOURS

Principles of Communicative English, Business Letters, Writing Technical Proposal.

UNIT III INDIVIDUAL AND TEAM WORK 3 HOURS

Creative Writing- Writing Paragraph, Dialogue Writing (Various situations), Rearrange the jumbled sentences

UNIT IV LIFE SKILLS 3 HOURS

Professional Ethics, Code of Conduct, Relative Clauses

UNIT V INTERPERSONAL SKILLS 3 HOURS

Swot Analysis& Life Positions

5 Oral Projects

Project 1: SELF INTRODUCTION&DELIVER A SPEECH BEFORE AUDIENCE (Time: 5 to 7 minutes)

- To Speak in front of an audience with courage.
- Make your message clear, with supporting material.
- Create a strong opening and conclusion.

Project 2: SPEAK ON THE CHOSEN CONTENT (Time: 5 to 7 minutes)

- Select a general topic and bring out specific purposes.
- Avoid using notes.
- Use symbolicideas to developyour ideas.

Project 3: USE EFFECTIVE BODY LANGUAGE& INTONATION(Time: 5 to 7 minutes)

- Use appropriate posture, gestures, facial expressions and eye contact to express your ideas.
- Use proper intonation and adequate speech module.

Project 4: PRESENT YOUR TOPIC WITH VISUAL AIDS (Time: 5 to 7 minutes)

- Persuade your points with suitable illustration, specific facts, examples
- Use suitable visual aids to present your topic with confidence.

Project 5: GRASP THE ATTENTION OF THE AUDIENCE (Time: 5 to 7 minutes)

- Influence your listeners by adopting holistic viewpoint.
- Use emotions, stories, and positive quotes in your speech.

TOTAL : 15 +15 =30 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Communicate orally with fluency and clarity in a given contextual situation.(**Responding A2**)
- Adapt them to work in a group as a member or leader for effectively executing the task. **(Organizing A4)**
- Write language appropriately without error in any given circumstances. (**Responding A2**)
- Communicate information ideas and opinions in any given situations. (**Responding A2**)
- Present the ideas creatively with coherence for given topic. **(Organizing A4)**

Reference Books:

1. Competent Communication- A Practical Guide to becoming a better speaker, Toastmasters International, USA.
2. Raman, Meenakshi, Sangeetha Sharma, Business Communication, New Delhi, Oxford University Press, 2014.
3. Norman Lewis – Word Power Made Easy, Pocket Book Publication, 2019.

21UMA205	Calculus and Transform Techniques (Only for EEE)	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

COURSE OBJECTIVES :

- To develop an understanding of the basics of vector calculus comprising of gradient, divergence and curl, and line, surface and volume integrals and the classical theorems involving them.
- To make the student acquire sound knowledge of Laplace transform and its properties and sufficient exposure to the solution of certain linear differential equations using the Laplace transform technique.
- To acquaint the student with Fourier transform techniques used in variety of situations.

UNIT I SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS 8+3

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Applications of ODE in Electrical Engineering.

UNIT II VECTOR CALCULUS 8+3

Gradient Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Applications of Vector calculus in Electrical Engineering.

UNIT III LAPLACE TRANSFORM 9 +3

Existence conditions – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function, impulse function and periodic function - Inverse Laplace transform – Convolution theorem (excluding Proof). Applications of Laplace Transforms in Electrical Engineering.

UNIT IV FOURIER SERIES 9 +3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic analysis - Application of Fourier series in Electrical Engineering.

UNIT V FOURIER TRANSFORMS 9+3

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity - Application of Fourier Transform in Electrical Engineering.

SUPPLEMENT TOPIC (for internal evaluation only) 3

Evocation / Application of Mathematics.

TOTAL : 45 (L) + 15 (T) = 60 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Apply the knowledge of higher order ordinary differential equations in real life engineering problems. [Apply**]**
- Apply the concept vector identities in problem solving and evaluate the line, surface and volume integrals. [Apply]
- Apply Laplace Transform methods to solve initial value problems for constant coefficient linear ODEs. [Apply]
- Apply the knowledge of Fourier series for the given function or Discrete data and compute the Periodic function arising in the study of Engineering problems.[Apply]
- Apply the acquired knowledge of Fourier transform and its properties which are used to transform signals between time and frequency domain.[Apply]
- Understand the basic concept of periodic function, scalar potential and order of differential equation. [Understand]

TEXT BOOKS:

- Veerarajan.T "Engineering Mathematics" Tata McGraw Hill Publishing Company, New Delhi, 2008.
- Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", Laxmi Publications (P) Ltd., New Delhi, 3rd Edition, (2008).
- Grewal. B.S, "Higher Engineering Mathematics", Khanna Publications, New Delhi, 43rd Edition, (2014).

REFERENCE BOOKS:

- Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 11th Reprint, (2010).
- Kreyszig. E, "Advanced Engineering Mathematics", John Wiley & Sons, New York, 10th Edition, (2011).
- Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", Narosa Publishing House Pvt. Ltd., New Delhi, 3rd Edition, (2007).
- Agarwal R.S., "Quantitative Aptitude", S. Chand Publications, New Delhi, 7th Edition, (2008), pp. 341-370, 384-404.

21UEE205	ELECTRIC CIRCUIT ANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce network theorems for the analysis of electrical circuits.
- To study the single phase and three phase circuits
- To introduce the phenomenon of resonance in coupled circuits.
- To educate on obtaining the transient response of circuits

UNIT 1 DC CIRCUITS 9

Basic circuit elements and sources; Ohm's law, Kirchoff's laws, series and parallel connection of circuit elements, Network reduction techniques: Voltage and Current division – Source Transformation – Star- Delta conversion.

UNIT 2 AC CIRCUITS 9

Introduction to AC circuits: Average and RMS value, Single Phase RL, RC, RLC series and parallel circuits, Power and Power factor, Balanced and unbalanced Three Phase circuits, Power measurement in three phase circuits

UNIT 3 NETWORK THEOREMS 9

Mesh current analysis and Nodal voltage analysis, Superposition Theorem, Thevenin Theorem, Norton Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem,

UNIT 4 RESONANCE AND COUPLED CIRCUITS 9

Series and Parallel Resonance – Frequency Response – Quality factor and Bandwidth – Self and Mutual Inductance – Coefficient of Coupling – Tuned circuits.

UNIT 5 TRANSIENT RESPONSE ANALYSIS 9

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input.

Total: 45 Periods

TEXT BOOKS:

1. A. Sudhakar, Shyammohan.S.Palli, "Circuits and Networks: Analysis and Synthesis" McGraw Hill Education, 5th Edition 2015.
2. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.

REFERENCE BOOKS:

1. C. K. Alexander and M. N. O. Sadiku, "Fundamentals of Electric Circuits", McGraw Hill Education, 2004.
2. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
3. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.
4. John Bird, "Electrical Circuit Theory and Technology", Routledge, 2012.

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Understand the basic concept of dc and ac electric circuits. [Understand]
- Apply Network Theorems to both DC and AC circuits. [Apply]
- Design tuned and filters circuit using the basic concepts of resonance. [Create]
- Analyze and determine the transient response of first order and higher order electric circuits. [Analyze]
- Analyze the three phase electrical parameters for balanced and unbalanced loading. [Analyze]
- Design tuned and filters circuit using the basic concepts of resonance using MATLAB. [Apply]

21UME226	BASIC CIVIL AND MECHANICAL ENGINEERING (Common to EEE)	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To understand the fundamentals of thermal systems
- To understand the basics of building construction and infrastructures

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 9

Surveying:

Objects – types – classification – principles – measurements of distances – angles –leveling – determination of areas – illustrative examples.

Civil Engineering Materials:

Bricks – stones – sand – cement – concrete – steel sections

UNIT II BUILDING COMPONENTS AND STRUCTURES 9

Foundations:

Types, bearing capacity – Requirement of good foundations - Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING 9

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV IC ENGINES 9

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 9

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner

TOTAL : 45 PERIODS

COURSE OUTCOMES:

After successful completion of this course the students will be able to:

1. Summarize the measurement of landscape and different building materials with norms. (Understand)
2. Classify the different building structure and its applications relevant to civil engineering practice. (Understand)
3. Interpret the ideas of variety of energy sources considering the norms of engineering practice. (Understand)
4. Explain the working principle of I.C engines. (Understand)
5. Discuss the working principle of Refrigeration and Air conditioning systems. (Understand)

TEXT BOOKS:

1. Shanmugam G. and Palanichamy M.S., “Basic Civil and Mechanical Engineering”, Tata Mc-Graw Hill Publishing Co., New Delhi, 1996.
2. Venugopal K., Prabhu Raja V., and Sreekanjana G., “Basic Civil and Mechanical Engineering”, Anuradha Publications, Third Edition 2010.

REFERENCE BOOKS:

1. Ramamrutham S., “Basic Civil Engineering”, DhanpatRai, Publishing Co. (P) Ltd, 1999.
2. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, 2005.
3. Shantha Kumar S.R.J., “Basic Mechanical Engineering”, Hi-Tech Publications, Mayiladuthurai, 2000.

21UPH205	PHYSICS FOR INFORMATION SCIENCE (COMMON TO CSE, EEE, IT, AI&DS, CSD)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To introduce the essential principles of physics for information science and related engineering applications.
- To demonstrate the concepts of conduction in conductors.
- To enable the students to understand the dielectric and magnetic materials.
- To apply fundamental knowledge in the area of fiber optics.

UNIT I CONDUCTING MATERIALS 9

Introduction-Conduction in metals-mobility and conductivity – classical free electron theory of metals –merits and demerits- Electrical and thermal conductivity (derivation)- Wiedemann – Franz law – Lorentz number– Fermi distribution function-Effect of temperature on Fermi function-Density of energy states – carrier concentration in metals

UNIT II TRANSPORT PROPERTIES OF SEMICONDUCTORS 9

Introduction- Properties-Types of semiconductor –Electron and hole concentration - Intrinsic Carrier Concentration–Expression for electrical conductivity of a semiconductor Band gap determination-Hall effect and its applications.

UNIT III MAGNETIC AND DIELECTRICS MATERIALS 9

Introduction–Classification of magnetic materials – Domain theory – Hysteresis –soft and hard magnetic material - Ferrites - Magnetic storage devices - hard disc-compact disc - RAM - ROM - Applications - Introduction - Types of polarization – Dielectric loss- Dielectric breakdown - Capacitor and its types - Applications.

UNIT IV OPTICAL PROPERTIES 9

Introduction – Optical properties of metal , insulator and semiconductor - Display devices – photoluminescence - EL display -Liquid crystal - LCD and its phases - Light Emitting Diode – Diode Laser – Solar cell – Detector.

UNIT V FIBRE OPTIC COMMUNICATION 9

Introduction - Principle and propagation of light in optical fibres – Numerical aperture and acceptance angle - Types of optical fibre – Attenuation - Fibre optic communication systems (Block diagram) - Fibre optic sensors –Temperature and pressure sensor - Applications

Total: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to :

- Summarize the importance of free electrons in determining the properties of metals, semiconductors and dielectric materials. (Understand)
- Interpret the characteristics of conducting materials and semiconducting materials in terms of band gap and charge carriers (Analyze)
- Apply the concept of spin and orbital motion of electrons in determining magnetic properties of materials and concept of polarization in dielectric materials having specific engineering applications. (Apply)
- Apply the principle of Laser in optical fiber communication (Apply)
- Analyze the structural behavior and properties of conducting, semiconducting and magnetic Materials to select suitable material for industrial application. (Analyze)
- Illustrate the strategies of magnetism and fiber optics to facilitate and to solve the engineering problems (Apply)

TEXT BOOKS:

1. William D. Callister, Jr. “Material Science and Engineering”, Seventh Edition, John Wiley & Sons Inc. New Delhi, 2015
2. Dr. Mani.P, “Engineering Physics II ”, Dhanam Publications, Edition ,2018, Chennai
3. Rajendran.V, “Engineering,Physics”, Tata Mc-Graw Hill Publishing Company limited, New Delhi, Revised Edition 2016.

REFERENCE BOOKS:

1. Raghuvenshi G.S., “Engineering Physics”, PHI Learning Private Limited, New Delhi, Revised Edition 2014.
2. Aruldoss .G., “Engineering Physics”, PHI Learning Limited, New Delhi, Revised Edition 2013.
3. Marikani .A., “Engineering Physics”, PHI Learning Private Limited, New Delhi, Revised Edition 2012.
4. Sankar B.N., and Pillai .S.O., “Engineering Physics – I”, New Age International Publishers Private Limited, New Delhi, Revised Edition 2015.
5. Ghatak & Thyagarajan, “Introduction to fiber optics,” Cambridge Univ. Press. 1998 (reprinted 2000)

21UGS210	BASIC SCIENCE LABORATORY II	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To analyze the Band gap, moment of inertia, thermal conductivity and rigidity modulus of the materials.
- To gain knowledge in PHOTONICS.
- To describe the theoretical concepts to perform lab experiments.
- To explain the water quality parameters.
- To impart the knowledge on water quality parameters for the analysis of industrial effluents

PHYSICS LABORATORY

LIST OF EXPERIMENTS

1. Determination of Energy band gap of a semiconductor.
2. Torsion pendulum – Determination of Moment of inertia of a metallic disc and rigidity
3. modulus of a given metallic wire.
1. Spectrometer - Determination of wavelength of mercury spectrum using grating.
2. Laser – Determination of numerical aperture and acceptance angle of an optical fiber
3. Newton's rings – Determination of radius of curvature of a convex lens
4. Lee's Disc - Determination of thermal conductivity of a bad conductor.
5. Determination of Solar cell characteristics using optical transducers kit.
6. Digital Logic gates (Virtual lab)

CHEMISTRY LABORATORY

LIST OF EXPERIMENTS

1. Estimation of hardness of water by EDTA method.
2. Estimation of alkalinity of water sample.
3. Estimation of Chloride in water sample (Argentometric method)
4. Determination of DO in water
5. Estimation of chromium in tannery wastes
6. Estimation of available chlorine in bleaching powder
7. Estimation of iron by Spectrophotometry.
8. Determination of acidity of industrial effluents.

TOTAL : 30 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Apply the Principles of Optics, Light and Elasticity to determine the Engineering properties of materials (Apply)
- Analyze the thermal conductivities of different bad conductors (Analyze)
- Analyze the Characteristics of a semiconductor (Analyze)
- Apply the basic knowledge of testing methods of water to identify the water quality for environmental sustainability.(Apply)
- Estimate the quality of water parameters that suits for domestic application. (Apply).
- Analyze the industrial effluents to identify the quality parameters and impurities to prevent water pollution. (Analyze)

A minimum of FIVE experiments shall be offered

21UEE211	ELECTRIC CIRCUITS LABORATORY	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

- To introduce network theorems for the analysis of electrical circuits.
- To introduce the phenomenon of resonance in coupled circuits.
- To educate on obtaining the transient response of circuits
- To study the three phase circuits
- To study two port circuit behaviors

LIST OF EXPERIMENTS

1. Verification of Kirchhoff's law
2. Verification of Mesh and Nodal analysis
3. Verification of superposition Theorem
4. Verification of Thevenin's and Norton's Theorem
5. Verification of Maximum Power Transfer Theorem
6. Frequency response of series resonance circuits
7. Frequency response parallel resonance circuits
8. Measurement of time constant for RL, RC and RLC circuits
9. Measurement of energy using single phase energy meter
10. Measurements of three phase power using two wattmeter methods
11. Determination of self, mutual inductances and co-efficient of coupling
12. Study of First & Second Order Circuit Transients by Digital simulation

A minimum of TEN experiments shall be offered

Total: 45 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Understand and verify Thevenin's/Norton's theorems, maximum power transfer, and reciprocity theorem applications in electrical circuit simplification. [Understand**]**
- Apply principles of mesh and nodal analysis to validate circuit solutions experimentally. [Apply]
- Analyze the transient and frequency response of various AC circuits for drawing insightful conclusions about its behavior. [Analyze]
- Develop an effective report and comprehend the technical skill for the given exercise. [Psychomotor Domain]

21UGM231	ENVIRONMENTALSCIENCE	L	T	P	C
	(Common to All Branches)	3	0	0	P/F

OBJECTIVES:

- To explain the concepts of Environment ecosystem and Pollution.
- To impart the environmental issues in the society and the impact of environment related to human health.
- To describe the knowledge in alternative energies.

UNIT – I ENVIRONMENTAND ECOSYSTEMS 9

Definition, scope and importance of environment – Need for public awareness – Concept of ecosystem–Structure and function of ecosystem–Producers, consumers and decomposers-Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Aquatic ecosystems (c) Grassland ecosystem.

UNIT – II ENVIRONMENTAL POLLUTION 9

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution - pollution case studies - Role of an individual in prevention of pollution –Disaster management: floods, earthquake, cyclone and landslides.

UNIT – III SOCIAL ISSUES AND THE ENVIRONMENT 9

Water conservation, rain water harvesting, watershed management – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. Environmental laws/Acts, (EPA).

UNIT – IV HUMAN POPULATION AND THE ENVIRONMENT 9

Population growth, variation among nations – Population explosion – Human rights – Family welfare programme – Environment and Human Health – Human Rights Value education – HIV / AIDS – Women and child welfare – Role of information technology in environment and human health.

UNIT – V FUTURE POLICYAND ALTERNATIVES 9

Introduction to future policy and alternatives-fossil fuels-nuclear energy-solar energy-wind energy - hydroelectric energy-geothermal energy - tidal energy – sustainability - green power-nanotechnology**.**

TOTAL : 45 PERIODS

COURSEOUTCOMES:

At the end of the course the student will be able to:

- **CO1**:Explain the environmental issues, consequences and suitable solution. (Understand-K2)
- **CO2**:Explain the various types of renewable energy sources for sustainable development of natural resources (Understand-K2)
- **CO3**:Apply the principles of value education with respect to human population to preserve environment (Apply-K3)
- **CO4**:Apply the knowledge of various pollution types to prevent the ecosystem and Environment (Apply-K3)
- **CO5**:Analyze the environmental problem to report the social issues and provide sustainable solution. (Analyze-K4)
- **CO6**: write a report on environmental issues and provide solution for sustainable development (Respond-A2)

TEXT BOOKS

1. Anubha Kaushik, kaushik C.P., "Environmental Science and Engineering",Third Edition, New Age International, New Delhi, 2009.
2. Benny Joseph "Environmental Science and Engineering", Tata Mc-Graw Hill, New Delhi, 2006.

REFERENCE BOOKS:

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', Pearson Education,Upper saddle River, New Jersey, 2008.
2. Miller T.G. Jr., Environmental Science", Wadsworth PublishingCompany, Belmont, California, 2005.
3. De A.K., "Environmental Chemistry", Wiley Eastern Ltd., New Delhi,2001.
4. Trivedi R.K., Goel P.K., "Introduction to Air Pollution", Techno-Science Publication, Jaipur,2005.

Semester III

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UMA324	Probability, Statistics, Complex Analysis And Numerical Methods (Only For EEE)	3	1	0	4	BS
21UEE302	Electrical Machines - I	3	0	0	3	PC
21UEE303	Analog Electronics	3	0	0	3	PC
21UEE304	Electromagnetic Fields	3	1	0	4	PC
21UIT327	Data Structure using C (Integrated Course)	3	0	2	4	ES
PRACTICAL						
21UEE307	Electrical Machines Laboratory - I	0	0	2	1	PC
21UEE308	Analog Electronics Laboratory	0	0	2	1	PC
MANDATORY						
21UGM331	Biology for Engineers (Common to All except BME & BT)	2	0	0	P/F	MC
	TOTAL	**17**	**2**	**6**	**20**	
Total No of Credits - 20						

PROBABILITY, STATISTICS, COMPLEX ANALYSIS AND

21UMA324	**NUMERICAL METHODS**	**L**	**T**	**P**	**C**
	(ONLY FOR EEE)				
		3	**1**	**0**	**4**

OBJECTIVES :

- To make the student acquire sound knowledge of fundamentals and applications of statistics which will greatly help at the data analysis stage of comparative experiments.
- To make the student acquire sound knowledge of standard distributions that can describe real life phenomena.
- To acquaint the student with the roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and Eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution

UNIT I TESTING OF HYPOTHESIS 9 + 3

Sampling distributions - Normal, t, Chi-square and F distributions **-** Tests for single mean, Proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – Chi-square test for goodness of fit – Independence of attributes

UNIT II PROBABILITY & RANDOM VARIABLES 9 + 3

Axioms of probability - Conditional probability - Total probability - Discrete and continuous random variables - Moments - Moment generating functions and their properties. Binomial, Poisson, Normal and Exponential- Joint probability distributions - Marginal and Conditional distributions – Covariance - Correlation and Regression.

UNIT IIISOLUTION OF ALGEBRAIC, TRANSCENDENTAL EQUATIONS AND EIGENVALUE PROBLEMS 9 + 3

Iteration method – Newton-Raphson method – Gauss Elimination method – Pivoting – Gauss Jordan methods –iterative methods : Gauss Jacobi method ,Gauss Seidel method - Eigen values of a matrix by Power method – Jacobi's method for a real symmetric matrix.

UNIT IVNUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS 9 + 3

Single step methods: Taylor series method – Euler method for first order equation – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods

UNIT V COMPLEX INTEGRATION 9 + 3

Analytic function- Statement and applications of Cauchy's integral theorem, Cauchy's integral formula and Cauchy Residue Theorem – Taylor's and Laurent's expansions – Applications of residue theorem to evaluate real integrals – Unit circle and semi-circular contour (excluding Poles on the real axis).

TOTAL : 45 (L) + 15 (T) = 60 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Analyse the concept of testing of hypothesis for small and large samples in Real life Problems (CO1). Analyze
- Apply the knowledge of concepts of probability to acquired knowledge of standard Distributions, Correlation and regression. (CO2).Apply
- Apply numerical techniques to solve linear, nonlinear equations and Eigen value problems of a Matrix by Numerically. (CO3).Apply
- Apply the knowledge of numerical techniques and methods for solving first and second order Ordinary Differential Equation. (CO4)
- Apply the knowledge of singularities, residues and applying to evaluate complex integration.(CO5)
- Understand the basic concept of probability , Random Variable and statistics .(CO6)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3		1								1	2	
CO2	3			1								1	2	
CO3	3			1								1	2	
CO4	3			1								1	2	
CO5	3			1								1	2	
CO6	3			1								1	2	

TEXT BOOKS:

- Gupta S.C., Kapoor V.K. “Fundamental of Mathematical Statistics” 10th Edition ,Sultan Chand and Sons , New Delhi 2002.
- GREWAL, B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 35th Edition, (2010).
- Veerarajan, T., “Probability and Random Processes” 4th Edition Tata McGraw-Hill, New Delhi, (2015).

REFERENCE BOOKS:

- Bali N.P., Manish Goyal and Watains, “Advanced Engineering Mathematics”, Firewall Media (An imprint of Laxmi Publication Private limited) New Delhi, 7th Edition, (2009).
- Ramana.B.V, “Higher Engineering Mathematics” Tata McGraw Hill, New Delhi, 11th Reprint (2010).
- Glyn James, “Advanced Modern Engineering Mathematics”, Pearson Education, New Delhi, 3rd Edition, (2007).
- Erwin Kreyszig, “Advanced Engineering Mathematics”, Wiley India, 10th Edition, (2011).

21UEE302	ELECTRICAL MACHINES - I	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the production of torque and EMF in Electrical Machines.
- To demonstrate the construction, operation and characteristics of various types of DC machines.
- To choose the suitable dc machine for a particular application.
- To understand the construction, operation and characteristics of transformers
- To estimate the performance of Transformers.

UNIT I DC GENERATORS 9

Principle of Electromechanical Energy Conversion: Magnetic circuits – Single and double excited systems. DC Generators: Construction – Windings - Armature Reaction – Commutation - EMF Equation – Types of Generators - Magnetization and load characteristics - Parallel operation - Applications

UNIT II DC MOTORS 9

Principle of operation – Types of motors – Torque equation - Characteristics – Speed control - Starters – Applications.

UNIT III TESTING OF DC MOTORS 9

Losses and efficiency –Swinburne's test – Hopkinson Test – Retardation test –Field test for dc series motor.

UNIT IV TRANSFORMERS 9

Construction – Principle of operation – Types of transformers – EMF Equation -Transformer on No load and load - phasor diagram – Equivalent circuit – predetermination of Efficiency and Voltage Regulation - Auto transformer.- Applications

UNIT V TRANSFORMER TESTING 9

Testing of transformers – Polarity test, Open Circuit test, Short Circuit and Sumpner"s test – Three phase transformers connections - Parallel operation

Total: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Demonstrate the construction and operating principles of DC Machines and Transformers [**Understand**]
- Compute the losses, efficiency of DC Motors using different testing methods**[Apply]**
- Analyze the characteristics of DC Generators and choose the suitable dc Generator for a particular application [**Analyze**]
- Analyze the performance of DC Motors based on its environmental impacts and choose the suitable dc motor for a particular application [Analyze]

- Analyze the performance of the transformers using voltage regulation for different load condition. [Analyze]
- Communicate effectively to propagate ideas to the engineering community and promote teamwork [Valuing]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2	3													
CO3	3													
CO4		3												2
CO5				3										
CO6									3	3				

TEXT BOOKS:

1. D. P. Kothari and I. J. Nagrath, Electric Machines, Tata McGraw Hill Publishing Company Ltd, 2017.
2. P. S. Bimbhra, Electrical Machinery, Khanna Publishers, Delhi, 2018.
3. E.Fitzgerald, Charles Kingsley, Stephen.D.Umans, Electric Machinery, Tata McGraw Hill publishing Company Ltd, New Delhi ,2015.
4. StephenJ.Chapman, Electric Machinery Fundamentals, Tata McGraw Hill, New Delhi,2018

REFERENCE BOOKS:

1. Theraja B.L., “A Text Book of Electrical Technology Vol. II ”, S.Chand & Co. Ltd, 2018.
2. Murugesh Kumar K.,”DC Machines and Transformers”, Vikas publishing house Pvt Ltd, 2014.
3. Mehta. V.K., “Principles of Electrical Machines”, S.Chand & Co. Ltd, 2017.
4. J.B. Gupta, Theory and performance of Electrical Machines- S.K. Kataria and sons-New Delhi,2013

21UEE303	ANALOG ELECTRONICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To be familiar with the structure of basic electronic devices
- To be exposed to the operation and application of electronic devices and their circuits
- To analyze circuit characteristics with signal analysis using Op-amp Ics.
- Illustrate the applications of IC555 in astable and monostable mode
- Explain the application of PLL for frequency multiplication/division and frequency translation

UNIT I ELECTRONIC DEVICES AND THEIR CHARACTERISTICS 9

PN junction diodes – structure, operation and VI characteristics: drift and diffusion current, transient capacitance – BJT, JFET, MOSFET: structure, operation and characteristics; biasing; UJT based relaxation oscillator

UNIT II AMPLIFIER CIRCUITS 9

BJT small signal model – Analysis of CE amplifier, Gain and Frequency response – Differential Amplifier - Multi-stage amplifier - Common mode and Differential mode analysis - Current mirror circuits - Introduction to internal circuit of typical OPAMP.

UNIT III OPERATIONAL AMPLIFIER AND ITS APPLICATIONS 9

Basic concepts, Differential amplifiers, Ideal op-amp, Parameters of op-amp. Basic op-amp applications- Scale changer, Inverting and non-inverting amplifiers, Summer and Subtractor, Differentiator, Integrator, Instrumentation amplifier, Precision rectifier.

UNIT IV COMPARATORS AND WAVEFORM GENERATORS 9

Comparator - Regenerative comparator, Square wave generator - Triangular wave generator, Sine wave oscillators - RC phase shift and wien bridge oscillators.

UNIT V SPECIAL ICS 9

555 Timer circuit: Functional block diagram, characteristics & applications – Astable and monostable multivibrator -566 Voltage Controlled Oscillator circuits - PLL Phase Locked Loop applications -Function generator circuit – Linear Voltage regulators.

Total: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Understand the structure, working principle and operation of analog devices and circuits. [Understand]
- Design a suitable circuit for linear and non – linear applications by applying the knowledge of Semiconductor devices. [Apply]
- Design a circuit for the given application using special ICs. [Apply]

- Analyze the characteristics of semiconductor devices and select suitable device for the given application. [Analyze]
- Compare the performance characteristics of analog circuits and recommend a suitable circuit for given application. [Evaluate]
- Make an effective communication and presentation in a team to demonstrate the concepts of Linear Integrated Circuits. [Affective Domain]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2	3													
CO3		3												
CO4	3													
CO5			3											
CO6									3	3				

TEXT BOOKS:

1. David A bell, " Electronic circuits" , Oxford University Press, 2011.
2. Ramakant A Gayakwad , " Opamps and Linear Integrated Circuits" , IV edition, PearsonEducation/ PHI, 2009
3. D. Roy Choudary, S.B. Jain, " Linear Integrated Circuits", Third edition, New Age publishers, 2014.

REFERENCE BOOKS:

1. Millman and Halkias, " Integrated Electronics", McGraw Hill Publications,
2. 2. Muhammad H. Rashid, "Linear Integrated Circuits", Cengage Learning, 2014.

21UEE304	ELECTROMAGNETIC FIELDS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

UNIT I INTRODUCTION 9+3

Sources and Effects of Electromagnetic Fields-Vector fields-Different Coordinate Systems-Differential Elements- Del Operator-Gradient- Divergence and curl of a vector- Divergence Theorem - Stoke's Theorem.

UNIT II ELECTROSTATIC FIELD 12+3

Coulomb's Law- Electric field Intensity-Field due to point and continuous charges-Different types of charge densities-Electric Charge density, Electric Flux Density- Gauss Law and its applications-Electric Potential-Electric field due to infinite line charge, charged circular ring-Equipotential plots-Dielectric polarization-Dielectric strength - Permittivity, Dielectric strength of Materials. Multiple Dielectrics and field behavior at the interface between conductor and free space-Poisson's and Laplace's equations- Calculation of Capacitance for various application and energy storage. Simulation of Electric Fields.

UNIT III MAGNETO STATIC FIELDS 9+3

Lorentz Law of Force, Magnetic field Intensity-Biot-Savart's Law and Ampere's Law- Magnetic fields due to straight conductors, Circular loop - Magnetic Flux Density and Magnetic Field Intensity, Permeability and strength of magnetic materials. Field Behavior at the interface of magnetic materials –Scalar and vector potential - Magnetic force - torque - Inductance- Energy density. Simulation of magnetic fields.

UNIT IV ELECTRO DYNAMIC FIELDS 9

Faraday's laws, induced emf – Transformer and motional EMF Force and Torque: Forces and Energy in quasi stationary Electromagnetic fields – Maxwell's equations (differential and integral forms) – Displacement current- Relation between field theory and circuit theory.

UNIT V ELECTRO MAGNETIC WAVES 9+3

Generation – Electro magnetic wave equations – wave parameters: velocity, intrinsic impedance, propagation constant- waves in free space, lossy and lossless dielectrics, conductors – skin depth, Poynting vector – Plane wave reflection and refraction.

Total: 60 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Understand the concepts of different coordinate systems and EMF generation. [Understand]
- Apply vector calculus to electrostatic and magnetostatic fields for computing the field parameters. [Apply]
- Analyze different wave parameters in various medium. [Analyze]

- Apply Maxwells equations to analyze and predict the behavior of electromagnetic fields in different situations [Apply]
- Develop a circuit to measure the electromagnetic radiations. [Create]
- Make an effective communication and presentation in a team to demonstrate the concepts of Electromagnetic Radiations. [Affective Domain]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2	3													
CO3		3												
CO4	3													
CO5			3											
CO6									3	3				

TEXT BOOKS:

1. Cheng, D.K., “Field and Wave Electromagnatics”, Pearson Education (Singapore) Pte. Ltd., 2nd Edn., 1989.
2. Hayt, W.H., J.A. Buck, “Engineering Electromagnetics”, Tata McGraw Hill.

REFERENCE BOOKS:

1. Edward C. Jordan & Keith G. Balmain, “Electro-magnetic waves & Radiating System”, PHI.
2. Deepak Sood, “Field & Wave, A Fundamental Approach”, University Science Press.
3. S. C. Matapatra, SudiptaMahapatra, “Principles of Electromagnetics”, Tata McGraw Hill.
4. Matthew Sadiku, “Principles of Electromagnetics”, Oxford University Press.
5. A. R. Harish, M. Sachidananda, “Antennas & Wave Propagation”, Oxford University Press.

21UIT327	DATA STRUCTURE USING C (Integrated Course)	L 3	T 0	P 2	C 4

PRE-REQUISITE:

COURSE OBJECTIVES :

- To develop C Programs using Basic Programming Constructs.
- To develop C Program using Array,Function, Pointer,Structures
- To learn the linear and non-linear data structures
- To learn to represent data using graph data structure

UNIT I C PROGRAMMING BASICS 9 +6

Structure of a C program – Data Types - Variables -Constants — Expressions using operators in C – Decision Making and Branching – Looping statements. Arrays – Introduction-Types of Array – One Dimensional Array - Two Dimensional Array.

List of Experiments:

1. Program to Implement Decision Control Statements
2. Program to Implement using Looping Statements
3. Program to Implement using Arrays

Case study:

1. The marks obtained by a student in 5 different subjects are input through the keyboard. The student gets a grade as per the following rules:

   Percentage above or equal to 60 - First grade

   Percentage between 50 and 59 - Second grade

   Percentage between 40 and 49 - Third grade

   Percentage less than 40 - Fail

   Write a program to calculate the grade obtained by the student with the use of logical operators

2. Write a program to pick up the largest number from any 5 row by 5 column matrix.

UNIT II FUNCTIONS, POINTERS, STRUCTURES AND UNIONS 9+6

Function: Introduction, Elements of Function - Pass by value – Pass by reference – Pointers - Definition – Declaration of Pointers – Initialization of Pointers-Dynamic Memory Allocation- Structure – Definition and Declaration – Nested Structure – Union.

List of Experiments:

1. Program to Implement using Function
2. Program to Implement using Pointers
3. Program to Implement using Structure

Case study:

1. Write a C program to read and display student details using structure.
2. An automobile company has serial number for engine parts starting from AA0 to FF9. The other characteristics of parts to be specified in a structure are: Year of manufacture, material and

quantity manufactured.

(a) Specify a structure to store information corresponding to a part.

(b) Write a program to retrieve information on parts with serial numbers between BB1 and CC6.

3. A record contains name of cricketer, his age and number of test matches that he has played and the average runs that he has scored in each test match. Create an array of structure to hold records of 20 such cricketer and then write a program to read these records and arrange them in ascending order by average runs. Use the qusort( ) standard library function.

UNIT III LINEAR DATA STRUCTURES(STACK, QUEUE, LIST) 9+6

Abstract Data Type- Arrays and its representations – lists – Types of list— Singly linked lists - Operation of List- implementation of List using ADT- Stacks and Queue – implementation of Stacks and Queues using ADT

List of Experiments:

1. Program to Implement Stack ADT using Array and Singly Linked List
2. Program to Implement Queue ADT using Array and Singly Linked List
3. Program to Implement Insertion and Deletion using Singly Linked List

Case study:

1. Design, develop and Implement a Program for the following operations on STACK of Characters (Array Implementation of STACK with maximum size MAX)

a. Push an Element on to STACK

b. Pop an Element from STACK

c. Demonstrate STACK FULL and STACK EMPTY situations on STACK Display the status

d. Exit.

UNIT IV NON-LINEAR DATA STRUCTURES (TREE, GRAPH) 10+6

Trees – Binary Trees – Binary tree representation and traversals — Applications of trees. Graph and its representations – Graph Traversals- Minimum Spanning Trees – Prim's and Kruskal's Algorithm Shortest path algorithm – Dijkstr's algorithm

List of Experiments:

1. Program to Implement Prim's Algorithm to find MST of an undirected graph.
2. Program to Implement Kruskal's Algorithm to find MST of an undirected graph.

Case study:

Design, Develop and Implement a Program for the following operations on Binary Tree of Integers

a. Create a Binary Tree of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2

b. Traverse the Binary Tree in Inorder, Preorder and Post Order

c. Search the Binary Tree for a given element (KEY) and report the appropriate message

d. Exit

UNIT V SORTING 8+6

Sorting - Bubble Sort, Selection Sort, Insertion sort – Merge sort – Quick sort – Hashing- Hash tables.

List of Experiments:

1. Program to Implement Bubble sort and Selection sort
2. Program to Implement Quick sort
3. Program to Implement Hashing

Case study:

1. Create a text file containing the name, height, weight of the students in a class. Perform Quick sort and Merge sort on this data and store the resultant data in two separate files. Also write the time taken by the two sorting methods into the respective files.

   Eg. Sony Mathew 5.5 60
   Arun Sajeev 5.7 58
   Rajesh Kumar 6.1 70

2. Write a program to perform the sort of an array of numbers in descending order using Selection sort. and then show the iterations of the sorting process 42, 34, 75, 23, 21, 18, 90, 67, 78

Total:75 Periods

Course Outcomes

At the end of the course the student will be able to

CO. No	Course Outcome	Taxonomy level	Domain	PO & PSO Mapping
CO1	Infer the Knowledge of Basics of C Programming Concepts	Understand	Cognitive	-
CO2	Apply various Concepts of C program for solving problems	Apply	Cognitive	PO1, PSO1
CO3	Compare and contrast alternative data structure applications to select the best process	Analyze	Cognitive	PO2, PSO1
CO4	Design and develop efficient linear, non-linear, sorting, searching and hashing data structure algorithms to solve problems.	Create	Cognitive	PO3, PSO1
CO5	Evaluate the problems and find solutions using linear, non-linear applications, searching, sorting and hashing algorithms.	Evaluate	Cognitive	PO4, PSO1
CO6	Select and apply appropriate data structures to design algorithms using modern tool.	Apply	Cognitive	PO5,9,10, PSO1

TEXT BOOK:

1. Yashavant P. Kanetkar,"Let us C", 5th Edition, BPB Publications, 2004.
2. ReemaThareja,"Data Structures Using C", Oxford University Press, Second Edition, 2014

REFERENCE BOOKS:

1. Brian.K.Kernighan,Dennis.M.Ritchie,"The C Programming Language", 2nd Edition, Pearson
2. Weiss. M.A, "Data Structures and Algorithm Analysis in C", Pearson Education, 2nd Edition, 2012
3. Aaron M.Tenenbaum, YedidyahLangsam, Moshe J.Augenstein, "Data Structures using C", Pearson Education India, 7th Edition, New Delhi, 2009.
4. Aho.V, Hopcroft.J.E, Ullman.J.D, "Data Structures and Algorithms", Pearson Education, 1st Edition Reprint, 2006

21UEE307 ELECTRICAL MACHINES LABORATORY – I

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

- To understand the open circuit and load characteristics of DC generator.
- To understand the electrical and mechanical characteristics of DC motor under various Loading conditions.
- To perform the tests to determine the efficiency and regulation of the DC machines and transformers.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of separately excited DC generators.
2. Open circuit and load characteristics of Self excited DC shunt generators
3. Load characteristics of DC compound generator.
4. Load characteristics of DC shunt motor.
5. Load characteristics of DC compound motor.
6. Load characteristics of DC series motor.
7. Predetermination of Efficiency of DC machine using Swin burnes Test.
8. Hopkinson's test.
9. Speed control of DC shunt and DC Series motor.
10. Load test on single phase transformer.
11. Open circuit and short circuit test on single phase transformer.
12. Determination of performance parameters of transformer using Sumpners test.
13. Separation of no-load losses in single phase transformer.
14. Study of three phase transformer connections.
15. Visit to Electrical Machines Manufacturing Industry.

A minimum of TEN experiments shall be offered

Total: 30 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Compute the efficiency of DC machine by conducting various tests [Apply]
- Analyze the performance characteristics of DC machines and choose the suitable dc machine for a particular application [Analyze]
- Evaluate the performance parameters of a single phase transformer using different testing Methods [Evaluate]]
- Compute the characteristics of DC motor by various Speed control methods [Apply]
- Develop an effective report and comprehend the technical skill as a team for the given exercise. [Psychomotor Domain]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2		3											3	
CO3				3									3	
CO4	3													
CO5									3	3				

21UEE308 **ANALOG ELECTRONICS LABORATORY**

L	T	P	C
0	0	2	1

LIST OF EXPERIMENTS

1. Characteristics of Semiconductor diode and zener diode.
2. Characteristics of Transistor using various configurations.
3. Frequency response of common emitter and JFET/MOSFET amplifier
4. Characteristics of FET and MOSFET.
5. Differential amplifier using FET/MOSFET.
6. Half wave and full-wave rectifier using op-amp
7. Schmitt trigger circuit using op-amp
8. Timer IC application:
   NE/SE 555 timer in Astable, Monostable operation.
9. Application of Op-Amp: Slew rate verifications, inverting and non-inverting amplifier, Adder, comparator, Integrator and Differentiator.
10. Analog to Digital Converter and Digital to Analog Converter: Verification of A/D conversion using dedicated IC's.
11. Frequency responses of low pass and band pass active filters.
12. Design of oscillator using opamp.

Total: 30 Periods

COURSE OBJECTIVES:

After the successful completion of this course, the student will be able to

- Apply the opamp for designing signal conditioning circuits. [Apply]
- Analyze the frequency response of various semiconductor devices. [Analyze
- Analyze the characteristics of various semiconductor devices. [Analyze]
- Develop an effective report and comprehend the technical skill as a team for the given exercise. [Psychomotor Domain]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2		3												
CO3		3												
CO4									3	3				

21UGM331	BIOLOGY FOR ENGINEERS	L	T	P	C
	(Common to All Branches except BME & BT)	2	0	0	P/F

OBJECTIVES:

- To provide a basic understanding of biological mechanisms of living organisms and the human biology from the perspective of engineers.
- To encourage engineering students to think about solving biological problems with engineering principles and tools.

UNIT – I INTRODUCTION AND CLASSIFICATION 5

Introduction to Biology – Comparison of Biology and Engineering – Eye and Camera – Bird flying and Aircraft – Brownian motion and Thermodynamics – Classification – Unicellular or multicellular – Unicellular: Bacteria, Protozoa, Yeast – Multi Cellular: Animals, Humans, Plants, fungi etc. – Ultra structure: prokaryotes or eukaryotes – Habitat: aquatic or terrestrial.

UNIT – II DIGESTIVE & RESPIRATORY SYSTEMS – ENZYME 6

Study of digestive – Respiratory systems and their functions –.Enzyme – Classification of Enzyme – Mechanism of Enzyme activity – Enzymes for Industrial Applications: Waste management – Food processing industry – Beverages – Pharmaceutical – Paper Industry etc.

UNIT – III GENETICS AND BIO MOLECULES (Basics only) 7

Basics of Genes – DNA structure – Genes and hereditary – Genetic Code – Coding and decoding Genetic information – Gene Mapping – Gene Interactions – Mutations – Genetic disorders – Gene therapy – Biomolecules: Carbohydrates, lipids, nucleic acids, proteins. Biological Applications in Engineering: Genetic Algorithm – Computer Application in Genetic Engineering – Genetic Programming – Genetic Computers.

UNIT – IV NERVOUS SYSTEM AND CELL SIGNALING 7

Central Nervous System: Brain and Spinal Cord – Peripheral Nervous System – Sensory Division – Motor Division – Neurons – sensory, motor, and interneurons – Signals –Transfer of Information – Bio Signals – Electrocardiography (ECG) – Electroencephalography (EEG) – Electromyography (EMG) – Electrooculography (EOG) – X-ray – CT Scan – MRI scan – Biological Applications in Engineering –Neurons and Neural Network.

UNIT – V BIOLOGY AND ITS INDUSTRIAL APPLICATION 5

Bioreactors – Biopharming – Recombinant vaccines – Cloning – Drug discovery – Bioremediation – Biofertilizer – Biocontrol – Biofilters – Biosensors – Biopolymers – Bioenergy – Biomaterials – Biochips.

TOTAL : 30 PERIODS

COURSE OUTCOMES:

At the end of the course the student will be able to:

- Explain the fundamentals of living things, their classification, cell structure and biochemical constituents. [Understand]
- Apply the concept of plant, animal and microbial systems and growth in real life situations. [Apply]
- Analyze biological engineering principles and procedures needed to solve societal issues. [Analyze]

TEXTBOOKS:

1. R.C.Dubey, “A Text book of Biotechnology”, S. Chand Higher Academic Publications, 2013.
2. R. Khandpur, “Biomedical instrumentation - Technology and applications”, McGraw Hill Professional, 2004.

REFERENCES:

1. Arthur T. Johnson, “Biology for Engineers”, CRC Press, Taylor and Francis, 2nd Edition, 2019.
2. Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, “Cell Biology and Genetics (Biology: The unity and diversity of life Volume I)”, Cengage Learning, 12th Edition, 2008.
3. Gerard J. Tortora and Bryan H.Derrickson, “Principles of Anatomy and Physiology”, 15th Edition, Wiley publications, 2016.

SEMESTER IV

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UGS431	Reasoning and Quantitative Aptitude (Common to Mech, EEE, Agri and Chem Engineering)	1	0	0	1	BS
21UEE401	Electrical Machines - II	3	0	0	3	PC
21UEE402	Control Systems	3	1	0	4	PC
21UEE403	Principles of Digital Electronics	3	1	0	4	PC
21UEE404	Electric Power Transmission and Distribution	3	1	0	4	PC
21UEE405	Electrical Measurements and Instrumentation	3	0	0	3	PC
PRACTICAL						
21UEE406	Electrical Machines Laboratory - II	0	0	2	1	PC
21UEE407	Control and Instrumentation Laboratory	0	0	2	1	PC
21UEE408	Digital Circuits Laboratory	0	0	2	1	PC
MANDATORY						
21UGM431	Gender Equality(Common to all)	1	0	0	P/F	MC
		17	**3**	**6**	**22**	
Total No of Credits - 22						

21UGS431	REASONING AND QUANTITATIVE APTITUDE	L	T	P	C
	(Common to Mech, EEE, Agri& Chemical)	1	0	0	1

COURSE OBJECTIVES:

- To make the student acquire sound knowledge of the characteristic of quantitative and qualitative aptitude.
- To familiarize the student with various principles involved in solving mathematical problems.
- To develop an understanding of the basic concepts of reasoning skills.

UNIT I QUANTITATIVE APTITUDE 8

Ratio and Proportion - Averages – Percentages – Problems on ages – Profit and Loss – Simple and Compound Interest -– Time – Speed –Distance - Time and Work – Permutation and Combination - Alligation or Mixture – Probability – Clocks – Calendars.

UNIT II VERBAL AND NON VERBAL REASONING 7

Analytical Reasoning – Circular and Linear arrangement – Direction problems – Blood relations – Analogy – Odd Man Out – Venn Diagrams - Data Sufficiency – Data interpretation –– Syllogism - Coding – Decoding.

Total: 15 Periods

TEXT BOOKS:

1. Dr. R.S.Agarwal, “Quantitative Aptitude”, S. Chand Publications, New Delhi, 20th Edition, (2013).
2. AbijitGuha, “Quantitative Aptitude for Competitive Examinations”, Tata McGraw Hill Publication, New Delhi, 4th Edition, (2011).
3. R.V.Praveen, “Quantitative Aptitude and Reasoning”, PHI Learning Pvt. Ltd., Delhi, 2nd Edition, (2013).

REFERENCE BOOKS:

1. Ashish Aggarwal, “Quick Arithmetic”, S. Chand Publications, New Delhi, 6th Revised Edition, (2014).
2. Dr.V.A.Sathgurunath’S “A Guide for Campus Recruitment”, Sagarikka Publications, Thiruchirapalli, 3rd Edition, (2011).

WEBSITES:

www.m4maths.com, www.indiabix.com, www.fresherworld.com, www.campusgate.co.in,

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Select an appropriate technique to solve the quantitative problems within the stipulated time. [Apply]
- Apply Verbal and Non Verbal Reasoning skills to solve the problems based on the logical and analytical reasoning. [Apply]
- Analyze the direction to solve equations involving one are more unknowns. [Analyze]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2	3													
CO3		3												

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21UEE401	ELECTRICAL MACHINES - II	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To impart the knowledge on construction and performance characteristics of synchronous Machines.
- To impart the knowledge on construction and performance characteristics of three phase Induction Machines.
- To impart the knowledge on operation of single phase Induction motor and special machines.

UNIT I ALTERNATOR 9

Principle of Operation - Construction - Types of rotor - EMF equation - Armature reaction – Regulation of alternator: EMF, MMF and ZPF method - Salient pole machine – Two reaction theory – Determination of direct and quadrature axis synchronous reactance using slip test – Parallel operation - Capability Curves.

UNIT II THREE PHASE INDUCTION MOTOR 9

Principle of operation - Constructional details – Types of rotors – Slip –cogging and crawling - Equivalent circuit – Torque- Slip characteristics, Effect of parameter variation on torque speed characteristics - Condition for maximum torque – Losses and efficiency – Circle diagram - Double cage induction motors –Induction generators.

UNIT III STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 9

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star- delta starters – Speed control – Voltage control, Frequency control, V/f control – pole changing – Cascaded connection – Slip power recovery scheme.

UNIT IV SYNCHRONOUS MOTOR 9

Principle of operation – Torque equation – Power input and power developed – Operation on infinite bus bars – V and Inverted V curves – Starting methods – Current loci for constant power input, constant excitation and constant power developed – Hunting – damper windings – synchronous condenser.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 9

Double Revolving Field Theory – Starting methods of single-phase induction motors – Split phase motors – Capacitor-start capacitor run Induction motor – Shaded pole induction motor – Linear induction motor – Repulsion motor – reluctance motor – Hysteresis motor – AC series motor – Stepper motors.

Total: 45 Periods

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

- Explain the construction and principle of operation of different types of AC Machines. [Understand]
- Determine the performance characteristics of synchronous motor. [Apply]
- Select a suitable starter and speed control method of three phase induction motors for various applications. [Apply]
- Analyze the performance characteristics of Induction motor. [Analyze]
- Compare the voltage regulation of alternator by using various methods. [Analyze]
- Select the AC machines for various application by considering its societal and environmental aspects [Evaluate]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2	3													
CO3	3													
CO4		3											3	
CO5		3												
CO6				3		2	3							

TEXT BOOKS:

1. D. P. Kothari and I. J. Nagrath, Electric Machines, Tata McGraw Hill Publishing Company Ltd, Fourth Edition 2018.

2. P. S. Bhimbhra, Electrical Machinery, Khanna Publishers, Seventh Edition 2018.

3. E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, Electric Machinery, Tata McGraw Hill publishing Company Ltd, New Delhi ,2015.

4. P. C. Sen, “Principles of Electric Machines and Power Electronics”, John Wiley & Sons, 2007.

REFERENCE BOOKS:

1. B.R.Gupta, ’Fundamental of Electric Machines’ New age International Publishers, 3rd Edition,Reprint 2015.

2. Murugesh Kumar, ‘Electric Machines’, Vikas Publishing House Pvt. Ltd, 2002.

3. Theraja B.L., “ A Text of Electrical Technology, Volume-II”, S.Chand& Co Ltd, 2008

4. M.G.Say, Performance and Design of Alternating Current Machines, 3rd Edition, CBS Publisher, 2017.

5. M.N. Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2009.

21UEE402	CONTROL SYSTEMS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of systems.
- To introduce state variable representation of physical systems and study the effect of state feedback.

UNIT I INTRODUCTION TO CONTROL PROBLEM 6

Basic Components of a Control System, Industrial Control examples. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Mathematical Modeling of Dynamic Systems: Mechanical, Electrical, thermal and fluid system. Transfer function: Block diagram reduction techniques and Signal flow graphs.

UNIT II TIME DOMAIN ANALYSIS 12

Standard test signals. Time response of first and second order systems for standard test inputs. Error coefficient and steady state error. Develop a MATLAB program and analyse the time response of the given system.

UNIT III FREQUENCY DOMAIN ANALYSIS 12

Frequency Response of Closed-Loop Systems, Frequency-Domain Specifications, Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. – Gain and phase margin. Develop a MATLAB program and analyse the frequency response of the given system.

UNIT IV RELATIVE STABILITY ANALYSIS 12

Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci. Develop a MATLAB program and analyse relative stability of the given system.

UNIT V DESIGN OF CONTROL SYSTEMS 12

Design specifications, Controller Configurations, Time-Domain and frequency domain Interpretation of PD, PI, & PID Controller. Design with Lag, lead and lag-lead controller. Effect of Lag, lead and lag-lead controllers on Time-Domain and frequency domain analysis. Develop a MATLAB program and design the controller of the given system.

UNIT VI STATE VARIABLE ANALYSIS 6

Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigen values and Stability Analysis. Concept of controllability and observability.

Total: 60 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Explain the various components and techniques involved in control systems, time domain and frequency domain parameters. [Understand]
- Develop mathematical model and compute transfer function of dynamic systems using block diagram reduction and signal flow graph [Apply]
- Determine the time-domain, frequency domain specifications and state space model for the control system. [Apply]
- Analyze the system response for stability in both time and frequency domain using algebraic and graphical representations. [Analyze]
- Examine the system behaviors like stability, controllability, and observability using various stability analysis techniques. [Evaluate].
- Design a linear control systems / compensators within the constraints for a given application using MATLAB. [Create]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2	3													
CO3	3													
CO4		3												
CO5		3		2										
CO6			3		3									

TEXT BOOKS:

1. Nagrath & Gopal, “Modern Control Engineering”, New Age International, New Delhi
2. Gopal. M., “Control Systems: Principles and Design”, Tata McGraw-Hill, 1997.

REFERENCE BOOKS:

1. Kuo, B.C., “Automatic Control System”, Prentice Hall, sixth edition, 1993.
2. Ogata, K., “Modern Control Engineering”, Prentice Hall, second edition, 1991.

21UEE403	PRINCIPLES OF DIGITAL ELECTRONICS	L	T	P	C
		3	1	0	4

OBJECTIVES :

- To impart the knowledge of combinational circuit design.
- To impart the knowledge of Sequential circuit design.
- To provide the basic knowledge about Verilog HDL & its use.

UNIT I FUNDAMENTALS OF DIGITAL SYSTEMS AND LOGIC FAMILIES 9 + 3

Digital signals, digital circuits, review of number systems, binary arithmetic, one's and two's complements arithmetic, Binary codes, error detecting and correcting codes, characteristics of digital lCs, digital logic families - TTL, Schottky TTL and CMOS logic, design using CMOS logic, interfacing CMOS and TTL.

UNIT II COMBINATIONAL CIRCUITS 9 + 3

Combinational logic, Boolean algebra, representation of logic functions-SOP and POS forms, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps-3 and 4 variables. Adders, Subtractors, Multiplexers - Implementation of Combinational circuits using Multiplexers, Demultiplexers, Encoders, Decoders, Parity Generators and Checkers, code converters.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9 + 3

Clock – Edge and Level, Flip-Flop, Analysis of RS, JK, Master Slave, T and D Flip-Flop, Registers, counters – Pulse forming circuits — Shift registers –. Synchronous Sequential Logic circuits –Design-state diagram, state table and excitation table - design of counters - Modulo counters, Ring counters. Moore and Mealy models - analysis of synchronous sequential logic circuits - state reduction and state assignment.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS & PROGRAMMABLE LOGIC DEVICES 9 + 3

Asynchronous sequential logic circuits-Transition table, flow table – race conditions – circuits with latches, analysis of asynchronous sequential logic circuits – introduction to design – implication table – hazards and errors. Introduction to PLDs – ROM, PAL, PLA, CPLD, FPGA

UNIT V INTRODUCTION TO VERILOG HDL 9 + 3

Verilog HDL - Modeling styles – structural – Behavioral – Dataflow - Design of simple/ complex combinational and sequential circuits using Verilog - case study on system design.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Summarize the concepts and process involved in digital circuits. [Understand]
- Model an optimized digital circuit by applying the knowledge of various simplification methods, number systems and codes. [Apply]
- Apply the concepts of PLDs and HDL to design and realize the digital circuits. [Apply]
- Analyze the performance characteristics of a digital circuit and derive its relationship between input and output. [Analyze]
- Design a digital circuit for the complex problem by using hardware /modern tool. [Create]
- Recommend a suitable digital circuit for a complex problem with a sustainable solution. [Evaluate]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2	3													
CO3	3													
CO4		3												
CO5			3		3									
CO6				2			2					1		

TEXT BOOKS:

1. Tocci R J, Widmer N and Moss G. —Digital Systems: Principles and Applications, Pearson, New Delhi, 2013.
2. Donald Givone, —Digital Principles and Design‖, Tata McGraw-Hill, New Delhi 2012
3. Thomas L Floyd, ‘Digital fundamentals’, Pearson Education Limited, 11th Edition, 2015.
4. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
5. J. Bhaskar, ‘Verilog HDL Primer’, BPB publications, 2000.

REFERENCE BOOKS:

1. Fundamental of Logic Design- Charles H. Roth & Larry L. Kinney, Thomas Learning, 2013.
2. Digital Logic Applications and principles- John Yarbrough, Pearson Education
3. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
4. A.Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

21UEE404	ELECTRIC POWER TRANSMISSION AND DISTRIBUTION	L	T	P	C
		3	1	0	4

OBJECTIVES :

- To impart knowledge on the computation of transmission line parameters and modeling of transmission lines
- To understand the operation of the different distribution schemes.

UNIT I STRUCTURE OF POWER SYSTEM 9+3

Structure of electric power system: generation, transmission and distribution; Types of AC and DC distributors – distributed and concentrated loads – interconnection – EHVAC and HVDC transmission -Introduction to FACTS.

UNIT II TRANSMISSION LINE PARAMETERS 9+3

Parameters of single and three phase transmission lines with single and double circuits - Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition - application of self and mutual GMD; skin and proximity effects - interference with neighboring communication circuits - Typical configurations, conductor types and electrical parameters of EHV lines, corona discharges.

UNIT III MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9+3

Classification of lines - short line, medium line and long line - equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation, real and reactive power flow in lines, Power - circle diagrams, surge impedance loading, methods of voltage control; Ferranti effect.

UNIT IV INSULATORS AND CABLES 9+3

Insulators - Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators. Underground cables - Types of cables, Capacitance of Single-core cable, Grading of cables, Power factor and heating of cables, Capacitance of 3- core belted cable, D.C cables.

UNIT V MECHANICAL DESIGN OF LINES AND GROUNDING 9+3

Mechanical design of transmission line – sag and tension calculations for different weather conditions, Tower spotting, Types of towers, Substation Layout (AIS, GIS), Methods of grounding.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Summarise the structure and parameters of power system [Understand]
- Compute the transmission line parameters, sag of an overhead transmission line and string efficiency of insulators.[Apply]
- Apply the concepts of power circle diagram and calculate the efficiency of underground cables. [Apply]
- Analyse the voltage distribution for the proper selection of insulator, strings, cables and tension calculation for different weather conditions. [Analyze]
- Evaluate the reliability, and critical performance of electric power systems and their components, incorporating advanced technologies like EHVAC, HVDC, and FACTS [Evaluate]
- Analyze the complexities of electric power systems by evaluating feeders and load distribution. (Analyze)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2	3													
CO3	3													
CO4		3					2							
CO5				2								3		
CO6		3												

TEXT BOOKS:

1. Wadhwa C.L., “Electrical Power Systems”, New Academic Science Ltd, 2009.

2. Singh S.N., “Electric Power Generation, Transmission and Distribution”, Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 2011.

REFERENCE BOOKS:

1. Gupta B.R and Chand S., “Power System Analysis and Design”,New Delhi, Fifth Edition, 2008.

2. Luces M. Fualkenberry and Walter Coffer, “Electrical Power Distribution and Transmission”, Pearson Education, 2007.

3. Brian J., Hardy and Colin R.Bayliss, “Transmission and Distribution in Electrical Engineering”,Newnes; Fourth Edition, 2012. 5.Ramamurthy G., “Handbook of Electrical power Distribution” , Universities Press, 2013.

21UEE405	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To introduce the general instrument system, error, calibration etc.
- To familiarize the comparison methods of measurement.
- To explain storage and display devices, various transducers and data acquisition system

UNIT I INTRODUCTION 9

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration.

UNIT II MEASUREMENT OF PARAMETERS IN ELECTRICAL SYSTEMS 9

Classification of instruments – moving coil and moving iron meters – Dynamometer type watt meters and energy meters, Magnetic measurements – Determination of B-H curve and measurements of iron loss – Instrument transformers.

UNIT III COMPARISON METHODS OF MEASUREMENTS 9

D.C & A.C potentiometers, D.C & A.C bridges, Electrostatic and electromagnetic interference – Earth loops - Grounding techniques –Megger.

UNIT IV STORAGE AND DISPLAY DEVICES 9

Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, Storage CRO,Multiple trace digital CRO - dot matrix display – Data Loggers.

UNIT V TRANSDUCERS AND DATA ACQUISITION SYSTEMS 9

Transducers – Classification and Selection of transducers – Resistive, capacitive & inductive transducers – Piezo electric, optical and digital transducers – Elements of data acquisition system – A/D, D/A converters – Introduction to Virtual Instrumentation.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Explain the operation of various measuring instruments, data acquisition system, storage and display devices. [Understand]
- Apply the norms and standards for the calibration of measuring instruments to measure the unknown values using DC & AC potentiometers and bridges. [Apply]
- Select and use the suitable transducers for a given application. [Apply]
- Choose a suitable electrical and electronic instrument for the measurement of electrical quantity. [Analyze]
- Identify the latest trends in measuring systems, storage and display devices for sustainable development. [Analyze]
- Make an effective communication and presentation in a team to demonstrate the concepts of Electrical measuring instruments. [Affective Domain]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2	3					3								
CO3	3													
CO4		3												
CO5												3		
CO6									3	3				

TEXT BOOKS:

1. Doebelin E.O, “Measurement Systems – Application and Design”, Tata McGraw Hill publishing company, 2003 .
2. Sawhney A.K. , “A Course in Electrical & Electronic Measurements & Instrumentation ”, DhanpatRai and Co, 2004

REFERENCE BOOKS:

1. Bouwens A.J., “ Digital Instrumentation ”, Tata McGraw Hill, 1997
2. Moorthy D.V.S., “Transducers and Instrumentation ”, Prentice Hall of India Pvt Ltd, 2007
3. Kalsi H.S., “ Electronic Instrumentation ”, Tata McGraw Hill, II Edition, 2004
4. Martin Reissland., “Electrical Measurements”, New Age International (P) Ltd, 2001.
5. Gupta J. B., “A Course in Electronic and Electrical Measurements”, S. K. Kataria& Sons, 2003.

21UEE406	ELECTRICAL MACHINES LABORATORY - II	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To acquire practical knowledge in determining regulation of synchronous machine, and the performance characteristics of synchronous & induction machines

LIST OF EXPERIMENTS

1. Regulation of three phase alternator by EMF and MMF methods.
2. Regulation of three phase alternator by ZPF and ASA methods.
3. Regulation of three phase salient pole alternator by slip test
4. V and inverted V curves of three phase synchronous motor
5. Parallel operation of alternators
6. Load test on three-phase induction motor
7. Predetermination of performance characteristics of three-phase induction motor by circle diagram and equivalent circuit
8. Load test on single-phase induction motor
9. No load and blocked rotor tests on single-phase induction motor
10. Separation of no load losses in three phase squirrel cage induction motor.

Total: 30 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Compute the voltage regulation of alternators using different methods [Apply]
- Determine the performance characteristics of Induction motors. [Apply]
- Analyze the performance characteristics of AC Machines. [Analyze]
- Develop an effective report and comprehend the technical skill as a team for the given exercise. [Psychomotor Domain]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2	3													
CO3		3											3	
CO4									3	3				

21UEE407	CONTROL AND INSTRUMENTATION LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To impart knowledge on analysis and design of control system along with basics of Instrumentation

LIST OF EXPERIMENTS:

CONTROLSYSTEMS:

1. Determination of transfer function parameters of Armature controlled and Field controlled of DC (Servo) motor.
2. Determination of transfer function parameters of an AC servomotor.
3. Analog simulation of type-0 and type-1 systems
4. Digital simulation of first order and second order systems
5. DC and AC position control systems.
6. Stepper motor control system
7. Determination of transfer function parameters of DC generators.
8. Design of P, PI and PID controllers.

A minimum of FIVE experiments shall be offered

INSTRUMENTATION:

1. AC bridges.
2. DC bridges.
3. Instrumentation amplifiers.
4. A/D and D/A converters.
5. Measurement of iron loss.

A minimum of FIVE experiments shall be offered

Total: 30 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Determine the transfer function parameters of DC & AC servomotors and DC generator. [Apply]
- Analyze the transient response of type-0, type-1, first and second order systems for identifying the system behaviour. [Analyze]
- Examine the performance of different position control systems. [Apply]
- Compute the unknown values of R, L and C by using a suitable bridge circuit. [Apply]
- Compute iron loss using ring specimen. [Apply]
- Design and test the performance of instrumentation amplifier, A/D and D/A converters under various conditions. [Apply]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2		3												
CO3	3													
CO4	3													
CO5	3													
CO6	3													

21UEE408 **DIGITAL CIRCUITS LABORATORY**

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

- To realize adders, subtractors, flip flops.
- To realize shift registers and counters.
- To assemble digital circuits using ICs and study the performance.

LIST OF EXPERIMENTS

1. Study of logic gates and verification of Boolean Laws.
2. Design of adders and subtractors
3. Design of Encoder and Decoder.
4. Design of code converters.
5. Design of Multiplexers and De-multiplexers.
6. Design of 2-bit and 8-bit magnitude comparators.
7. Study of flip-flops.
8. Design and implementation of counters using flip-flops.
9. Design and implementation of shift registers.
10. Design BCD to seven-segment display using 7447 IC
11. Mini Project.

Total: 30 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Design and implement Combinational Circuits using logic gates [Create]
- Analyze and design sequential circuits using appropriate memory elements. [Create]
- Construct and verify combinational circuits using MSI devices. [Apply]
- Demonstrate proficiency in digital circuits by designing and implementing project based circuits. [Create]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2		3												
CO3	3													
CO4			3							3				1

21UGM431	GENDER EQUALITY	L	T	P	C
		1	0	0	P/F

COURSE OBJECTIVES:

- To introduce basic concepts relating to gender and to provide logical understanding of gender roles.

UNIT I GENDER SENSITIZATION 5

Definition of gender, Perspectives-Gender sensitive approach- Gender and sex- Social construction of gender and gender roles- Socialization- institutions of socialization- changing content and context of gender-need for re-socialization. Gender Stereotyping and Gender Discrimination.

UNIT II GENDER EQUALITY AND CONSTITUTION 5

Indian constitution related to equality - Fundamental rights - Directive principles of state policy - right to equality - rights against exploitation - cultural and educational rights - the right to constitutional remedy - University Declaration of Human Rights - Enforcement of Human Rights for Women and Children - Role of Cells and Counselling Centres - Internal Complaints Committee - Legal AID cells, Help line, State and National level Commission.

UNIT III GENDER ROLES & EQUALITY 5

Gender & Morality–Structural and functionalist views of Gender- Gender in the Classroom-Beyond access for girls and boys-Gender equality in schools-Gender equality and adult basic education-Developing capacity to achieve gender equality in education-Individuality and removal of gender stereotypes- Respect for each other's-Promote equal Opportunity.

Total: 15 Periods

REFERENCE BOOKS:

1. Sheila Aikman and Elaine Unterhalter, "Practising Gender Equality in Education", Oxfam GB, 2007.
2. Pasadena and Hackensack, "Gender roles and Equality", Salem Press, 2011.

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Describe the social construction of gender and sexuality and their influence in social context. [Understand]
- Analyze how the concepts of gender equality are created, maintained, and/or challenged. [Analyze]
- Apply concepts of gender roles and equality in classroom, school, disciplinary or interdisciplinary creative, scholarly, and/or activist project. [Apply]

Semester V

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UEE501	Power Electronics	3	0	0	3	PC
21UEE502	Power System Analysis	3	1	0	4	PC
21UEE503	Microprocessor and Microcontroller Programming	3	0	0	3	PC
21UEE504	Internet of Things for Electrical Automation	3	0	0	3	PC
PE1	Professional Elective–I	3	0	0	3	PE
OE1	Open Elective–I	3	0	0	3	OE
PRACTICAL						
21UGS532	Soft Skills Laboratory (Common to CSE,IT,CSBS,AIDS,EEE, CSD &AGRI)	0	0	2	1	HSS
21UEE507	Creative Thinking and Innovation	0	0	2	1	PW
21UEE508	Power Electronics Laboratory	0	0	3	1.5	PC
21UEE509	Microprocessor and Microcontroller Programming Laboratory	0	0	3	1.5	PC
MANDATORY						
21UGT140	தமிழர மரபு / Heritage of Tamils (Common to all)	1	0	0	1	MC
	TOTAL	**19**	**1**	**10**	**25**	
Total No of Credits – 25						

21UEE501	POWER ELECTRONICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Different types of power switching devices and their static characteristics
- Operation, characteristics and performance parameters of phase controlled converters
- Operation and basics topologies of DC-DC Converters
- Different modulation techniques of pulse width modulated inverters
- Operation of AC voltage controller and various configurations.
- Applications of power electronic converters

UNIT I Power switching Devices 9

SCR, TRIAC, GTO, BJT, MOSFET, IGBT - Static characteristics; Firing circuit for thyristor; Voltage and current commutation of a thyristor; Gate drive circuits for MOSFET and IGBT.

UNIT II Phase controlled Converters 9

2-pulse, 3-pulse and 6-pulseconverters with R load and highly inductive load– performance parameters –Effect of source inductance–Dual converters; Applications-light dimmer, Solar PV systems

UNIT III DC-DC Converters 9

Elementary chopper with an active switch and diode, concepts of duty ratio and average voltage; power circuit of a buck, boost and Buck boost converter: analysis and waveforms at steady state; Introduction to resonant converters; Applications-Battery operated vehicles

UNIT IV Inverters 9

Power circuit and operation of single and three phase voltage source inverter; instantaneous output voltage; Harmonic Control; PWM techniques: Single PWM, Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM; Introduction to space vector modulation; Current source inverter- ASCI; Applications-Induction heating, UPS.

UNIT V AC to AC Converters 9

Single phase and Three phase AC voltage controllers; Control strategy- Power Factor Control, Multistage sequence control; single phase and three phase cyclo converters ; Introduction to Matrix converters; Applications –welding.

Total: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Explain the switching characteristics of various power-switching devices and their application in phase-controlled converters [Understand]
- Design the Converters and Inverters by applying various control strategies for a given practical application using Matlab. [Create]
- Sketch the input and output waveforms of power electronics converter under various load condition [Apply]
- Analyze the various performance parameters of Converters and Inverters with its standard values. [Analyze]
- Select appropriate power electronic converters and control strategies for specific applications, considering performance requirements, technological advancements and cost constraints. [Evaluate]
- Make an effective communication in a team to demonstrate the role of power electronics applications in the aspect of energy conservation, societal, environmental and ethical standards.

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2			3		3									3
CO3	3													3
CO4		3												3
CO5				3							2	3		3
CO6						3	3	3	3	3				

TEXT BOOKS:

1. M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, Third Edition, New Delhi, 2004.

2. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition, 2003.

3. Ashfaq Ahmed 'Power Electronics for Technology', Pearson Education, Indian reprint, 2003.

REFERENCE BOOKS:

1. Joseph Vithayathil,' Power Electronics, Principles and Applications', McGraw Hill Series, 6th Reprint, 2013.

2. L. Umanand, "Power Electronics Essentials and Applications", Wiley, 2010.

3. Ned Mohan Tore. M. Undel and, William. P. Robbins, 'Power Electronics: Converters, Applications and Design', John Wiley and sons, third edition, 2003.

4. S.Rama Reddy, 'Fundamentals of Power Electronics', Narosa Publications, 2014.

5. M.D. Singh and K.B. Khanchandani, "Power Electronics," McGraw Hill India, 2013.

21UEE502	POWER SYSTEM ANALYSIS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To model various power system components and carry out load flow, short circuit and stability studies

PREREQUISITE: Linear Algebra, Partial Differential Equations, Knowledge in circuit theory, Transmission and Distribution

UNIT I INTRODUCTION 9+3

Structure and restructure of Power system - Electricity market entities and model- Benefits of deregulation- Basic Components of a power system and its modelling - Single line diagram – Impedance diagram – Reactance diagram - Per Phase Analysis -Per unit system - Simple bus building algorithms for the formation of Y-Bus matrix – Applications of Power System Analysis.

UNIT II POWER FLOW ANALYSIS 9+3

Importance of power flow analysis in planning and operation of power systems-Statement of power flow problem – Bus Classifications – power flow solution methods - Gauss Seidal method - Newton Raphson method (polar form) - Fast decoupled method – Comparison of all the methods.

UNIT III SYMMETRICAL FAULT ANALYSIS 9+3

Need of short circuit analysis - Symmetrical three phase fault- Short circuit capacity- Bus building algorithm for the formulation of Z – Bus matrix - systematic fault analysis using bus impedance matrix.

UNIT IV UNSYMMETRICAL FAULT ANALYSIS 9+3

Introduction to symmetrical components – sequence impedances – sequence networks representation of single line to ground fault, line to line fault and Double line to ground fault.

UNIT V POWER SYSTEM STABILITY ANALYSIS 9+3

Importance of stability analysis in power system planning and operation – Types of stability - Basic concepts and definitions – Rotor angle stability - Swing equation- Solution of swing equation by step by step method – An elementary view of transient stability – Equal area criterion – critical clearing angle and time- Numerical integration methods (Algorithm and flow chart) for multi-machine stability analysis – Euler method – modified Euler method – Real time stability analysis – Introduction to Advanced Power System Analysis.

Total: 60 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Understand the structure and restructuring of power system and need of load flow analysis, short circuit analysis and stability analysis. (Understand)
- Use simulation tools to perform comprehensive load flow studies, short circuit studies and stability studies.(Apply)
- Develop reactance diagram of given power system. [Apply]
- Analyse a power system network under symmetrical and unsymmetrical fault condition and interpret the results (Analyse)
- Analyze the stability of the power system during steady and transient operations for power system planning and operation. [Analyze]
- Choose appropriate numerical methods to solve the power flow problem by interpreting its results. (Evaluate)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2	3				3									
CO3	3													
CO4		3												
CO5		3				2								
CO6				3										

TEXT BOOKS:

1. Nagrath I.J. Kothari D.P, “Modern Power System Analysis”, Tata McGraw-Hill, Forth Edition, 2011.
2. John J.Grainger and W.D.Stevenson Jr., “Power System Analysis”, Tata McGraw-Hill, Sixth reprint, 2010.

REFERENCE BOOKS:

1. HadiSaadat, “Power System Analysis”, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.
2. Kundur P. “Power System Stability and Control”, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.
3. Olle. I. Elgerd, “Electric Energy Systems Theory – An Introduction”, Tata McGraw Hill Publishing Company Limited, New Delhi, Second Edition, 2012.
4. P.Venkatesh, B.V.Manikandan, S.Charles Raja, A.Srinivasan, “Electrical Power Systems Analysis, Security and Deregulation”, PHI Learning Private Limited, New Delhi, 2012.

21UEE503	MICROPROCESSOR AND MICROCONTROLLER PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce students with the architecture and operation of typical microprocessors and microcontrollers.
- To familiarize the students with the programming and interfacing of microprocessors and microcontrollers.
- To provide strong foundation for designing real world applications using microprocessors and microcontrollers.
- To introduce Arduino and beagle boards

Unit I 8085 Microprocessor 9

Introduction and brief history of Microprocessors – Architecture of 8085 Microprocessor – CPU module – Bus Configuration of 8085 – Addressing Mode – Instruction format – Instruction set of 8085 Microprocessor – some basic examples – Subroutine & stack – Timing diagram.

Unit II 8051 Microcontroller 9

8051 Architecture – Pin details – Parallel Ports – Counters/Timers – Interrupts – Addressing modes – Instruction set of 8051 – Basic Assembly language Programming – Arithmetic operations, Code conversions, Sorting – Look up tables – Timer and serial port programming.

Unit III Peripheral Interface IC's 9

External Memory RAM, ROM Interface – Serial Communication (8251) – Parallel Communication (8255) – Programmable Keyboard and Display controller (8279) –UART (8250) - DMA Controller (8237) – ADC – DAC Interface to 8051.

Unit IV 8051 Embedded 'C' Programming 9

Introduction to IDE – Embedded C Data types – Programming structure – reading and writing data from/to parallel ports – Timer/Counter programming – Interrupt handling – Serial port programming.

Unit V Advanced microcontrollers 9

PIC 16F877 microcontroller – Architecture – On chip ADC – Capture/Compare/PWM Module – I2C – SPI – Watchdog timer – ARM7 (LPC2148) microcontroller – Architecture and applications.

Total: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Illustrate the architecture, interfacing and programming concepts of Microprocessor and Microcontroller. [Understand]

- Develop an assembly language program for microprocessor and microcontroller based applications. [Apply]
- Select a suitable IC for peripheral interfacing with microprocessor for a given application. [Apply]
- Compare the requirements of a given application based on the features of suitable processor / controller and technological advancements for effective implementation of the system. [Analyze]
- Develop Microcontroller based system using C for real world applications with the economical and resource considerations. [Create]
- Make an effective communication and presentation in a team to demonstrate the concepts of Microprocessor and Microcontroller. [Affective Domain]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2	3													
CO3	3													
CO4		3										3		
CO5			3		3						3			1
CO6									3	3				

TEXT BOOKS:

1. Ramesh Gaonkar, “Microprocessor Architecture, Programming and Applications with 8085”, 5th Edition, PIP Publication.
2. N.Senthil kumar, M.Saravanan, S.Jeevanandhan, “Microprocessors and Microcontrollers”, Oxford university press, 2010.
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, and Rolin D. McKinlay, “The 8051 Microcontroller and Embedded Systems”, second edition, By © 2005 Pearson Education, Inc.
4. Ajay V.Deshmukh, “Microcontrollers - Theory and applications”, Tata McGraw-Hill, publisher,2005.
5. Steve Furber, “ARM System-on-Chip Architecture”, Pearson Education, ISBN978-81- 317-0840-8, 2E, 2012.
6. John B.Peatman, “Design with PIC Microcontrollers”, Pearson Education, 2002.

REFERENCE BOOKS:

1. S K Mandal, “Microprocessors and Microcontrollers”, WBUT Series by Tata McGraw-Hill publisher.
2. Kenneth .J. Ayala, “The 8051 Microcontroller, Architecture, Programming & Applications”, Third edition, Penram International, India (2004).
3. P.S.Manoharan, P.S.Kannan, “Microcontroller based system design”, Scitech Publications Pvt. Ltd., Chennai, 2007.
4. Andrew N. Sloss, “ARM System Developer‟s guide”, ELSEVIER Publications, ISBN 978-81-8147-646-3, 2016
5. Shibu K V, “Introduction to Embedded Systems”, Tata McGraw Hill Education Private Limited, 2009.
6. http://www.nxp.com/documents/data_sheet/LPC2141_42_44_46_48.pdf

21UEE504	INTERNET OF THINGS FOR ELECTRICAL AUTOMATION	L	T	P	C
		3	0	0	3

UNIT I Introduction to IoT **9**

Internet of Things Architecture, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs, Introduction to Python, Introduction to different IoT tools.

UNIT II Sensors **9**

Sensors: Working Principles: Different types; Selection of Sensors for Practical ApplicationsDifferent Types of Sensors : Capacitive, Resistive, Surface Acoustic Wave for Temperature, Pressure, Humidity, Toxic Gas etc

Mechanical and Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges, Inductive Sensors- Sensitivity and Linearity of the Sensor, Types- Capacitive Sensors, Electrostatic Transducer, Force/Stress Sensors using Quartz Resonators, Ultrasonic Sensors.

UNIT III Actuators **9**

Electrical Actuation Systems, Electrical systems, Mechanical switches, Solid-state switches, Solenoids, D.C. Motors, A.C. Motors, Stepper motors.

UNIT IV Building Iot With Raspberry Pi & Arduino **9**

Building IOT with RASPERRY PI- IOT Systems –Embedded computing logic-Microcontroller, system on chips –Arduino – Board details, IDE programming.

UNIT V Case Studies and Real-World Applications **9**

Case study: Study of Smart City and its Design - Applications - Industrial automation, smart grid, Smart Lighting, Smart Traffic Control, Electrical Vehicle Charging

Total: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Understand the fundamental concepts, sensing techniques and actuation methods used in IoT applications for electrical automation. [Understand]
- Identify an IoT-based solutions using sensors, actuators, and microcontrollers for specific electrical automation tasks. [Apply]
- Analyze various IoT solutions using Raspberry Pi and Arduino platforms for electrical automation. [Analyze]

- Analyze the effectiveness and limitations of IoT applications in electrical automation. [Analyze]
    - Evaluate the ethical, societal implications and adaptability of IoT system in electrical automation for sustainable development [Evaluate]
    - Develop an electrical system using IoT for real world applications with the economical and resource considerations. [Create]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2	3													
CO3		3			3									
CO4		3												
CO5				3		3	3	3				3		
CO6			3		3						3			

TEXT BOOKS:

1. D. Patranabis, “Sensors and Transducers”, PHI Learning Private Limited.
2. W. Bolton, “Mechatronics”, Pearson Education Limited.
3. Simon Knight “Arduino for Beginners: Step-by-Step Guide to Arduino”
4. James R. Strickland “Raspberry Pi for Arduino Users” Published by APress 2018

REFERENCE BOOKS:

1. Patranabis, “Sensors and Actuators”, 2nd Edition, PHI, 2013.
2. Vijay Madisetti, ArshdeepBahga, “Internet of Things: A Hands-On Approach”
3. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

21UGS532 SOFT SKILLS LABORATORY

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

- To develop a requisite knowledge in Communication skills and Soft skills.
- To enhance the students' acumen in honing the skills to meet the Global changes and Industrial needs.

Unit I Speaking Skills

Conversational Skills - Self Introduction - Group Discussion - Public Speaking - Presentation Skills

Unit II Writing Skills

Letter Writing – Report Writing – Email Writing – Job Application – Resume Preparation

Unit III Reading and Listening Skills

Reading Comprehension – Enriching Vocabulary – Error Spotting – Listening and Note Taking

Unit IV Soft skills

Professional Ethics – Interpersonal Skills – Stress Management – Leadership Qualities – Time Management – Conflict Resolution

Unit V Interview Skills

Types of Interview – Body Language – Professional Grooming – Basic Etiquette

Total: 30 Periods

COURSE OUTCOMES:

After the successful completion of this course, the students will be able to:

- CO – 1: Students will give oral presentations and improve their reading fluency skills through extensive reading and listening.
- CO – 2: Students will increase their reading speed and comprehension of academic articles by enhancing their vocabulary by keeping a vocabulary journal.
- CO – 3 Students will strengthen their ability to write academic papers, essays, official documents and summaries using the process approach.
- CO – 4: Students will be aware of correct usage of English grammar and develop in writing skills, speaking fluently and comprehend properly

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1										3				
CO2										3				
CO3										3				
CO4										3				

21UEE507 **CREATIVE THINKING AND INNOVATION**

L	T	P	C
0	0	2	1

PREAMBLE:

Creativity is vital in nearly every industry and occupation. Creativity and innovation are key to generation of new ideas and methods of improving goods and services for customer satisfaction. This course enhances the creative thinking and innovation skills of the students. Being creative helps one to be a better problem solver in all areas of life and work.

COURSE OBJECTIVES:

- To develop next generation Entrepreneurs and Creative Leaders to resolve live challenges.
- To transform innovative ideas into successful businesses
- To use a range of creative thinking tools to develop Out of the Box Ideas

Course Content

Introduction to Creativity and Innovation- Creative Techniques - Problem Identification through Brain Storming - Solution Identification through Creative Techniques - Presentation on the Innovative Idea - Market Analysis - Revenue and Business Model - Preparation of promotional aids - Customer Feedback Analysis.

List of Activities:

Duration	What does the Faculty do?	What do the students do?
Week 1	Explains creativity and innovation	Team Formation (Team Size: 3)
Week 2	Explains the Creative Techniques (Through Video / Presentation)	Discovering Consumer Need through Need Analysis (Customer Segment)
Week 3	Facilitates the brain storming	Problem Identification through brain storming
Week 4	Facilitates problem solving	Identify the solution for the chosen problem through creative techniques
Week 5	Evaluates the presentation	Presentation on the Innovative Idea and Value Proposition
Week 6	Evaluates the presentation	Presentation on the Innovative Idea

		and Value Proposition
Week 7	Explains about the Market Research / Competitor Analysis, Revenue Model and Business Model	Market Analysis after the explanation
Week 8	Facilitates the students work	Preparation of Innovation Development Plan, Business Development Plan and Financial Plan
Week 9	Facilitates the students work	Preparing product promotional material
Week 10	Facilitates the students work	Improvement through Feedback

Total: 30 Periods

Assessment Pattern

1. Internal Assessment: Presentation on the Innovative Idea
2. End Semester Assessment:
    - Submission of Business Plan
    - Presentation on My Startup Idea (Evaluator : From Industry)

COURSE OUTCOMES

After successful completion of the course students will be able to:

- Demonstrate the ability to assess societal, health and safety issues and the consequent responsibilities relevant to the professional engineering practice (Valuing – Affective Domain)
- Examine impact on environment and society in the proposed innovative idea and provide solutions for sustainable development (Organization – Affective Domain)
- Adapt themselves to work in a group as a member or a leader for efficiently executing the given task (Organization – Affective Domain)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1						3								
CO2				3			3							
CO3									3					

21UEE508 **POWER ELECTRONICS LABORATORY**

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To demonstrate the performance and characteristics of power semiconductor devices, Phase controlled Converters , DC-DC Converters , inverters and AC to AC Converters

LIST OF EXPERIMENTS

1. Characteristics of SCR ,GTO and TRIAC
2. Characteristics of MOSFET and IGBT .
3. Transient characteristics of SCR and MOSFET
4. AC to DC fully controlled converter
5. AC to DC half-controlled converter
6. Step down and step up MOSFET based choppers
7. Resonant dc-to-dc converter
8. IGBT based single-phase PWM inverter
9. IGBT based three-phase PWM inverter
10. TRIAC based single phase AC voltage controller
11. TRIAC based single phase cyclo converters.
12. Simulation of Power electronic circuits using MATLAB
13. Study of battery charger, UPS and SMPS.

Total: 45 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Examine the performance of converters, chopper and inverter circuits for different loads. [Analyze]
- Examine the performance of AC voltage controller and cyclo converters circuits for control of voltage. [Analyze]
- Design power electronic circuits using MATLAB - Simulink. [Create]
- Develop an effective report and comprehend the technical skill as a team for the given exercise. [Psychomotor Domain]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1		3												
CO2		3												
CO3			3		3									
CO4									3	3				

21UEE509	MICROPROCESSOR AND MICROCONTROLLER PROGRAMMING LABORATORY	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

- To be familiar with the architecture and programming of microprocessor and Microcontrollers.

LIST OF EXPERIMENTS

1. Simple arithmetic operations: addition / subtraction / multiplication / division using 8085.
2. Programming with control instructions:
   Ascending / Descending order, Maximum / Minimum of numbers
3. Programs using Rotate instructions
   Hex / ASCII / BCD code conversions.
4. Interface Experiments: with 8085
   A/D Interfacing. & D/A Interfacing.
   Traffic light controller.
5. Simple arithmetic operations: addition / subtraction / multiplication / division using 8051.
6. Read a key ,interface display
7. Interfacing of Stepper Motor.
8. Write embedded 'C' program to display your NAME in the first row of LCD and simultaneously 'ON' the first row of LEDs. After 10 seconds your REGISTER NUMBER to be displayed in the second row of LCD and simultaneously 'ON' the second row of LEDs. Draw the necessary flowchart.
9. Interface two seven segment LEDs with 8051 and develop embedded C program to display the numbers from 00 to 99in the LEDs.
10. Mini Project.

Total: 45 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Develop an assembly language program for arithmetic operations and data manipulation using 8085 and 8051 instruction set. [Apply]
- Select an appropriate interface for the given application and implement it using 8085 / 8051. [Analyze]
- Develop an embedded C program for interfacing Matrix Keyboard, LCD, DAC, ADC and 7segment LED Display [Apply]
- Recommend a suitable solution for real time problems using microprocessor / microcontroller. [Evaluate]

- Develop an effective report and comprehend the technical skill as a team for the given exercise. [Psychomotor Domain]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2		3												
CO3	3				3									
CO4				3										
CO5									3	3				

21UGT140	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

OBJECTIVES:

- To provide insights regarding the cultural heritage of the Tamil , Sangam Literature and the past History during ancient periods.

UNIT I HERITAGE AND CIVILIZATION OF TAMIL THROUGH ARCHAEOLOGY **4**

Introduction - Basics of archaeology – Historical Source - Archaeological Excavations in Keeladi - Findings based on Keeladi Excavation - Excavations near Mayiladumparai - Excavations near Sivagalai - Excavations at Adichanallur - An Analysis of the excavations in Tamilnadu

UNIT II TAMIL HERITAGE IN SANGAM AGE **5**

Introduction - Sangam Literature - Political History of Sangam Period - Sangam Polity and Administration – Sangam Society - Position of Women during Sangam Age - Economy of the Sangam Age

UNIT III SOURCES OF ANCIENT TAMIL HERITAGE AND HISTORY **4**

Evidences of Tamilakam in Greek and Roman Literature - Archaeological sources - Evidencefor economic activities - Literary sources in Tamil - Literary Evidences about Tamil History in other languages - Epigraphical sources - Cave inscriptions - Pottery inscriptions - Numismatic(Coins) sources

UNIT IV EVIDENCE FOR ANCIENTNESS OF TAMIL LITERAURE AND HERITAGE **4**

Tamil Literature - India’s Earliest Script: Tamili (Tamil Brahmi) - Literary work of AncientTamil - Tolkappiam - Thirukkural & Naladiyar - Tracing Ancient Tamil Literature by U.V. Saminaytha Iyer - Tamil, a Classical Language

Total = 15 periods

Course Outcomes

On successful completion of this course, the students will be able to:

1. Describe the Heritage and Civilization of Tamil through Archaeology.(Understand)
2. Interpret the Tamil Literature and Civilization in historical manner. (Understand)
3. Demonstrate the ability to appreciate the ancientness Tamil heritage and literature.(Apply)
   (Valuing – Affective Domain)
4. Analyze the sources of Tamil Civilization relating to Indus Valley Civilization. (Analyze)

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கக. கக. பிள்ளை(வவியீடு: தமிழ்நாடு பாடநூல் மற்றும்கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முளனவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – ளவளக நதிக்களரயில் சங்ககால நகர நாகரீகம்(வதால்லியல் துளை வவியீடு)
4. வபாருளந – ஆற்ைங்களர நாகரிகம். (வதால்லியல் துளை வவியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (inprint)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published byInternational 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 C ivilization 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).
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

SEMESTER VI

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UEE601	Electric Drives and Control	3	0	0	3	PC
21UEE602	Protection and Switchgear	3	0	0	3	PC
PE-II	Professional Elective–II	3	0	0	3	PE
PE-III	Professional Elective–III	3	0	0	3	PE
OE-II	Open Elective–II	3	0	0	3	OE
PRACTICAL						
21UEE607	Product Development Project (Common to all Branches)	2	0	4	4	PW
21UGS633	Interpersonal Skills Development Lab(Common to CSE,EEE, IT, AGRI,CSBS, AIDS,CSD)	0	0	3	1.5	HSS
21UEE608	Electric Drives and Control Laboratory	0	0	3	1.5	HSS
MANDATORY						
21UGM631	Indian Constitution (Common to all Branches)	1	0	0	P/F	MC
	TOTAL	**18**	**0**	**10**	**22**	
Total No of Credits - 22						

21UEE601 ELECTRIC DRIVES AND CONTROL

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To study the Steady state operation and transient dynamics of a motor load system.
- To Analyze the operation of the converter/chopper fed dc drives
- To Analyze the Operation and performance of AC motor drives.
- To impart knowledge on design of current and speed controllers for a closed loop solid state dc motor drive
- To explain the operation of the converter / chopper fed dc drive and ac drive

UNIT I DRIVE CHARACTERISTICS 9

Introduction to Electric drives – Equations governing motor load dynamics – steady state stability – multi quadrant operation-Modes of operation: acceleration, deceleration, starting & stopping – typical load torque characteristics – Classes of duty and ratings-Selection of motor.

UNIT II CONVERTER / CHOPPER FED DCMOTORDRIVE 9

Steady state analysis of the single and three phase converter fed separately excited DC motor drive– continuous conduction – Time ratio and current limit control – 4 quadrant operation of converter / chopper fed drive-Applications, Microcontroller based control of DC motor drives.

UNIT III INDUCTION MOTOR DRIVES 9

Stator voltage control–V/f control– Rotor Resistance control-qualitative treatment of slip power recovery drives-- voltage/current source inverter fed AC drives- Cycloconverter fed IM drives-closed loop control—— vector control

UNIT IV SYNCHRONOUS MOTORDRIVES 9

V/f control and self-control of synchronous motor: Constant Margin angle control and ower factor control- Three phase voltage/current source fed synchronous motor drive- Cycloconveter fed synchronous motor drive- Applications.

UNIT V DESIGN OF CONTROLLERSFOR DRIVES 9

Transfer function for DC motor / load and converter – closed loop control with Current and speed feedback–armature voltage control and field weakening mode – Design of controllers; current controller and speed controller- converter selection and characteristics.

Total: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Illustrate the steady state operation and transient dynamics of a motor load system [Understand]
- Determine the performance parameters of DC / AC Drives under different load conditions. [Apply]
- Analyze the operation of the converter/chopper fed dc drive [Analyze]
- Analyze the performance of VSI / CSI fed AC drives for industrial applications. [Analyze]
- Design the current and speed controllers for a closed loop solid state DC motor drive.[Create]
- Communicate effectively the significance, social impact and future perspects of DC / AC motor drives in various applications. [Valuing – Affective Domain]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2	3												3	3
CO3		3											3	3
CO4		3											3	3
CO5			2		3								3	3
CO6						3				3		3		

TEXT BOOKS:

1. Gopal K.Dubey, Fundamentals of Electrical Drives, Narosa Publishing House,Reprint 2019.
2. Bimal K.Bose. Modern Power Electronics and AC Drives, Pearson Education,2002.
3. Vedam Subramanyam, " Electric Drives Concepts and Applications ", 2e, McGraw Hill,2016.

REFERENCE BOOKS:

1. Krishnan R, " Electric Motor & Drives Modeling, Analysis and Control ", Prentice Hall of India,2001 Shaahin Felizadeh, "Electric Machines and Drives", CRC Press (Taylor and Francis Group), 2013.
2. N.K. De., P.K. SEN" Electric drives" PHI,2012.
3. Eclayton A. and NNHancock,, "The performance and Design of Direct current Machines",CBS & Distributors Pvt.Ltd, 2004.

21UEE602	PROTECTION AND SWITCHGEAR	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the characteristics and functions of relays and protection schemes
- To impart knowledge on apparatus protection and functioning of circuit breakers
- To introduce static and numerical relays

Unit I PROTECTION SCHEMES 9

Principles and need for protective schemes – nature and causes of faults – types of faults – fault current calculation using symmetrical components – Methods of Neutral grounding – Zones of protection and essential qualities of protection – Protection schemes.

Unit II ELECTROMAGNETIC RELAYS 9

Operating principles of relays - the Universal relay – Torque equation – R-X diagram – Electromagnetic Relays – Over current, Directional, Distance, Differential, Negative sequence and Under frequency relays.

Unit III APPARATUS PROTECTION 9

Current transformers and Potential transformers and their applications in protection schemes - Protection of transformer, generator, motor, bus bars and transmission line.

Unit IV STATIC RELAYS AND NUMERICAL PROTECTION 9

Static relays – Phase, Amplitude Comparators – Synthesis of various relays using Static comparators– Block diagram of Numerical relays – Over current protection, transformer differential protection and distant protection of transmission lines.

Unit V CIRCUIT BREAKERS 9

Physics of arcing phenomenon and arc interruption - DC and AC circuit breaking – re-striking voltage and recovery voltage - rate of rise of recovery voltage - resistance switching - current chopping -interruption of capacitive current - Types of circuit breakers – air blast, air break, oil, SF6 and vacuum circuit breakers – comparison of different circuit breakers – Rating and selection of Circuit breakers. Intelligent Circuit Breakers.

Total: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Explain the functions of protective schemes and switchgears used in the power system [Understand]
- Compute the performance parameters of power system protection under different scenarios. [Apply]
- Choose a suitable static and numerical relays for power system protection. [Apply]
- Analyze different types of faults that occured in high power generator and transformers to identify suitable protective scheme for the safe functioning of industry / soceity. [Analyze]
- Analyze the functions of Circuit breaker for the given condition. [Analyze]
- Make an effective communication and presentation in a team to demonstrate the concepts of Electromagnetic relays and circuit breakers. [Affective Domain]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2	3													
CO3	3													
CO4		3				3								
CO5		3												
CO6									3	3				

TEXT BOOKS:

1. Sunil S.Rao, “Switch gear and Protection”, Khanna Publishers, New Delhi, 2008.
2. Rabindranath B. and Chander N., “Power System Protection and Switchgear”, New Age International (P) Ltd., First Edition 2011.
3. Soni M.L., Gupta P.V., Bhatnagar U.S. and Chakrabarti A., “A Text Book on Power System Engineering”, Dhanpat Rai& Co.,1998.

REFERENCE BOOKS:

1. BadriRam B.H. Vishwakarma, “Power System Protection and Switchgear”, New Age International Pvt Ltd Publishers, Second Edition, 2011.

2. Paithankar Y.G. and Bhide S.R., “Fundamentals of power system protection”, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2010.

3. Wadhwa C.L., “Electrical Power Systems”, 6th Edition, New Age International (P) Ltd., 2010

4. Ravindra P.Singh, “Switchgear and Power System Protection”, PHI Learning Private Ltd., NewDelhi, 2009.

5. BhaveshBhalja, Maheshwari R.P. and Nilesh G. Chotani, “Protection and Switchgear”, Oxford University Press, 2011.

21UEE607 **PRODUCT DEVELOPMENT PROJECT**

L	T	P	C
2	0	4	4

COURSE OBJECTIVES:

- To deepen comprehension of principles by applying them to new technical problems which may be the design, and research investigation of electrical and electronic systems.
- To perform literature survey on recent developments in a selected problem domain.
- To exercise various strategies to find a solution addressing the problem.
- To communicate the work done in written and oral forms.
- To develop a prototype model.

Total: 90 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Identify and formulate the real world problem (Understand)
- Articulate and conceptualize the methodology of the project (Apply)
- Categorize the proper components as per requirements of the design/system (Analyze)
- Apply the new tools, algorithms, methodologies that contribute to obtain the solution of the project (Analyze)
- Design and execute the project using modern tools and demonstrate the working of the model (Create)
- Defend the findings and execute the project with written reports and developed product. (Evaluate)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2		3												
CO3		3									3			
CO4	3		1		3									
CO5			3		3									
CO6				3					3	3				

21UGS633 INTERPERSONAL SKILLS LABORATORY

L	T	P	C
0	0	3	1.5

List of Exercises

Part - A : Communication and Leadership Projects

I) Speech Projects

1. The Open up Speech (Prepared Speech)
2. Speech Organizing to the Point (Prepared Speech)
3. Table Topics Speech

II) Evaluation Projects

4. Speech Evaluation
5. TAG (Timer, Ah Counter and Grammarian) Evaluation

III) Leadership Roles

6. Speech Master of the Day
7. General Evaluator
8. Table Topics Master

Part - B : Problem-Solving and Decision- Making Project

IV) Quality Circle Project

Total: 45 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Communicate orally with fluency and clarity in a given contextual situation (Responding - Affective Domain)
- Evaluate a speech and offer constructive evaluation of the speech (Evaluating - Cognitive Domain)
- Adapt themselves to work in a group as a member or a leader for efficiently executing the given task (Organization – Affective Domain)
- Analyze a problem and find appropriate solution (Analyze - Cognitive Domain)
- Take decision by organizing relevant information and defining alternatives (Create - Cognitive Domain)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1										3				
CO2										3				
CO3									3					
CO4		2												
CO5			2											

21UEE608 ELECTRIC DRIVES AND CONTROL LABORATORY

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To impart knowledge on design of current and speed controllers for a closed loop solid state dc motor drive

LIST OF EXPERIMENTS

1. Simulation of Single Phase Fully Controlled Converter fed DC motor Drive
2. IGBT Chopper Fed DC motor Drive
3. IGBT based Three phase PWM Inverter Fed AC motor Drive
4. Simulation of Three Phase Fully Controlled Converter fed DC motor Drive
5. Simulation of speed of converter/chopper fed DC motor drive
6. Simulation of speed control of VSI fed three-phase induction motor.
7. Micro controller based speed control of Stepper motor.
8. Simulation of speed control of DC motor.
9. Modeling and simulation of Induction Motor using MATLAB
10. Simulation of Single phase AC Voltage Controller fed AC motor drive.
11. DSP based speed control of BLDC motor.
12. Modeling and simulation of Induction Generator using MATLAB

Total: 45 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Simulate the converter fed DC & AC Drives circuits for various control strategies. [Apply]
- Analyze the performance of converter fed dc drives for industrial applications [Analyze]
- Analyze the performance of inverter fed AC drives for industrial applications [Analyze]
- Design closed loop controllers for solid state drives. [Create]
- Develop an effective report and comprehend the technical skill as a team for the given exercise. [Psychomotor Domain]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3				3								3	3
CO2		3											3	3
CO3		3											3	3
CO4			3										3	3
CO5									3	3				

21UGM631	INDIAN CONSTITUTION	L	T	P	C
		1	0	0	P/F

COURSE OBJECTIVES:

- The students will be exposed to fundamental rights & duties in Indian Constitution.
- The students will be given knowledge on the components of the parliamentary system to prepare for the process of their career development.
- The student will have knowledge on powers and functions of Local bodies and Indian polity to appear for various competitive exams such as UPSC, TNPSC and RRB.
- The student will know about the functions of judiciary and electoral process followed in the country.

UNIT I INTRODUCTION ON INDIAN CONSTITUTION 4

Preamble - Salient features of the Constitution of India. Fundamental Rights - its restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) - Fundamental Duties: its Scope and significance in Nation building - Constitution components: schedule, parts and articles of constitution- important Amendments of constitution.

UNIT II PARLIAMENTARY SYSTEM 4

Parliamentary System – parliamentary system of other countries - Indian parliamentary system-Federal System – LS and RS, Centre-State Relations-Election of member of parliaments- Union Executive - President, Prime Minister, Union Cabinet. State Legislature - State Executives –election of MLA- Governor, Chief Minister, State Cabinet.

UNIT III JUDICIARY AND ELECTION COMMISSION 4

Supreme Court of India: Structure, Power and Functions of Supreme Court-- Judicial Reviews - Judicial Activism. High Court and Subordinate Courts: Structure, Power and Functions. – Lok adhalats. Elections- Electoral Process - Election Commission of India - Election Laws – Emergency Provisions - types of Emergencies and its consequences.

UNIT IV LOCAL ADMINISTRATION 3

Local Administration: Powers and functions of Municipalities and Panchayats System- Panchayat Raj- Co–operative Societies and Constitutional and Non-constitutional Bodies.

Total: 15 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Apply knowledge of the fundamental rights and duties prescribed by Indian Constitution to prepare for various competitive examinations.[Apply]
- Manage complex societal issues in society with the knowledge of judiciary and local administration. [Apply]
- Interpret the societal, health, safety, legal and cultural issues with understanding of parliamentary system and electoral process through self-learning skills. [Analyze]
- Understand the ethical responsibilities of municipalities, panchayats and co-operative societies.[Understand]
- Understand and distinguish the functioning of the parliamentary system followed in various countries. [Understand]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1						3								
CO2						3								
CO3						3								
CO4								3						
CO5						3								

TEXT BOOKS:

1) Shubham Singles, Charles E. Haries, et al., “Constitution of India and Professional Ethics” by Cengage Learning India Private Limited, 2018.

2) Subhash C. Kashyap,”Our Constitution: An Introduction to India’s Constitution and constitutional Law”, NBT, 2018.

3) Brij Kishore Sharma,“Introduction to the Constitution of India”, PHI Learning Pvt. Ltd., New Delhi, 2011.

4) M.V.Pylee, “An Introduction to Constitution of India”, Vikas Publishing, 2002.

5) Durga Das Basu, “Introduction to the Constitution on India”, Prentice Hall, 2001.

Semester VII

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
21UME701	Project Management and Finance(Common to All Branches Except CSBS)	3	0	0	3	HSS
21UEE702	Power System Operation and Control	3	1	0	4	PC
PE-IV	Professional Elective–IV	3	0	0	3	PE
PE-V	Professional Elective –V	3	0	0	3	PE
OE-III	Open Elective–III	3	0	0	3	OE
PRACTICAL						
21UEE706	Renewable Energy Laboratory	0	0	3	1.5	PC
21UEE707	Power System Simulation Laboratory	0	0	3	1.5	PC
21UGE710	MDP Phase I	0	0	6	3	PW
MANDATORY						
21UGM731	Sports and Social Development (Common to all)	-	-	-	P/F	MC
21UGM732	Skill Development	-	-	-	P/F	MC
	TOTAL	**15**	**0**	**4**	**19**	
Total No of Credits - 19						

21UME701	PROJECT MANAGEMENT AND FINANCE	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To impart knowledge to find solutions and approaches for various projects.
- To familiarize the utilization of project within time, resource and financial constraints.

UNIT I PROJECT MANAGEMENT CONCEPTS 9

Concept and characteristics of a project, importance of project management, types of project, project organizational structure, project life cycle, Statement of Work, Work Breakdown Structure.

UNIT II PROJECT PLANNING 9

Project Planning and Scheduling techniques - developing the project network using CPM/PERT, Limitations of CPM/PERT, Precedence Diagramming Method, constructing diagram and computations using precedence diagramming method, PERT/CPM simulation, reducing project duration.

UNIT III RESOURCE SCHEDULING & CRITICAL CHAIN SCHEDULING 9

Resource Scheduling - Resource allocation method, splitting and multitasking, Multi project resources scheduling - Critical Chain Scheduling -Concept of critical chain scheduling - critical chain scheduling method, application of Critical chain scheduling and limitations.

UNIT IV PROJECT QUALITY MANAGEMENT 9

Concept of project quality, responsibility for quality in projects, quality management at different stages of project, tools and techniques, Quality Management Systems, TQM in projects - Project Performance Measurement and Control - Monitor and assess project performance, schedule, and cost. Earned Value Management, performance measurement methods to monitor, evaluate and control planned cost and schedule performance - Project Closure/ Termination - Meaning of closure/ termination, project audit process, termination steps, final closure.

UNIT V FINANCIAL ACCOUNTING 9

Balance sheet and related concepts - Profit & Loss Statement and related concepts - Financial Ratio Analysis - Cash flow analysis - Funds flow analysis – Comparative financial statements. Investments - Average rate of return - Payback Period - Net Present Value - Internal rate of return.

Total: 45 Periods

COURSE OUTCOMES:

After successful completion of this course the students will be:

1. Describe the concept and characteristics of project management and application of resource scheduling and critical chain scheduling. (Understand)
2. Estimate the suitable resources required for given project work (Apply)
3. Construct the balance sheet to identify the fund flow and cash flow statements (Apply)
4. Apply the concept of CPM and PERT to develop the project network (Apply)
5. Examine the various tools and techniques at different stages of Quality management. (Analyze)
6. Evaluate the decision related to fore casting, inventory, quality control problems etc. for the industries (Evaluate)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1											3			
CO2											3			
CO3											3			
CO4											3			
CO5		3												
CO6				3			3							

TEXT BOOKS:

1. Prasanna Chandra, "'Fundamentals of Financial Management' ", Tata Mcgraw-Hill Publishing Ltd. 2015.
2. Jack Meredith, Samuel J.Mantel, "Project Management- A Managerial Approach", John Wiley andSons.

REFERENCE BOOKS:

1. Clifford F Gray, Erik W Larson, "Project Management-The Managerial Process ", Tata Mcgraw-Hill Publishing Co Ltd.
2. John M Nicholas, "Project Management For Business And Technology", Prentice Hall of India Pvt Ltd.
3. Paresh Shah, "Basic Financial Accounting for Management", Oxford University Press, 2020.

21UEE702	POWER SYSTEM OPERATION AND CONTROL	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To summarize the power system operation and control
- To impart knowledge on real power-frequency control and reactive power-voltage control
- To introduce the concepts of computer control of power systems

UNIT I INTRODUCTION 9+3

System load variation - load characteristics - load curves and load-duration curve (daily, weekly and annual) - load factor - diversity factor. Importance of load forecasting and simple techniques of forecasting. An overview of power system operation and control.

UNIT II REAL POWER - FREQUENCY CONTROL 9+3

Basics of speed governing mechanism and modeling - Speed-Load characteristics – load sharing between two synchronous machines in parallel. Control area concept LFC control of a single-area system and two-area system.

UNIT III REACTIVE POWER–VOLTAGE CONTROL 9+3

Basics of reactive power control. Excitation systems - generation and absorption of reactive power, Relation between voltage, power and reactive power at a node - Methods of voltage control - tap-changing transformer - SVC (TCR + TSC) and STATCOM – secondary voltage control.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH 9+3

Introduction – incremental cost curve - co-ordination equations without loss and with loss, solution by direct method. (No derivation of loss coefficients). Statement of Unit Commitment problem - Priority-list methods.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 9+3

Need of computer control of power systems - Concept of energy control centre (or) load dispatch centre and the functions - system monitoring - data acquisition and control. System hardware configuration – SCADA and EMS functions. Concept of State Estimation - State transition diagram showing various state transitions and control strategies.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Summarize the technological advancements in computer control strategies for enhancing the security of power system. [Understand]
- Apply the knowledge of load characteristics and load forecasting for the planning of power system operation and control. [Apply]
- Model typical excitation system and select appropriate compensating device for voltage control. [Apply]
- Analyze the static and dynamic load frequency control loops for controlled and uncontrolled power system cases. [Analyze]
- Analyze the parallel operation of synchronous machines by examining their speed load characteristics [Analyze]
- Choose appropriate methods for economic load sharing to enhance economic operation of power system for the benefit of the society. [Evaluate]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1					1							3		
CO2	3										2			
CO3	3		1											
CO4		3												
CO5		3												
CO6				3		3					3			

TEXT BOOKS:

1. Allen. J. Wood. And Bruce F. Wollenberg, " Power Generation, Operation and Control ", John Wiley & Sons,2013.
2. Chakrabarti, Halder, " Power System Analysis: Operation and Control ", Prentice Hall of India, Third edition, 2010.

REFERENCE BOOKS:

1. Kothari D.P. Nagrath I.J, "Modern Power System Analysis ", Tata McGraw Hill Publishing Company Limited, Third Edition, 2003.
2. Grigsby L.L., "The Electric Power Engineering, Hand Book ", CRC Press & IEEE Press, 2001.
3. Hadi Saadat, " Power System Analysis",11th Edition, 2007.
4. Kundur P., " Power System Stability and Control ", MC Craw Hill Publisher, 2006.

21UEE706 **RENEWABLE ENERGY LABORATORY**

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To train the students in Renewable Energy Sources and technologies.
- To provide adequate inputs on a variety of issues in harnessing Renewable Energy.
- To recognize current and possible future role of Renewable energy sources.

LIST OF EXPERIMENTS

1. Simulation study on Solar PV Energy System.
2. Experiment on "VI-Characteristics and Efficiency of 1kWp Solar PV System".
3. Experiment on "Shadowing effect & diode based solution in 1kWp Solar PV System".
4. Experiment on Performance assessment of Grid connected and Standalone 1kWp Solar Power System.
5. Simulation study on Wind Energy Generator.
6. Experiment on Performance assessment of micro Wind Energy Generator.
7. Simulation study on Hybrid (Solar-Wind) Power System.
8. Experiment on Performance Assessment of Hybrid (Solar-Wind) Power System.
9. Experiment on Performance Assessment of 100W Fuel Cell.

Total: 45 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Understand the functioning of various Renewable energy systems. [Understand]
- Apply the knowledge of Renewable Energy technologies for sustainable Energy development. [Apply]
- Analyze the operation and performance characteristics of Renewable Enegy Systems. [Analyze]
- Compare the performance of conventional and recent technologies in renewable energy system. [Analyze]
- Develop an effective report and comprehend the technical skill as a team for the given exercise. [Psychomotor Domain]

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1					3									3
CO2	3				3		3							3
CO3					3		3							3
CO4		3			3							3		
CO5									3	3				

21UEE707 POWER SYSTEM SIMULATION LABORATORY

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To familiarize with the digital simulation of power system problems

LIST OF EXPERIMENTS

1. Computation of Parameters and Modeling of Transmission Lines
2. Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
3. Load Flow Analysis - I : Solution of Load Flow And Related Problems Using Gauss-Seidel Method.
4. Load Flow Analysis - II: Solution of Load Flow and Related Problems using Newton-Raphson and Fast- Decoupled Methods
5. Fault Analysis.
6. Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System
7. Electromagnetic Transients in Power Systems
8. Analysis of System Load Variations.
9. Load – Frequency Dynamics of Single- Area and Two-Area Power Systems
10. Economic Dispatch in Power Systems

Total: 45 Periods

COURSE OUTCOMES

After the successful completion of this course, the student will be able to

- Compute the parameters & modelling of Transmission Line and formation of Bus Admittance & Impedance Matrices. [Apply]
- Compute the fault current under balanced and unbalanced conditions. [Apply]
- Analyze the steady state and transient stability of SMIB and multi machine system for power system planning and operation. [Analyze]
- Analyze the load frequency control of single area and two area system for maintaining the system frequency in power system. [Analyze]
- Compute the solution for economic dispatch problem in power system. [Apply]
- Choose appropriate numerical methods to solve the power flow problem by interpreting its results. (Evaluate)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3				3									
CO2	3				3									
CO3		3			3									
CO4		3			3									
CO5	3				3									
CO6				3	3									

Semester VIII

Course Code	Course Title	L	T	P	C	Type of Course
THEORY						
PE-VI	Professional Elective–VI	3	0	0	3	PE
OE-IV	Open Elective–IV	3	0	0	3	OE
PRACTICAL						
21UEE801	Project work	0	0	16	8	PW
21UGE810	MDP Phase II	0	0	16	8	PW
MANDATORY						
21UGM831	Professional Ethics and Human values (Common to all branches)	2	0	0	P/F	MC
	TOTAL	**8**	**0**	**16**	**14**	
Total No of Credits - 14						

21UEE801	PROJECT WORK	L	T	P	C
		0	0	16	8

OBJECTIVES

To deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer based project or management project.

PROJECT DESCRIPTION

Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project. The progress of the project is evaluated based on a minimum of three reviews.

TOTAL : 360 PERIODS

COURSE OUTCOMES:

After successful completion of this course the students will be able to:

1. Design/Develop sustainable solutions for societal issues with environmental considerations by applying the basic engineering knowledge. [Create]
2. Analyze and review research literature to synthesize research methods including design of experiments to provide valid conclusion. [Analyze]
3. Utilize the new tools, algorithms, techniques to provide valid conclusion following the norms of engineering practice. [Apply]
4. Test and Evaluate the performance of the developed solution using appropriate techniques and tools. [Evaluate]
5. Apply management principles to function effectively in the project team for project execution. [Affective Domain]
6. Engage in learning for effective project implementation in the broadest context of technological change with consideration for public health, safety, cultural and societal needs. [Affective Domain]
7. Write effective reports and make clear presentation to the engineering community and society. [Psychomotor Domain]

CO –PO MAPPING

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3		3				3						3	3
CO2		3		3									3	3
CO3					3			3					3	3
CO4		3			3								3	3
CO5									3		3			
CO6						3	3					3		
CO7										3				

21UGM831	PROFESSIONAL ETHICS AND HUMAN VALUES	L	T	P	C
		2	0	0	P/F

OBJECTIVES :

- To enable the students to create an awareness on Engineering Ethics and Human Values to instill Moral and Social Values and Loyalty and to appreciate the rights of others

UNIT I HUMAN VALUES 7

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS 7

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 4

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 6

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES 6

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL : 30 PERIODS

COURSE OUTCOMES:

After successful completion of this course the students will be able to:

1. Apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1								3						

TEXT BOOKS:

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.
2. 2. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.

REFERENCE BOOKS:

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2009.
3. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.
4. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003
5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6. World Community Service Centre, ‘ Value Education’, Vethathiri publications, Erode, 2011.