CHOICE BASED CREDIT SYSTEM

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

ABOUT THE DEPARTMENT:

The Department of Electrical and Electronics Engineering was established in the year 2002. It offers a UG Course namely B.E Electrical and Electronics Engineering, which was started in the year 2002 with a sanctioned intake of 60. B.E. Electrical and Electronics Engineering was accredited by the National Board of Accreditation for a period of three years (2022-2025). It offers PG Courses, namely, M.E. Power Systems Engineering, which was started in the year 2012 with a sanctioned intake of 18.The department strongly, believes in working towards a goal to make the students from engineer to skilled professional. The department of Electrical and Electronics Engineering in V.S.B. Engineering College is a centre of erudition, where we nurture young talents in different fields of Engineering. Our major emphasis of imparting technical training is to encourage curiosity and innovativeness among our students and lay a foundation from where they can acquire quick learning ability and adapt to the fast changing needs of the industry.

VISION OF THE DEPARTMENT:

- To create dynamic and challenging electrical engineers with social responsibilities.

MISSION OF THE DEPARTMENT:

- To provide technical proficiency by adopting well defined teaching learning process.
- To create an environment to practice ethical codes.
- To prepare the graduates to be professionally competent to meet out the industrial needs.
- To motivate the students to pursue higher studies and research activities.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO #1: Have a successful career in core and allied engineering or associated industries or in higher education or as entrepreneurs or in research.

PEO#2: Provide the optimal solution for complex engineering problems in chosen Technical areas.

PEO#3: Exhibit continuous improvement in their profession through life-long learning.

PROGRAMME OUTCOMES (POs):

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

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

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

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities.

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

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

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **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.

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

12. **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.

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: Provide optimal solution in the field of Power sector.

PSO2: Apply suitable Electronic controllers for Power conversion, Control and Automation.

PSO3: Make use of appropriate technique and modern tools to analyze and evaluate the performance of Electrical machines and Electronic circuits

PROPOSED CURRICULUM AND SYLLABI AFTER IMPLEMENTATION OF AUTONOMOUS CHOICE BASED CREDIT SYSTEM

B.E ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM FOR SEMESTERS I TO VIII AND SYLLABI FOR SEMESTER I AND II

SEMESTER – I

S.NO.	COURSE CODE	COURSE TITLE	CATE-GORY	Int/Ext	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
					L	T	P		
1.	23IP101	Induction Programme				-	-	-	0
THEORY									
2.	23HST101	Professional English-I	HSMC	40/60	3	0	0	3	3
3.	23MAT101	Matrices and Calculus	BSC	40/60	3	1	0	4	4
4.	23PHT101	Engineering Physics	BSC	40/60	3	0	0	3	3
5.	23CYT101	Engineering Chemistry	BSC	40/60	3	0	0	3	3
6.	23GET101	Programming in C	ESC	40/60	3	0	0	3	3
7.	23GET102	தமிழர் மரபு / Heritage of Tamils	HSMC	40/60	1	0	0	1	1
PRACTICALS									
8.	23GEP101	Programming in C Laboratory	ESC	60/40	0	0	4	4	2
9.	23BSP101	Physics and Chemistry Laboratory	BSC	60/40	0	0	4	4	2
10.	23HSP102	English Laboratory $	EEC	60/40	0	0	2	2	1
				Total	**16**	**1**	**10**	**27**	**22**

$ Skill Based Course

SEMESTER – II

S.NO.	COURSE CODE	COURSE TITLE	CATE-GORY	Int/Ext	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
					L	T	P		
THEORY									
1.	23HST201	Professional English-II	HSMC	40/60	2	0	0	2	2
2.	23MAT202	Laplace Transform and Numerical methods	BSC	40/60	3	1	0	4	4
3.	23PHT203	Physics for Electrical Engineering	BSC	40/60	3	0	0	3	3
4.	23BET201	Basic Civil and Mechanical Engineering	ESC	40/60	3	0	0	3	3
5.	23GET201	Engineering Graphics	ESC	40/60	2	0	4	6	4
6.	23EET201	Electric Circuit Analysis	PCC	40/60	3	1	0	4	4
7.		NCC Credit Course Level1#	-	40/60	2	0	0	2	2#
8.	23GET202	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	40/60	1	0	0	1	1
PRACTICALS									
9.	23EEP201	Electric Circuits Laboratory	PCC	60/40	0	0	4	4	2
10.	23GEP201	Engineering Practices Laboratory	ESC	60/40	0	0	4	4	2
11.	23GEP202	Communication Laboratory/ Foreign Language$	EEC	60/40	0	0	4	4	2
Total					**17**	**2**	**16**	**35**	**27**

 # NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.
$ Skill Based Course

SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	Int/Ext	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
					L	T	P		
THEORY									
1.	23MAT301	Transforms and Partial Differential Equations	BSC	40/60	3	1	0	4	4
2.	23EET301	Electromagnetic Fields	PCC	40/60	3	0	0	3	3
3	23EET302	Electrical Machines - I	PCC	40/60	3	1	0	4	4
4.	23EET303	Electron Devices and Circuits	PCC	40/60	3	0	0	3	3
5.	23EET304	Digital Logic Circuits	PCC	40/60	3	0	0	3	3
6.	23CST201	Problem Solving and Python Programming	PCC	40/60	3	0	0	3	3
PRACTICALS									
7.	23EEP301	Electrical Machines Laboratory – I	PCC	60/40	0	0	3	3	1.5
8.	23EEP302	Electronic Devices and Circuits Laboratory	PCC	60/40	0	0	3	3	1.5
9.	23CSP201	Problem Solving and Python Programming laboratory	PCC	60/40	0	0	3	3	1.5
10.	23GEP301	Professional Development[$]	EEC	100	0	0	2	2	1
Total					**18**	**2**	**11**	**31**	**25.5**

$ Skill Based Course

SEMESTER IV

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	Int/Ext	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
					L	T	P		
THEORY									
1.	23GET401	Environmental Science and Engineering	BSC	40/60	2	0	0	2	2
2.	23EET401	Electrical Machines - II	PCC	40/60	3	0	0	3	3
3.	23EET402	Transmission and Distribution	PCC	40/60	3	0	0	3	3
4.	23EET403	Control System	PCC	40/60	3	0	0	3	3
5.	23EET404	Linear Integrated Circuits	PCC	40/60	3	0	0	3	3
6.	23EET405	Measurements and Instrumentation	PCC	40/60	3	0	0	3	3
7.		NCC Credit Course Level 2#			3	0	0	3	3#
PRACTICALS									
8.	23EEP401	Electrical Machines Laboratory - II	PCC	60/40	0	0	4	4	2
9.	23EEP402	Control and Instrumentation Laboratory	PCC	60/40	0	0	4	4	2
10.	23EEP403	Linear and Digital Circuits Laboratory	PCC	60/40	0	0	3	3	1.5
				TOTAL	**17**	**0**	**11**	**28**	**22.5**

 # NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

SEMESTER V

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	Int/Ext	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
					L	T	P		
THEORY									
1.	23EET501	Power System Analysis	PCC	40/60	3	0	0	3	3
2.	23EET502	Power Electronics	PCC	40/60	3	0	0	3	3
3.	23EET503	Microprocessor and Microcontroller	PCC	40/60	3	0	0	3	3
4.		Professional Elective I	PEC	40/60	3	0	0	3	3
5.		Professional Elective II	PEC	40/60	3	0	0	3	3
6.		Professional Elective III	PEC	40/60	3	0	0	3	3
7.		Mandatory Course-I[&]	MC		3	0	0	3	0
PRACTICALS									
8.	23EEP501	Power Electronics Laboratory	PCC	60/40	0	0	4	4	2
9.	23EEP502	Microprocessor and Microcontroller laboratory	PCC	60/40	0	0	4	4	2
				TOTAL	**21**	**0**	**8**	**29**	**22**

[&] Mandatory Course-I is a Non-credit Course (Student shall select one course from the list given under MC-I)

SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	Int/Ext	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
					L	T	P		
THEORY									
1.	23EET601	Protection and Switchgear	PCC	40/60	3	0	0	3	3
2.	23EET602	Power System Operation and Control	PCC	40/60	3	0	0	3	3
3.		Open Elective – I*	OEC	40/60	3	0	0	3	3
4.		Professional Elective IV	PEC	40/60	3	0	0	3	3
5.		Professional Elective V	PEC	40/60	3	0	0	3	3
6.		Professional Elective VI	PEC	40/60	3	0	0	3	3
7.		Mandatory Course-II[&]	MC		3	0	0	3	0
8.		NCC Credit Course Level 3[#]			3	0	0	3	3[#]
PRACTICALS									
9.	23EEP601	Power System Laboratory	PCC	60/40	0	0	4	4	2
TOTAL					**21**	**0**	**4**	**25**	**20**

*** Open Elective – I shall be chosen from the emerging technologies**

[&] Mandatory Course-II is a Non-credit Course (Student Shall select one course from the list given under MC-II)

 # NCC Credit Course level 3 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA

SEMESTER VII/VIII *

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	Int/Ext	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
					L	T	P		
THEORY									
1.	23EET701	Renewable Energy Systems	PCC	40/60	3	0	0	3	3
2.	23GET701	Human Values and Ethics	HSMC	40/60	2	0	0	2	2
3.		Elective – Management[#]	HSMC	40/60	3	0	0	3	3
4.		Open Elective – II**	OEC	40/60	3	0	0	3	3
5.		Open Elective – III ***	OEC	40/60	3	0	0	3	3
6.		Open Elective – IV ***	OEC	40/60	3	0	0	3	3
7		Professional Elective VII	PEC	40/60	3	0	0	3	3
				TOTAL	**20**	**0**	**0**	**20**	**20**

***If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII.**
[#] Elective - Management shall be chosen from the Elective Management Courses
****Open Elective – II shall be chosen from the emerging technologies**
*****Open Elective III and IV (shall be chosen from the list of open electives offered by other Programmes).**

SEMESTER VIII/VII*

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	Int/Ext	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
					L	T	P		
PRACTICALS									
1.	23EEP801	Project Work / Internship	EEC	60/40	0	0	20	20	10
TOTAL					**0**	**0**	**20**	**20**	**10**

***If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII.**

TOTAL CREDITS: 169

MANDATORY COURSES I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23MXT01	Introduction to Women and Gender Studies	MC	3	0	0	3	0
2.	23MXT02	Elements of Literature	MC	3	0	0	3	
3.	23MXT03	Film Appreciation	MC	3	0	0	3	
4.	23MXT04	Disaster Management	MC	3	0	0	3	

MANDATORY COURSES II

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23MXT05	Well Being with Traditional Practices (Yoga, Ayurveda and Siddha)	MC	3	0	0	3	0
2.	23MXT06	History of Science and Technology in India	MC	3	0	0	3	
3.	23MXT07	Political and Economic Thought for a Humane Society	MC	3	0	0	3	
4.	23MXT08	State, Nation Building and Politics in India	MC	3	0	0	3	
5.	23MXT09	Industrial Safety	MC	3	0	0	3	

ELECTIVE - MANAGEMENT COURSES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTA CONTACT PERIODS	CREDITS
				L	T	P		
1.	23GET01	Principles of Management	HSMC	3	0	0	3	3
2.	23GET02	Total Quality Management	HSMC	3	0	0	3	3
3.	23GET03	Engineering Economics and Financial Accounting	HSMC	3	0	0	3	3
4.	23GET04	Human Resource Management	HSMC	3	0	0	3	3
5.	23GET05	Knowledge Management	HSMC	3	0	0	3	3
6.	23GET06	Industrial Management	HSMC	3	0	0	3	3

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Professional Elective	Vertical I Power Engineering	Vertical II Converters and Drives	Vertical III Embedded Systems	Vertical IV Electric Vehicle Technology	Vertical V Advanced Control	Vertical VI (Diversified Courses)
1.	Utilization and Conservation of Electrical Energy	Special Electrical Machines	Embedded System Design	Electric Vehicle Architecture	Process Modeling and Simulation	Energy Storage Systems
2.	Under Ground Cable Engineering	Analysis of Electrical Machines	Embedded C-Programming	Design of Motor and Power Converters for Electric Vehicles	Computer Control of Processes	Hybrid Energy Technology
3.	Substation Engineering and Substation and Substation Automation	Multilevel Power Converters	Embedded Processors	Electric Vehicle Design, Mechanics and Control	System Identification	Design and Modelling of Renewable Energy Systems
4.	HVDC and FACTS	Electrical Drives	Embedded Control for Electrical Drives	Design of Electric Vehicle Charging System	Model Based Control	Grid integrating Techniques and Challenges
5.	Energy Management andAuditing	SMPS and UPS	Smart System Automation	Testing of Electric Vehicles	Non Linear Control	Sustainable and Environmental Friendly HV Insulation System
6.	Power Quality	Power Electronics for Renewable Energy Systems	Embedded System for Automotive Applications.	Grid Integration of Electric Vehicles	Optimal Control	Power System Transients
7.	Smart Grids	Control of Power Electronics Circuits	VLSI Design	Intelligent control of Electric Vehicles.	Adaptive Control	PLC Programming
8.	Restructured Power Market	-	MEMS and NEMS	Battery Management Systems	Machine Monitoring System	Big Data Analytics
9.	-	-	Digital Signal Processing System	-	-	AI in Electrical Engineering

Registration of Professional Elective Courses from Verticals:

Professional Elective Courses will be registered in Semesters V and VI. These courses are listed in groups called verticals that represent a particular area of specialisation / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI.

The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E/B.Tech (Honours) or Minor degree also. For more details on B.E./B.Tech (Honours) or Minor degree refer to the Regulations 2021, Clause 4.10.

Total number of courses per vertical may change in the each programme of study as 6 or 7 or 8. If there is shortage of courses in a vertical the same may be chosen from another vertical of the same programme.

PROFESSIONAL ELECTIVE COURSES : VERTICALS

VERTICAL I : POWER ENGINEERING

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23EET01	Utilization and Conservation of ElectricalEnergy	PEC	3	0	0	3	3
2.	23EET02	Under Ground CableEngineering	PEC	3	0	0	3	3
3.	23EET03	Substation Engineeringand Substation and Substation Automation	PEC	3	0	0	3	3
4.	23EET04	HVDC and FACTS	PEC	2	0	2	4	3
5.	23EET05	Energy Management andAuditing	PEC	3	0	0	3	3
6.	23EET06	Power Quality	PEC	3	0	0	3	3
7.	23EET07	Smart Grids	PEC	3	0	0	3	3
8.	23EET08	Restructured PowerMarket	PEC	3	0	0	3	3

VERTICAL II : CONVERTERS AND DRIVES

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23EET09	Special Electrical Machines	PEC	2	0	2	4	3
2.	23EET10	Analysis of Electrical Machines	PEC	2	0	2	4	3
3.	23EET11	Multilevel Power Converters	PEC	2	0	2	4	3
4.	23EET12	Electrical Drives	PEC	2	0	2	4	3
5.	23EET13	SMPS and UPS	PEC	2	0	2	4	3
6.	23EET14	Power Electronics for Renewable Energy Systems	PEC	2	0	2	4	3
7.	23EET15	Control of Power Electronics Circuits	PEC	1	0	4	5	3

VERTICAL III : EMBEDDED SYSTEMS

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23EET16	Embedded System Design	PEC	2	0	2	4	3
2.	23EET17	Embedded C-programming	PEC	2	0	2	4	3
3.	23EET18	Embedded Processors	PEC	2	0	2	4	3
4.	23EET19	Embedded Control for Electrical Drives	PEC	2	0	2	4	3
5.	23EET20	Smart System Automation	PEC	2	0	2	4	3
6.	23EET21	Embedded System for Automotive Applications.	PEC	2	0	2	4	3
7.	23EET22	VLSI Design	PEC	2	0	2	4	3
8.	23EET23	MEMS and NEMS	PEC	2	0	2	4	3
9.	23EET24	Digital Signal ProcessingSystem	PEC	2	0	2	4	3

VERTICAL IV : ELECTRIC VEHICLE TECHNOLOGY

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23EET25	Electric Vehicle Architecture	PEC	2	0	2	4	3
2.	23EET26	Design of Motor and Power Converters for Electric Vehicles	PEC	1	0	4	5	3
3.	23EET27	Electric Vehicle Design, Mechanics and Control	PEC	2	0	2	4	3
4.	23EET28	Design of Electric Vehicle Charging System	PEC	2	0	2	4	3
5.	23EET29	Testing of Electric Vehicles	PEC	3	0	0	3	3
6.	23EET30	Grid Integration of Electric Vehicles	PEC	3	0	0	3	3
7.	23EET31	Intelligent Control ofElectric Vehicles	PEC	1	0	4	5	3

VERTICAL V : ADVANCED CONTROL

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23EET32	Process Modeling andSimulation	PEC	3	0	0	3	3
2.	23EET33	Computer Control of Processes	PEC	3	0	0	3	3
3.	23EET34	System Identification	PEC	3	0	0	3	3
4.	23EET35	Model Based Control	PEC	3	0	0	3	3
5.	23EET36	Nonlinear Control	PEC	3	0	0	3	3
6.	23EET37	Optimal Control	PEC	3	0	0	3	3
7.	23EET38	Adaptive Control	PEC	3	0	0	3	3
8.	23EET39	Machine Monitoring System	PEC	3	0	0	3	3

VERTICAL VI - (DIVERSIFIED COURSES)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23EET40	Energy Storage Systems	PEC	3	0	0	3	3
2.	23EET41	Hybrid Energy Technology	PEC	2	0	2	4	3
3.	23EET42	Design and Modeling of Renewable Energy Systems	PEC	2	0	2	4	3
4.	23EET43	Grid integrating Techniques and Challenges	PEC	2	0	2	4	3
5.	23EET44	Sustainable and Environmental Friendly HV Insulation System	PEC	3	0	0	3	3
6.	23EET45	Power System Transients	PEC	3	0	0	3	3
7.	23EET46	PLC Programming	PEC	3	0	0	3	3
8.	23EET47	Big Data Analytics	PEC	3	0	0	3	3

OPEN ELECTIVES

(Students shall choose the open elective courses, such that the course contents are notsimilar to any other course contents/title under other course categories).

OPEN ELECTIVE I AND II

(EMERGING TECHNOLOGIES)

To be offered other than Faculty of Information and Communication Engineering

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23OCST351	Artificial Intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2.	23OCST352	IoT Concepts and Applications	OEC	2	0	2	4	3
3.	23OCST353	Data Science Fundamentals	OEC	2	0	2	4	3
4.	23OCST354	Augmented and Virtual Reality	OEC	2	0	2	4	3
5	23OCST355	Data structures in Programming	OEC	2	0	2	4	3

OPEN ELECTIVES – III

SL. NO.	COURSE CODE	COURSE TITSLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23OHST351	English for Competitive Examinations	OEC	3	0	0	3	3
2.	23OMGT352	NGOs and Sustainable Development	OEC	3	0	0	3	3
3.	23OMGT353	Democracy and Good Governance	OEC	3	0	0	3	3
4.	23OMET353	Renewable Energy Technologies	OEC	3	0	0	3	3
5.	23OMET354	Applied Design Thinking	OEC	2	0	2	4	3
6.	23OMFT351	Reverse Engineering	OEC	3	0	0	3	3
7.	23OMFT353	Sustainable Manufacturing	OEC	3	0	0	3	3
8.	23OAUT351	Electric and Hybrid Vehicle	OEC	3	0	0	3	3
9.	23OAST352	Space Engineering	OEC	3	0	0	3	3
10.	23OIMT351	Industrial Management	OEC	3	0	0	3	3
11.	23OIET354	Quality Engineering	OEC	3	0	0	3	3
12.	23OSFT351	Fire Safety Engineering	OEC	3	0	0	3	3
13.	23OMLT351	Introduction to non-destructive testing	OEC	3	0	0	3	3

14.	23OMRT351	Mechatronics	OEC	3	0	0	3	3
15.	23ORAT351	Foundation of Robotics	OEC	3	0	0	3	3
16.	23OAET352	Fundamentals of Aeronautical engineering	OEC	3	0	0	3	3
17.	23OGIT351	Remote Sensing Concepts	OEC	3	0	0	3	3
18.	23OAIT351	Urban Agriculture	OEC	3	0	0	3	3
19.	23OENT351	Drinking Water Supply and Treatment	OEC	3	0	0	3	3
20.	23OCET353	Lean Concepts, Tools And Practices	OEC	3	0	0	3	3
21.	23OEIT353	Introduction to PLC Programming	OEC	3	0	0	3	3
22.	23OCHT351	Nano Technology	OEC	3	0	0	3	3
23.	23OCHT352	Functional Materials	OEC	3	0	0	3	3
24.	23OBT352	Biomedical Instrumentation	OEC	3	0	0	3	3
25.	23OFDT352	Traditional Indian Foods	OEC	3	0	0	3	3
26.	23OFDT353	Introduction to food processing	OEC	3	0	0	3	3
27.	23OPYT352	IPR for Pharma Industry	OEC	3	0	0	3	3
28.	23OTTT351	Basics of Textile Finishing	OEC	3	0	0	3	3
29.	23OTTT352	Industrial Engineering for Garment Industry	OEC	3	0	0	3	3
30.	23OTT353	Basics of Textile Manufacture	OEC	3	0	0	3	3
31.	23OPET351	Introduction to Petroleum Refining and Petrochemicals	OEC	3	0	0	3	3
32.	23OPET352	Energy Conservation and Management	OEC	3	0	0	3	3
33.	23OPTT351	Basics of Plastics Processing	OEC	3	0	0	3	3
34.	23OECT351	Signals and Systems	OEC	3	0	0	3	3
35.	23OECT352	Fundamentals of Electronic Devices and Circuits	OEC	3	0	0	3	3
36.	23OBMT351	Foundation Skills in integrated product Development	OEC	3	0	0	3	3
37.	23OBMT352	Assistive Technology	OEC	3	0	0	3	3
38.	23OMAT352	Operations Research	OEC	3	0	0	3	3
39.	23OMAT353	Algebra and Number Theory	OEC	3	0	0	3	3
40.	23OMAT354	Linear Algebra	OEC	3	0	0	3	3

OPEN ELECTIVES – IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23OHST352	Project Report Writing	OEC	3	0	0	3	3
2.	23OMAT355	Advanced Numerical Methods	OEC	3	0	0	3	3
3.	23OMAT356	Random Processes	OEC	3	0	0	3	3
4.	23OMAT357	Queuing and Reliability Modelling	OEC	3	0	0	3	3
5.	23OMGT354	Production and Operations Management for Entrepreneurs	OEC	3	0	0	3	3
6.	23OMGT355	Multivariate Data Analysis	OEC	3	0	0	3	3
7.	23OMET352	Additive Manufacturing	OEC	3	0	0	3	3
8.	23OMET353	New Product Development	OEC	3	0	0	3	3
9.	23OMET355	Industrial Design & Rapid Prototyping Techniques	OEC	2	0	2	4	3
10.	23OMFT352	Micro and Precision Engineering	OEC	3	0	0	3	3
11.	23OMFT354	Cost Management ofEngineering Projects	OEC	3	0	0	3	3
12.	23OAUT352	Batteries and Management system	OEC	3	0	0	3	3
13.	23OAUT353	Sensors and Actuators	OEC	3	0	0	3	3
14.	23OAST353	Space Vehicles	OEC	3	0	0	3	3
15.	23OIMT352	Management Science	OEC	3	0	0	3	3
16.	23OIMT353	Production Planning and Control	OEC	3	0	0	3	3
17.	23OIET353	Operations Management	OEC	3	0	0	3	3
18.	23OSFT352	Industrial Hygiene	OEC	3	0	0	3	3
19.	23OSFT353	Chemical ProcessSafety	OEC	3	0	0	3	3
20.	23OMLT352	Electrical, Electronic and Magnetic materials	OEC	3	0	0	3	3
21.	23OMLT353	Nanomaterials andapplications	OEC	3	0	0	3	3

22.	23OMRT352	Hydraulics and Pneumatics	OEC	3	0	0	3	3
23.	23OMRT353	Sensors	OEC	3	0	0	3	3
24.	23ORAT352	Foundation of Automation	OEC	3	0	0	3	3
25.	23ORAT353	Concepts in Mobile Robotics	OEC	3	0	0	3	3
26.	23OMVT351	Marine Propulsion	OEC	3	0	0	3	3
27.	23OMVT352	Marine Merchant Vehicles	OEC	3	0	0	3	3
28.	23OMVT353	Elements of Marine Engineering	OEC	3	0	0	3	3
29.	23OAET353	Drone Technologies	OEC	3	0	0	3	3
30.	23OGIT352	Geographical Information System	OEC	3	0	0	3	3
31.	23OAIT352	Agriculture Entrepreneurship Development	OEC	3	0	0	3	3
32.	23OENT352	Biodiversity Conservation	OEC	3	0	0	3	3
33.	23OCET354	Basics of Integrated Water Resources Management	OEC	3	0	0	3	3
34.	23OEIT354	Introduction to Industrial Automation Systems	OEC	3	0	0	3	3
35.	23OCHT353	Energy Technology	OEC	3	0	0	3	3
36.	23OCHT354	Surface Science	OEC	3	0	0	3	3
37.	23OBTT353	Environment and Agriculture	OEC	3	0	0	3	3
38.	23OFDT354	Fundamentals of Food Engineering	OEC	3	0	0	3	3
39.	23OFDT355	Food safety and Quality Regulations	OEC	3	0	0	3	3
40.	23OPYT353	Nutraceuticals	OEC	3	0	0	3	3
41.	23OTTT354	Basics of Dyeing and Printing	OEC	3	0	0	3	3
42.	23OTTT355	Fibre Science	OEC	3	0	0	3	3
43.	23OTTT356	Garment Manufacturing Technology	OEC	3	0	0	3	3
44.	23OPET353	Industrial safety	OEC	3	0	0	3	3

45.	23OPET354	Unit Operations in Petro-Chemical Industries	OEC	3	0	0	3	3
46.	23OPTT352	Plastic Materials for Engineers	OEC	3	0	0	3	3
47.	23OPTT353	Properties and Testingof Plastics	OEC	3	0	0	3	3
48.	23OECT353	VLSI Design	OEC	3	0	0	3	3
49.	23OECT354	Industrial IoT and Industry 4.0	OEC	2	0	2	4	3
50.	23OBMT353	Wearable devices	OEC	3	0	0	3	3
51.	23OBMT354	Medical Informatics	OEC	3	0	0	3	3

CREDIT DISTRIBUTION

SL. NO.	SUBJECT AREA	CREDITS PER SEMESTER								TOTAL
		I	II	III	IV	V	VI	VII/VIII	VIII/VII	
1.	HSMC	4	3	-	-	-	-	5	-	**12**
2.	BSC	12	7	4	2	-	-	-	-	**25**
3.	ESC	5	9	-	-	-	-	-	-	**14**
4.	PCC	-	6	20.5	20.5	13	8	3	-	**71**
5.	PEC	-	-	-	-	9	9	3	-	**21**
6.	OEC	-	-	-	-	-	3	9	-	**12**
7.	EEC	1	2	1	-	-	-	-	10	**14**
	Total	**22**	**27**	**25.5**	**22.5**	**22**	**20**	**20**	**10**	**169**
8.	Mandatory Course (Non credit)					✓	✓			

CATEGORY		Breakup of Credits
HSMC	Humanities & Social Science Including Management	**12**
BSC	Basic Science Courses	**25**
ESC	Engineering Science Courses	**14**
PCC	Professional Core Courses	**71**
PEC	Professional Elective Courses	**21**
OEC	Open Elective Courses	**12**
EEC	Employment Enhancement Courses	**14**
	Total	**169**

Enrollment for B.E. / B. Tech. (Honours) / Minor degree (Optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E./B.Tech. (Honours) Minor degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also.

Complete details are available in clause 4.10 of Regulations 2021.

VERTICALS FOR MINOR DEGREE (In addition to all the verticals of other degree programmes)

Vertical I	Vertical II	Vertical III	Vertical IV	Vertical V
Fintech and Block Chain	**Entrepreneurship**	**Public Administration**	**BusinessData Analytics**	**Environment and Sustainability**
Financial Management	Foundations of Entrepreneurship	Principles of Public Administration	Statistics for Management	Sustainable infrastructure Development
Fundamentals of Investment	Team Building and Leadership Management for Business	Constitution of India	Data mining for Business Intelligence	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity and Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management for Business	Administrative Theories	Marketing and Social Media WebAnalytics	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurship	Indian Administrative System	Operation and SupplyChain Analytics	Green Technology
Introduction to Fintech	Financing New Business Ventures	Public Policy Administratio n	Financial Analytics	Environmental Quality Monitoring and Analysis
-	-	-	-	Integrated Energy Planning for Sustainable Development
-	-	-	-	Energy Efficiency for Sustainable Development

VERTICALS FOR MINOR DEGREE

(Choice of courses for Minor degree is to be made from any one vertical of other programmesor from anyone of the following verticals)

VERTICAL I : FINTECH AND BLOCK CHAIN

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23EET48	Financial Management	PEC	3	0	0	3	3
2.	23EET49	Fundamentals ofInvestment	PEC	3	0	0	3	3
3.	23EET50	Banking, Financial Services and Insurance	PEC	3	0	0	3	3
4.	23EET51	Introduction to Block chain and its Applications	PEC	3	0	0	3	3
5.	23EET52	Fintech Personal Finance and Payments	PEC	3	0	0	3	3
6.	23EET53	Introduction to Fintech	PEC	3	0	0	3	3

VERTICAL II : ENTREPRENEURSHIP

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23EET54	Foundations of Entrepreneurship	PEC	3	0	0	3	3
2.	23EET55	Team Building & Leadership Management for Business	PEC	3	0	0	3	3
3.	23EET56	Creativity & Innovationin Entrepreneurship	PEC	3	0	0	3	3
4.	23EET57	Principles of Marketing Management for Business	PEC	3	0	0	3	3
5.	23EET58	Human Resource Management for Entrepreneurs	PEC	3	0	0	3	3
6.	23EET59	Financing New Business Ventures	PEC	3	0	0	3	3

VERTICAL III: PUBLIC ADMINISTRATION

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23EET60	Principles of Public Administration	PEC	3	0	0	3	3
2.	23EET61	Constitution of India	PEC	3	0	0	3	3
3.	23EET62	Public Personnel Administration	PEC	3	0	0	3	3
4.	23EET63	Administrative Theories	PEC	3	0	0	3	3
5.	23EET64	Indian Administrative System	PEC	3	0	0	3	3
6.	23EET65	Public Policy Administratio n	PEC	3	0	0	3	3

VERTICAL IV : BUSINESS DATA ANALYTICS

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23EET66	Statistics For Management	PEC	3	0	0	3	3
2.	23EET67	Data mining For BusinessIntelligence	PEC	3	0	0	3	3
3.	23EET68	Human Resource Analytics	PEC	3	0	0	3	3
4.	23EET69	Marketing And SocialMedia Web Analytics	PEC	3	0	0	3	3
5.	23EET70	Operation And SupplyChain Analytics	PEC	3	0	0	3	3
6.	23EET71	Financial Analytics	PEC	3	0	0	3	3

VERTICAL V : ENVIRONMENT AND SUSTAINABILITY

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	23EET72	Sustainable infrastructure Development	PEC	3	0	0	3	3
2.	23EET73	Sustainable Agricultureand Environmental Management	PEC	3	0	0	3	3
3.	23EET74	Sustainable Bio Materials	PEC	3	0	0	3	3
4.	23EET75	Materials for Energy Sustainability	PEC	3	0	0	3	3
5.	23EET76	Green Technology	PEC	3	0	0	3	3
6.	23EET77	Environmental Quality Monitoring and Analysis	PEC	3	0	0	3	3
7.	23EET78	Integrated Energy Planning for Sustainable Development	PEC	3	0	0	3	3
8.	23EET79	Energy Efficiency for Sustainable Development	PEC	3	0	0	3	3

VALUE ADDED COURSES

S.No.	Course Name	Total Hours
1	MATLAB	30 Hrs
2	PLC	30 Hrs
3	Embedded C & Image Processing	30 Hrs
4	Internet of Things	30 Hrs
5	Lab VIEW	30 Hrs
6	Robotics and Automation	30 Hrs
7	SCADA	30 Hrs
8	iOS APP Development	30 Hrs
9	IC testing	30 Hrs
10	System Design using Micro Controllers	30 Hrs

23HST101 **PROFESSIONAL ENGLISH-I** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To enable learners of Engineering and Technology develop their basic communication skills in English.
- To emphasize specially the development of speaking skills amongst learners of Engineering and Technology.
- To develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- To inculcate the habit of reading and writing leading to effective and efficient communication.
- To develop the ability to write job applications and interviews for internship and effective reports.

INTRODUCTION TO BASIC OF COMMUNICATION

- What are the fundamentals of effective communication? (Activity based practices in classroom)
- Why is communication critical for excellence during study, research and work?
- What are the seven C's of effective communication?
- What are key language skills?
- What is effective listening? What does it involve?
- What is effective speaking?
- What does it mean to be an excellent reader? What should you be able to do?
- What is effective writing?
- How does one develop language and communication skills?
- What do you as a learner needs to do to enhance your English language and communication skills to get the best out of this course?

UNIT I INTRODUCTION TO BASICS OF ENGLISH 12

Listening- Types of Listening, Listening to Speeches/ presentations, Listening to technical topics and completing information-gap exercises.
Reading- Reading longer technical texts, Reading and interpreting visual material- Finding key information in a given text. **Writing-** Writing emails/letters introducing oneself. **Speaking-** Describing a process, Self Introduction, Group Discussion and interaction. **Grammar-** Present Tenses (Simple and progressive), Synonyms and Antonyms, Articles **Vocabulary-** Word forms prefixes and suffixes, Different forms and uses of words.

UNIT II TECHNICAL WRITING SKILLS 12

Listening- Listening and note making, listening to specific task-focused audio tracks.
Reading-Reading short passages - skimming, scanning, predicting the inference of the passage, Reading job advertisements **Writing-**Paragraph writing, writing short report on an event **Speaking-**Role-play Group Interaction, Speaking in formal situations (teachers, officials, foreigners) **Grammar-** Past Tense (Simple and progressive) Compound words, Active & Passive voice. **Vocabulary-**Technical Vocabulary, Prepositions, One word substitution.

UNIT III EFFECTIVE ENGLISH 12

Listening-Watching videos /documentaries and Responding to questions based on them. **Reading-**

Email Communication, Reading biographies, excerpts from literature **Writing-** writing definitions, writing instructions, Recommendations. **Speaking-** Showing appreciation, Asking or giving directions, seeking clarification **Grammar-** Adjectives, Subject - Verb Agreement. **Vocabulary-** Lexical items (fixed/semi fixed expressions), Phrasal Verbs.

UNIT IV PRESENTATION SKILLS 12

Listening- Listening to broadcast and telecast from Radio and TV, listening to anecdotes. **Reading-** Reading editorials and opinion blogs. Reading Newspaper articles, journal reports **Writing-**Writing Data Interpretations-Pie-Chart, Bar chart and Table, Essay writing (Descriptive and Narrative) **Speaking-**Offering help, describing a process, speaking in different situations. **Grammar-**Adverbs, Tenses - future tense, Use of sequence words, **Vocabulary-**Content vs. Function words, Cause and effect Expressions

UNIT V EFFECTIVE LEARNING 12

Listening- Listening for general information - specific details - conversation, listening to interviews with celebrities. **Reading-** Reading brochures (technical content), telephone messages, social media messages, relevant to technical contexts and emails. **Writing -** Process description, Note making/Note-taking **Speaking-** Mechanics of Presentation, Participating in Group Discussion **Grammar-** Question Tag, Yes/No questions, WH questions **Vocabulary-** Discourse Markers, Negation, Simple, and Compound & Complex Sentence.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- To listen and comprehend complex academic texts
- To read and infer the denotative and connotative meanings of technical texts
- To write definitions, descriptions, narrations and essays on various topics
- To speak fluently and accurately in formal and informal communicative contexts
- To express their opinions effectively in both oral and written medium of communication

TEXT BOOKS:

1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition).
2. English for Science & Technology Cambridge University Press, 2021.
3. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:

1. Technical Communication – Principles and Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. A Course Book on Technical English By Lakshmi Narayanan, Scitech Publications (India) Pvt. Ltd.
3. English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw Hill Education, ISBN : 0070264244.
4. Effective Communication Skill, Kulbhusan Kumar, R S Salaria, Khanna Publishing House.
5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi,2003.

23MAT101 **MATRICES AND CALCULUS** **L T P C**
3 1 0 4

COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To understand various techniques of multiple integrals.

UNIT I MATRICES **9+3**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation - Properties of Eigenvalues and Eigenvectors – Cayley – Hamilton Theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical from by orthogonal transformation – Nature of quadratic forms.

UNIT II DIFFERENTIAL CALCULUS **9+3**

Derivatives – Differentiation rules (Sum, Product, Quotient, Chain rules) – Implicit differentiation – Logarithmic differentiation – Maxima and Minima of functions of one variables.

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

Partial differentiation– Total derivative - Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables–Applications: Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

UNIT IV INTEGRATION **9+3**

The Definite and Indefinite integral – Integration techniques - Substitution methods-Integration by parts –Reduction formula- Trigonometric substitutions- Integration of rational and Irrational functions (Partial fraction method)-Improper Integrals.

UNIT V MULTIPLE INTEGRALS **9+3**

Double integrals– Double integrals in polar coordinates– Change of order of integration - Triple integrals – Volume of solids – Change of variable in double and triple integrals.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Use the matrix algebra methods for solving practical problems.
- Apply differential calculus tools in solving various application problems.
- Use differential calculus ideas on several variable functions.
- Apply different methods of integration in solving practical problems.
- Apply various techniques in multiple integrals.

TEXT BOOKS :

1. Kreyszig E, "Advanced Engineering Mathematics" John Wiley and 10th Edition, New Delhi, 2016.
2. Grewal B. S, "Higher Engineering Mathematics, New Delhi, 44th Edition, 2018.
3. James Stewart, "Calculus: Early Transcendentals", Cengage Learning 8th Edition, New Delhi, 2015.

REFERENCE BOOKS:

1. Jain R. K and IyengarS.R.K, "Advanced Engineering Mathematics", Narasa Publications, New Delhi, 5th Edition, 2016.
2. Narayanan S, and Manicavachagampillai T. K, "Calculus:Volume I and II", S. Viswnathan Publishers Pvt. Ltd., Chennai, 2009.
3. Ramana B. V, "Higher Engineering Mathematics", McGral Hill Eduvation Pvt. Ltd., New Delhi, 2016.

MAPPING OF COs WITH POs AND PSOs

Course Outcomes	Program Outcomes												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1	-	-	-	-	-	-	-	1	-	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	1	-	-	-
CO3	3	2	1	1	-	-	-	-	-	-	-	1	-	-	-
CO4	3	2	1	1	-	-	-	-	-	-	-	1	-	-	-
CO5	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-
Average	3	2	1.2	1	-	-	-	-	-	-	-	1	-	-	-

23PHT101 ENGINEERING PHYSICS L T P C
3 0 0 3

COURSE OBJECTIVES:

- To make the students effectively to achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to be successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT I MECHANICS 9

Multiparticle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M .I –moment of inertia of continuous bodies – M.I of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum –

rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum – double pendulum –Introduction to nonlinear oscillations.

UNIT II ELECTROMAGNETIC WAVES 9

The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS 9

Simple harmonic motion - resonance –analogy between electrical and mechanical oscillating systems - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect. Reflection and refraction of light waves - total internal reflection - interference – Michelson interferometer –Theory of air wedge and experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO_2 laser, semiconductor laser –Basic applications of lasers in industry.

UNIT IV BASIC QUANTUM MECHANICS 9

Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS 9

The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

- Understand the importance of mechanics.
- Express their knowledge in electromagnetic waves.
- Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
- Understand the importance of quantum physics.
- Comprehend and apply quantum mechanical principles towards the formation of energy bands.

TEXT BOOKS:

1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education(Indian Edition), 2017.
2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw-Hill(Indian Edition), 2017.

REFERENCES:

1. R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition),2009.
2. Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
3. K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications,(Indian Edition), 2019.
4. D.Halliday, R.Resnick and J.Walker. Principles of Physics, Wiley (Indian Edition), 2015.
5. N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer-Verlag, 2012.

23CYT101 ENGINEERING CHEMISTRY

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand water quality parameters, treatment process and corrosion.
- To analyses absorption, adsorption and phases.
- To evaluate engineering materials and study of batteries.
- To understand the nature of polymers and recent advanced energy sources.
- To observe various chemical composition analyses and shock waves.

UNIT-I UNIVERSAL SOLVENT (WATER) AND CORROSION 9

Water quality parameters of-color, odour, turbidity, pH, hardness, TDS, COD and BOD. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion. Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralization and zeolite process. **Corrosion-** causes- factors- types chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control and corrosion inhibitors.

UNIT-II SURFACE CHEMISTRY AND PHASE RULE 9

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms. Langmuir's adsorption isotherm –Catalysis: Catalyst – types of catalysis – criteria – autocatalysis acid base catalysis – enzyme catalysis– Michaelis – Menten equation.

Phase rule: Introduction, definition of terms with examples. One component system – water system; Reduced phase rule;– Thermal analysis; Two component system: lead-silver system – Pattinson process.

UNIT-III ALLOYS AND BATTERIES 9

Introduction- Definition- Properties of alloys- Significance and Functions and Ferrous alloys- Nichrome and Stainless steel – heat treatment of steel; Non-ferrous alloys – brass and bronze. **Batteries**: Types of batteries, Primary battery – dry cell, Secondary battery – lead acid battery and lithium-ion battery; Electric vehicles

UNIT-IV POLYMERS AND ADVANCED ENERGY SOURCES 9

Introduction: Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerization. Types and mechanism of polymerization: Addition (Free Radical, cationic and anionic); condensation and copolymerization. Preparation, properties and uses of Nylon 6,6, and Epoxy resin. **Advanced Energy Sources**- Recent developments in solar cell materials. Fuel cells: H_2-O_2 fuel cell, microbial fuel cell; Super capacitors: Storage principle, types and examples

UNIT-V ANALYTICAL CHEMISTRY AND SHOCK WAVE 9

Proximate and ultimate analysis of coal. Accuracy, precision, sensitivity, detection limits, significant figures, rounding off. Types of errors determinate and indeterminate errors.

Shock Wave- Description of a shock wave and its applications. Methods of creating shock waves in the laboratory using a shock tube, description of hand operated Reddy shock tube and its characteristics.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Know well about water quality parameters and corrosion nature.
- Differentiate easily absorption, adsorption and also phases.
- Use alloys in day to day life and also batteries.

- Distinguish polymers in regular use and clearly mention about advanced energies.
- Calibrate chemical composition and use of shock wave in real life.

TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai, Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3. S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.
4. Skoog, D.A.; West, D.M.; Holler, F.J.; Crouch, S.R. (2014),Fundamentals of Analytical Chemistry, Cengage Learning.

REFERENCES:

1. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017
2. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
4. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013
5. Shock waves made simple- Chintoo S Kumar, K Takayama and KPJ Reddy: Willey India Pvt. Ltd. New Delhi2014

23GET101 **PROGRAMMING IN C** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To understand the basics of algorithmic problem solving.
- To understand the constructs of C Language and develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop modular applications in C using functions and develop applications in C using pointers
- To develop C programs using structures, union and to do input/output operations of file handling in C

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion), simple problems(find odd or even, sum of n numbers, find factorial of a given number, etc.)

UNIT II BASICS OF C PROGRAMMING 9

Introduction to programming paradigms – Applications of C Language - Structure of C program – C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Preprocessor directives - Compilation process

UNIT III ARRAYS AND STRINGS 9

Introduction to Arrays: Declaration, Initialization – One dimensional array – Two dimensional arrays - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

UNIT IV FUNCTIONS AND POINTERS 9

Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, Binary Search using recursive functions – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Parameter passing: Pass by value, Pass by reference.

UNIT V STRUCTURES, UNION AND FILE PROCESSING 9

Structure - Nested structures – Pointer and Structures – Array of structures – Self referential structures – Dynamic memory allocation - Singly linked list – typedef – Union - Storage classes and Visibility - Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Develop algorithmic solutions to simple computational problems.

CO2: Demonstrate knowledge on C Programming constructs and develop simple applications in C using basic constructs

CO3: Design and implement applications using arrays and strings

CO4: Develop and implement modular applications in C using functions and develop applications in C using pointers

CO5: Design applications using sequential and random access file processing.

TEXT BOOKS:

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.
3. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

23GEP101 **PROGRAMMING IN C LABORATORY** **L T P C**
0 0 4 2

COURSE OBJECTIVES:

- To familiarize with C programming constructs.
- To develop programs in C using basic constructs.
- To develop programs in C using arrays.
- To develop applications in C using strings, pointers, functions.
- To develop applications in C using structures.
- To develop applications in C using file processing.

LIST OF EXPERIMENTS:

Note: The lab instructor is expected to design problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed.

1. I/O statements, operators, expressions
2. Decision-making constructs: if-else, go to, switch-case, break-continue
3. Loops: for, while, do-while
4. Arrays: 1D and 2D, Multi-dimensional arrays, traversal
5. Strings: operations
6. Functions: call, return, passing parameters by (value, reference), passing arrays to function.
7. Recursion
8. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
9. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
10. Files: reading and writing, File pointers, file operations, random access, processor directives.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Demonstrate knowledge on C programming constructs.
CO2: Develop programs in C using basic constructs.
CO3: Develop programs in C using arrays.
CO4: Develop applications in C using strings, pointers, functions.
CO5: Develop applications in C using structures.
CO6: Develop applications in C using file processing.

TEXT BOOKS:

1. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.

REFERENCES:

1. Paul Deitel and Harvey Deitel, “C How to Program with an Introduction to C++”, Eighth edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
4. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2013.
5. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, 1st Edition, Pearson Education, 2013.

23BSP101	PHYSICS AND CHEMISTRY LABORATORY (Common to all branches)	L T P C 0 0 4 2

PHYSICS LABORATORY

(Any Seven Experiments)

COURSE OBJECTIVES:

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student as an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS:

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young's modulus.
4. Uniform bending – Determination of Young's modulus.
5. Laser- Determination of the wavelength of the laser using grating.
6. Air wedge - Determination of thickness of a thin sheet/wire.
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle.
   b) Compact disc- Determination of width of the groove using laser.
8. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids.
9. Post office box -Determination of Band gap of a semiconductor.
10. Michelson Interferometer.
11. Melde's string experiment.

TOTAL : 30 PERIODS

COURSE OUTCOMES:

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

- Understand the functioning of various physics laboratory equipment.
- Use graphical models to analyze laboratory data.
- Use mathematical models as a medium for quantitative reasoning and describing physical reality.
- Access, process and analyze scientific information.
- Solve problems individually and collaboratively.

CHEMISTRY LABORATORY

(Any Seven Experiments)

COURSE OBJECTIVES:

- To impart practical skills in the estimation of water quality parameters by volumetry and gravimetry.
- To familiarize the students with the estimation of impurities in aqueous solutions through electro analytical techniques such as, pH metry, potentiometry and conductometry.
- To demonstrate the analysis of metals by UV-Visible spectroscopic and flame photometric methods.

LIST OF EXPERIMENTS

1. Determination of total, temporary & permanent hardness of water by EDTAmethod
2. Determination of chloride content of water sample by Argentometric method
3. Determination of types and amount of alkalinity in water sample
4. Determination of DO content of water sample by Winkler's method
5. Determination of strength of acids in a mixture of acids using conductivitymeter
6. Conductometric titration of barium chloride against sodium (precipitation titration).
7. Estimation of iron content of the given solution using potentiometer

OPEN ENDED EXPERIMENTS

1. Determination of strength of given hydrochloric acid using pH meter.
2. Conductometric titration of Strong acid against Strong base

TOTAL : 30 PERIODS

COURSE OUTCOMES:

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

- Independently estimate the water quality parameters, such as, acidity, alkalinity, hardness, DO, TDS, chloride and copper contents by appropriate wet chemical analyses.
- Quantitatively analyse the impurities in aqueous solution by electro analytical techniques.
- Determine the amount of metal ions in aqueous samples by spectroscopic techniques.

TEXTBOOKS:

1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, "Vogel's Textbook of Quantitative Chemical Analysis", Pearson Education, 2009.

2. V. K. Ahluwalia, SunithaDhingra and AdarshGulati, "College Practical Chemistry", Universities Press (India) Pvt. Ltd., 2018

23HSP102 ENGLISH LABORATORY L T P C
2 0 0 2

COURSE OBJECTIVES:

- To improve the learners skill to read and comprehend the technical texts.
- To strengthen the ability of the learners' official written communication skill on technical context.
- To help learners to enhance the public speaking skills to make technical presentations, participate in group discussions.
- To develop their analytical thinking skills, problem solving skills and interpersonal skills of the learners.
- To develop the ability to write job applications and interviews for internship and effective reports.

UNIT I STRENGTHENING PROFESSIONAL WRITING 9

Listening – Evaluative Listening: Advertisements, Product Descriptions, -Audio / video; Active and passive Listening. **Speaking** – Asking and giving directions, Persuasive Speech Techniques.
Writing – Professional emails writing - Compare and Contrast Essay; Itinerary
Grammar –Tenses in Functional usage, Prepositional phrases
Language Development – Contextual meaning of words, Purpose and statement.

UNIT II BUSINESS WRITING IN TECHNICAL CONTEXT 9

Listening - Listening to longer technical talks and completing– gap filling exercises. Listening to the comprehension talks. – Listening to information from podcasts. **Speaking** – Describing and discussing the reasons of accidents or disasters based on news reports. Describing about process/ product (Technical and General). **Reading** - Reading longer technical texts-news reports, journals and understanding the technical terms. **Writing** - Writing responses to complaints. Letter writing- Accepting, Declining the invitation and seeking clarification. **Grammar** - Active Passive Voice transformations, Infinitive and Gerunds**. Language Development** – Word Formation, Adverbs.

UNIT III ENGLISH IN WORK PLACE 9

Listening – Listening to / Watching movie scenes/ documentaries depicting a technical problem and suggesting solutions. **Speaking** – Group Discussion (based on case studies), Discussion on a technical topic of common interest by group participants. **Reading** - Practice in lexical chucking and speed reading, Reading the Case Studies, excerpts from literary texts, news reports etc.,
Writing – Jumbled sentences, Problem solution essay / Argumentative Essay.
Grammar – Direct and Indirect questions; If conditional sentences.
Language Development – Embedded sentences, Sentence Completion.

UNIT IV REPORTING OF THE EVENTS AND ANALYSING THE CONTENT 9

Listening – Listening Comprehension based on IELTS Practice test. **Speaking** – Public Speaking (Debate, Extempore and just a minute), Presenting an oral report, Mini presentations on select topics. **Reading** –Newspaper articles; Technical reports and Advertisements. **Writing** – Minutes of the Meeting, Recommendations, Transcoding, Report writing- Feasibility and Survey report.

Grammar – Verbal Analogies, Modals. **Language Development** – Conjunctions- use of prepositions.

UNIT V THE ABILITY TO NARRATE THE INFORMATION PERSUASIVELY 9

Listening – Listening and its process –Practices and strategies of better Listening. Listening to TED Talks, Presentations, Formal job interviews, (analysis of the interview performance);

Speaking – Participating in a Role play, (interview/telephone interview), Types of role play, Mock interviews, Formal conversations. **Reading** – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; **Writing** – Job application – Cover letter & Resume;

Grammar – Numerical adjectives, Misspelt words. **Language Development** – Idioms, Error Spotting.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Apply the reading strategies to comprehend the technical terms and helps to compare and contrast products and ideas in technical texts.
- Listen and comprehend the cause and effects in events, industrial processes through technical texts.
- Analyze problems in order to arrive at feasible solutions and communicate them orallyand in the written format.
- Speak appropriately and effectively in varied context in formal and informal context.
- Present their opinions in a planned and logical manner, and draft effective resumes in context of job search. It helps to report events and the processes of technical and industrial nature.

TEXT BOOKS:

1. English for Engineers & Technologists (2022 edition) Orient Blackswan Private Ltd. Hyderabad.

REFERENCES:

1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
3. Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Krishna Mohan, Meera Banerji, “Developing Communication Skills”, Trinity Press, 2017.

23MAT202 Laplace Transform and Numerical Methods LT P C
3 1 0 4

COURSE OBJECTIVES:

- To acquaint the students with Differential Equations which are significantly used in engineering problems.
- To make the students appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I ORDINARY DIFFERENTIAL EQUATIONS 9+3

Higher order linear differentiale quations with constant coefficients-MethodofvariationofparameterS– HomogenousequationofEuler'sandLegendre'stype–System of simultaneous linear first order differential equations with constant coefficients.

UNIT II LAPLACE TRANSFORMS 9+3

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations - Bisection Method -Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel-Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT IV NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+3

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+3

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Acquaint the students with Differential Equations which are significantly used in engineering problems
- Understand the mathematical principles on Laplace transforms and would provide them the ability to formulate and solve some of the physical problems of engineering.
- Appreciate the numerical techniques of interpolation in various intervals and apply the numerical

techniques of differentiation and integration for engineering problems.

- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXT BOOKS:

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Grewal.B.S.,"Higher EngineeringMathematics",KhannaPublishers,NewDelhi,44th Edition,2018.
3. Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers" SPIE Press, 1999.

REFERENCES

1. Narayanan. S., ManicavachagomPillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10th Edition, Laxmi Publications Pvt. Ltd, 2015.
3. James. G., "Advanced Modern Engineering Mathematics", 4thEdition, Pearson Education, New Delhi, 2016.
4. Narayanan. S., ManicavachagomPillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.
6. Wylie. R.C. and Barrett . L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

MAPPING OF COs WITH POs AND PSOs

Course Outcomes	Program Outcomes												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	2	2	-	-	-	-	-	-	-	2	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	2	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	2	-	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	2	-	-	-
CO5	3	2	2	2	2	-	-	-	-	-	-	2	-	-	-
Average	3	2	2	2	2	-	-	-	-	-	-	2	-	-	-

Comments

1. **This syllabus emphasis the essence of analytical and numerical skills to the students.**
2. **The syllabus is well framed to meet the technical needs of the electrical students.**
3. **It will help the students achieve their learning outcomes.**

23PHT203 **PHYSICS FOR ELECTRICAL ENGINEERING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To make the students to understand the electrical properties including free electron theory, applications of quantum mechanics.
- To understand the magnetic properties of materials and its applications.
- To instil knowledge on physics of semiconductors, determination of charge carriers and device applications.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications.
- To inculcate an idea of significance of nano structures, quantum confinement and ensuing nano device applications.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory – Expression for electrical conductivity – Thermal conductivity, Expression – Wiedemann-Franz law – Quantum free electron theory: Tunneling – Degenerate states – Fermi – Dirac statistics – Density of energy states – Electron in periodic potential – Bloch Theorem – Kronig-Penney model – Energy bands in solids–Tight binding approximation –Electron effective mass.

UNIT II MAGNETIC PROPERTIES OF MATERIALS 9

Origin of magnetic moment – Bohr magneton – Magnetic field and induction – Magnetization – Magnetic permeability and susceptibility – Magnetic materials: Dia, para and ferromagnetic effects – paramagnetism in the conduction electrons in metals – Exchange interaction and ferromagnetism – Saturation magnetization and Curie temperature – Weiss theory – Domain theory – Structure of Ferrites – Hysterisis curve – Soft and Hard magnetic materials.

UNIT III SEMICONDUCTOR PHYSICS 9

Semiconductor types – Intrinsic Semiconductors – Energy band diagram – Direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – Extrinsic semiconductors – Carrier concentration in N–type & P–type semiconductors – Variation of carrier concentration with temperature – Hall effect and Hall coefficients – Ohmic contacts – Schottky diode – Power transistors.

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – Optical processes in semiconductors: optical absorption and emission, charge injection and recombination, optical absorption, loss and gain. Optical processes in quantum wells – Optoelectronic devices: light detectors and solar cells – Light emitting diode (LED) – Organic LED – Laser diode – Optical processes in organic semiconductor devices – Excitonic state.

UNIT V NANOELECTRONIC DEVICES 9

Density of states for solids – Significance between Fermi energy and volume of the material – Quantum confinement – Quantum structures – Density of states for quantum wells, wires and dots –
Band gap of nanomaterials –Tunneling – Single electron phenomena – SET. Conductivity of metallic nanowires – Ballistic transport – Quantum resistance and conductance – Carbon nanotubes: Properties and applications – Spintronic devices and applications – Optics in quantum structures – quantum well laser.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

- Know basics of electrical properties of materials.
- Gain knowledge on the magnetic properties of materials and their applications.
- Understand clearly of semiconductor physics and functioning of semiconductor devices.
- Understand the optical properties of materials and working principles of various optical devices.
- Appreciate the importance of nanotechnology and nanodevices.

TEXT BOOKS:

1. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.
2. R.F.Pierret. Semiconductor Device Fundamentals. Pearson (Indian Edition), 2006.
3. G.W.Hanson. Fundamentals of Nanoelectronics. Pearson Education (Indian Edition), 2009.

REFERENCES:

1. Laszlo Solymar, Walsh, Donald, Syms and Richard R.A., Electrical Properties of Materials, Oxford Univ. Press (Indian Edition) 2015.
2. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw– Hill Education (Indian Edition), 2019.
3. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
4. Mark Fox, Optical Properties of Solids, Oxford Univ.Press, 2001.
5. Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw–Hill Education (Indian Edition), 2020.

23BET201 BASIC CIVIL AND MECHANICAL ENGINEERING **L T PC**
3 0 0 3

COURSE OBJECTIVES:

- To provide the students an illustration of the significance of the Civil and Mechanical Engineering Profession in satisfying the societal needs.
- To help students acquire knowledge in the basics of surveying and the materials used for construction.
- To provide an insight to the essentials of components of a building and the infrastructure facilities.
- To explain the component of power plant units and detailed explanation to IC engines their working principles.
- To explain the Refrigeration & Air-conditioning system.

UNIT I PART A: OVERVIEW OF CIVIL ENGINEERING **5**

Civil Engineering contributions to the welfare of Society - Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering – National building code – terminologists: Plinth area, Carpet area, Floor area, Buildup area, Floor space index - Types of buildings: Residential buildings, Industrial buildings.

UNIT I PART B: OVERVIEW OF MECHANICAL ENGINEERING **4**

Overview of Mechanical Engineering - Mechanical Engineering Contributions to the welfare of Society – Specialized sub disciplines in Mechanical Engineering – Manufacturing, Automation, Automobile and Energy Engineering - Interdisciplinary concepts in Mechanical Engineering.

UNIT II SURVEYING AND CIVIL ENGINEERING MATERIALS **9**

Surveying: Objects – Classification – Principles – Measurements of Distances and angles – Leveling – Determination of areas– Contours.

Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel - Timber – Modern Materials, Thermal and Acoustic Insulating Materials, Decorative Panels, Water Proofing Materials. Modern uses of Gypsum, Pre-fabricated Building component (brief discussion only)

UNIT III BUILDING COMPONENTS AND INFRASTRUCTURE **9**

Building plans – Setting out of a Building - Foundations: Types of foundations - Bearing capacity and settlement – Brick masonry – Stone Masonry – Beams – Columns – Lintels – Roofing – Flooring – Plastering.

Types of Bridges and Dams – Water Supply Network - Rain Water Harvesting – Solid Waste Management - Introduction to Highways and Railways - Introduction to Green Buildings.

UNIT IV INTERNAL COMBUSTION ENGINES AND POWER PLANTS **9**

Classification of Power Plants- Working principle of steam, Gas, Diesel, Hydro -electric and Nuclear Power plants- 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. Working principle of Boilers-Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps, Concept of hybrid engines. Industrial safety practices and protective devices

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. Properties of air - water mixture, concepts of psychometric and its process.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand profession of Civil and Mechanical engineering.
CO2: Summarise the planning of building, infrastructure and working of Machineries.
CO3: Apply the knowledge gained in respective discipline
CO4: Illustrate the ideas of Civil and Mechanical Engineering applications.
CO5: Appraise the material, Structures, machines and energy.

TEXT BOOKS:

1. G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018

REFERENCES:

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2018.
2. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co.(P) Ltd, 2013.
3. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, 2005.
4. Shantha Kumar SRJ., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, 2000.

23GET201	ENGINEERING GRAPHICS	L T P C
		2 0 4 4

COURSE OBJECTIVES:

1. To prepare the students for drawing engineering curves.
2. To prepare the students for drawing freehand sketch of simple objects.
3. To prepare the students for drawing orthographic projection of solids and section of solids.
4. To prepare the students for drawing development of solids
5. To prepare the students for drawing isometric and perspective projections of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING 6+12

Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 6+12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method and auxiliary projection method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6 +12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other - obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids - Prisms, pyramids cylinders and cones. Cut-outs and drilled holes in section of solids and development of surfaces.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12

Principles of isometric projection — isometric scale - lsometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

TOTAL: (L-30; P-60) = 90 PERIODS

COURSE OUTCOMES:

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

• Use BIS conventions and specifications for engineering drawing.

• Construct the conic curves, involutes and cycloid.

• Solve practical problems involving projection of lines.

• Draw the orthographic, isometric and perspective projections of simple solids.

• Draw the development of simple solids.

TEXT BOOKS:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.

2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.

3. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015

REFERENCES:

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.

2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.

3. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.

4. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.

5. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.

6. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

Publication of Bureau of Indian Standards:

1. IS 10711 — 2001: Technical products Documentation — Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) — 2001: Technical products Documentation — Lettering.
3. IS 10714 (Part 20) — 2001 & SP 46 — 2003: Lines for technical drawings.
4. IS 11669 — 1986 & SP 46 —2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods.

23EET201 **ELECTRIC CIRCUIT ANALYSIS** **L T P C**
3 1 0 4

COURSE OBJECTIVES:

- To introduce DC circuit analysis analysis
- To impart knowledge in AC circuit analysis
- To impart knowledge on solving network Theorems
- To educate on obtaining the transient response of circuits
- To introduce Phasor diagrams and analysis of three phase circuits

UNIT I **DC CIRCUITS ANALYSIS** **6+6**

Voltage and current sources -Resistive elements - Ohm's Law Resistors in series and parallel circuits – Kirchoffs laws – voltage and current division, source transformation -Mesh current and node voltage - methods of analysis.

AC CIRCUIT ANALYSIS **6+6**

UNIT II A.C circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.- Mesh current and node voltage - methods of analysis. Series and parallel resonance – their frequency response – Quality factor and Bandwidth

UNIT III **NETWORK THEOREMS FOR AC AND DC CIRCUITS** **6+6**

Thevenin's and Norton Theorems –Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT IV **TRANSIENT RESPONSE ANALYSIS** **6+6**

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

UNIT V **THREE PHASE CIRCUITS** **6+6**

Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, star-delta conversion-balanced & unbalanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Apply mesh analysis/ nodal analysis in DC circuits.
CO2: Apply mesh analysis/ nodal analysis in AC circuits.
CO3: Analyse network theorems to determine behavior of the givenDC and AC circuit
CO4: Compute the transient response of L,C,RL, RC and RLC Circuits with differtent input.
CO5: Compute power, line/ phase voltage and currents of the given three phase circuit.

TEXT BOOKS:

1. William H. HaytJr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis",McGraw Hill publishers, 9th edition, New Delhi, 2020.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition,McGraw Hill, 2019.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage LearningIndia, 2013.

REFERENCES:

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpat Rai& Sons, New Delhi, 2020.
2. Joseph A. Edminister, Mahmood Nahvi, "Electric circuits", Schaum's series, McGraw-Hill, First Edition, 2019.
3. M E Van Valkenburg, "Network Analysis",Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
4. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley &Sons, Inc. 2018.
5. Sudhakar A and Shyam Mohan SP, "Circuits and Networks Analysis and Synthesis",McGraw Hill,2015.

MAPPING OF COs WITH POs AND PSOs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	-	-	-	-	-	-	-	2	-	2	-	2
CO2	3	3	2	-	-	-	-	-	-	-	2	-	2	-	1
CO3	3	3	-	-	1	-	-	-	-	-	-	-	2	-	2
CO4	3	3	3	3	-	-	-	-	-	-	-	3	2	2	2
CO5	3	3	3	-	-	-	-	-	-	-	2	-	2	1	2
CO	3	3	3	3	1	-	-	-	-	-	2	3	2	2	2

23EEP201 **ELECTRIC CIRCUITS LABORATORY** **L T P C**
0 0 4 2

COURSE OBJECTIVES:

To simulate various electric circuits using Pspice/ Matlab/e-Sim/Sci lab

To gain practical experience on electric circuits and verification of theorems

LIST OF EXPERIMENTS:

Familiarization of various electrical components, sources and measuring instruments

1. Simulation and experimental verification of series and parallel electrical circuit using fundamental laws.
2. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
3. Simulation and experimental verification of electrical circuit problems using Norton's theorem.
4. Simulation and experimental verification of electrical circuit problems using Superposition theorem.
5. Simulation and experimental verification of Maximum Power transfer theorem.
6. Simulation and Experimental validation of R-C,R-L and RLC electric circuit transients
7. Simulation and Experimental validation of frequency response of RLC electric circuit.
8. Design and implementation of series and parallel resonance circuit.
9. Simulation and experimental verification of three phase balanced and unbalanced star, delta networks circuit (Power and Power factor calculations).

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

1. Use simulation and experimental methods to verify the fundamental electrical laws for the given DC/AC circuit (Ex 1)
2. Use simulation and experimental methods to verify the various electrical theorems (Superposition, Thevenin, Norton and maximum power transfer) for the given DC/AC circuit (Ex 2-5)
3. Analyze transient behaviour of the given RL/RC/RLC circuit using simulation and experimental methods (Ex 6)
4. Analyze frequency response of the given series and parallel RLC circuit using simulation and experimentation methods (Ex 7-8)
5. Analyze the performance of the given three-phase circuit using simulation and experimental methods (Ex 9)

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	1	-	-	2	2	-	-	2	1	1
CO2	3	3	-	-	-	-	-	-	2	1	2	1	2	1	2
CO3	3	3	1	-	-	-	2	-	3	-	2	-	2	2	2
CO4	3	3	1	-	-	1	2	-	2	-	-	1	1	1	2
CO5	3	3	2	-	-	2	1	-	2	1	1	1	3	3	3
CO	3	2.8	1.33	-	-	1.33	1.67	-	2.2	1.33	1.67	1	2	1.6	2

23GEP201 ENGINEERING PRACTICES LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

The main learning objective of this course is to provide hands on training to the students in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipment; Making a tray out of metal sheet using sheet metal work.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES 15

PLUMBING WORK:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
b) Preparing plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:

a) Sawing,
b) Planing and
c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:

a) Studying joints in door panels and wooden furniture
b) Studying common industrial trusses using models.

PART II ELECTRICAL ENGINEERING PRACTICES 15

a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
b) Staircase wiring
c) Fluorescent Lamp wiring with introduction to CFL and LED types.
d) Energy meter wiring and related calculations/ calibration
e) Study of Iron Box wiring and assembly
f) Study of Fan Regulator (Resistor type and Electronic type using Diac / Triac / quadrac)
g) Study of emergency lamp wiring/Water heater

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES **15**

WELDING WORK:

a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.

b) Practicing gas welding.

BASIC MACHINING WORK:

a) (simple)Turning.

b) (simple)Drilling.

c) (simple)Tapping.

ASSEMBLY WORK:

a) Assembling a centrifugal pump.

b) Assembling a household mixer.

c) Assembling an air conditioner.

SHEET METAL WORK:

a) Making of a square tray

FOUNDRY WORK:

a) Demonstrating basic foundry operations.

PART IV ELECTRONIC ENGINEERING PRACTICES **15**

SOLDERING WORK:

a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:

a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:

a) Study an elements of smart phone.

b) Assembly and dismantle of LED TV.

c) Assembly and dismantle of computer/ laptop

TOTAL : 60 PERIODS

COURSE OUTCOMES:

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

1. Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.

2. Wire various electrical joints in common household electrical wire work.

3. Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.

4. Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

23GEP202 **COMMUNICATION LABORATORY** **L T P C**
0 0 4 2

COURSE OBJECTIVES:

- Expose students to learn the basic skills of pronunciation/Vocabulary
- Help the learners learn the basic level of listening activity
- Remove the fear and hesitation of students in participating speaking activities
- Expose them learn different types of reading
- Make them to learn the basics of writing

UNIT I: PRONUNCIATION AND SPELLING **12**

Confusing words of mispronunciation – Syllabic division with examples – Mispronounced word exercises – Tongue Twisters

UNIT II: LISTENING **12**

Audio Listening exercises for making gist – Listening to the audio extract - Find the unknown words – Listening to the motivational videos – Listening to the BBC News

UNIT III: SPEAKING **12**

Group Discussion (Advanced level) – Oral Presentation on Social Issues – Narrating a story/ unforgettable moments in life – Role Play (minimum two or more participants) – Extempore Speech

UNIT IV: READING **12**

Intensive Reading – Extensive Reading – Reading Advertisements or Graphs – Picture Description

UNIT V: WRITING **12**

Writing a letter of Application and Resume – Writing the review of the favourite film/story – Translating a passage of your mother tongue into English – Writing Proposals

TOTAL : 60 PERIODS

COURSE OUTCOMES:

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

- Listen and respond appropriately.
- Participate in group discussions
- Participate well in conversation
- Learn different types of writing both formal & informal.
- Understand the correct way of pronunciation.

TEXT BOOKS:

1. Brooks,Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.

2. Richards,C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES:

1. Bhatnagar, Nitin and MamtaBhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.

2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.

3. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.

4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.

5. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014

23MAT301 TRANSFORM AND PARTIAL DIFFERENTIAL EQUATIONS L T P C
3 1 0 4

COURSE OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis this is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used invarious situations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9 + 3

Formation of partial differential equations –Solutions of standard types of first order partial differential equations - First order partial differential equations reducible to standard types- Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 9 + 3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9 + 3

Classification of PDE – Method of separation of variables - Fourier series solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (Cartesian coordinates only).

UNIT IV FOURIER TRANSFORMS 9 + 3

Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval'sidentity

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS 9 + 3

Z-transforms - Elementary properties – Convergence of Z-transforms - – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Understand how to solve the given standard partial differential equations.

CO2: Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.

CO3: Apply the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.

CO4: Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

CO5: Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXT BOOKS:

1. Grewal B.S.,"Higher Engineering Mathematics" 44thEdition, KhannaPublishers,New Delhi, 2018.
2. Kreyszig E, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, New Delhi, India, 2016.

REFERENCES:

1. Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers" SPIE Press, 1999.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10th Edition, Laxmi Publications Pvt. Ltd, 2015.
3. James. G., "Advanced Modern Engineering Mathematics", 4thEdition, Pearson Education, New Delhi, 2016.
4. Narayanan. S., ManicavachagomPillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.
6. Wylie. R.C. and Barrett . L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	1	-	-	-	-	-	1	-	-	-
CO2	3	3	3	3	-	1	-	-	-	-	-	1	-	-	-
CO3	3	3	3	3	-	1	-	-	-	-	-	1	-	-	-
CO4	3	3	3	3	-	1	-	-	-	-	-	1	-	-	-
CO5	3	3	3	3	-	1	-	-	-	-	-	1	-	-	-
CO	3	3	3	3	-	1	-	-	-	-	-	1	-	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

23EET301 **ELECTROMAGNETIC FIELDS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To introduce the basic mathematical concepts related to electromagnetic vector fields and impart knowledge on Coulomb's law and Gauss's law
- To impart knowledge on the concepts of Electrostatic fields, electric potential, energy density.
- To impart knowledge on the concepts of Magneto static fields, magnetic flux density, vector potential.
- To impart knowledge on the concepts of different methods of emf generation and Maxwell's equations
- To impart knowledge on the concepts of Electromagnetic waves and characterizing parameters

UNIT I **ELECTROSTATICS – I** **8+1**

Coordinate Systems – Vector fields – Gradient, Divergence, Curl – Divergence theorem and Stoke's theorem - Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges – Gauss's law and applications.

UNIT II **ELECTROSTATICS – II** **8+1**

Electric potential – Equipotential plots – Electric field in free space, conductors, dielectrics - Dielectric polarization – Electric field in multiple dielectrics – Boundary conditions, Poisson's and Laplace's equations, Capacitance, Energy and Energy density.

UNIT III **MAGNETOSTATICS** **8+1**

Lorentz force, Magnetic field intensity (H) – Biot–Savart's Law - Ampere's Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, Magnetic scalar and vector potential, Poisson's Equation, Magnetic Torque, Inductance,Energy and Energy density.

UNIT IV **ELECTRODYNAMIC FIELDS** **8+1**

Faraday's law – Transformer and motional EMF – Continuity equation of current - Displacement current -Maxwell's equations (differential and integral form) – Relation between field theory and circuit theory.

UNIT V **ELECTROMAGNETIC WAVES** **8+1**

Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors- skin depth - Poynting vector, Poynting theorem.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Explain Gradient, Divergence, and Curl operations on vector fields and Coulomb's law and Gauss's law.

CO2: Explain electrostatic fields, electric potential, capacitance and energy density.

CO3: Calculate magneto static fields, magnetic flux density, vector potential, inductance and energy density.

CO4: Explain different methods of emf generation and Maxwell's equations

CO5: Explain the concept of electromagnetic waves and characterizing parameters

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	1	-	-	-	-	-		3	3	3
CO2	3	2	2	2	1	1	-	-	-	-	-	3	3	3	3
CO3	3	2	2	2	1	1	-	-	-	-	-	3	3	3	3
CO4	3	2	2	2	1	1	-	-	-	-	-	3	3	3	3
CO5	3	2	2	2	1	1	-	-	-	-	-	3	3	3	3
CO	3	2	2	2	1	1	-	-	-	-	-	3	3	3	3

TEXT BOOKS:

1. Mathew N. O. Sadiku, 'Principles of Electromagnetics', 6th Edition, Oxford University Press Inc. Asian edition, 2015.
2. William H. Hayt and John A. Buck, 'Engineering Electromagnetics', McGraw Hill Special Indian edition, 2014.
3. K A Gangadhar, 'Electromagnetic Field Theory', Khanna Publishers; Sixteenth Edition EighthReprint :2015
4. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 2010.

REFERENCES:

1. V.V.Sarwate, 'Electromagnetic fields and waves', Second Edition, Newage Publishers,2018.
2. J.P.Tewari, 'Engineering Electromagnetics - Theory, Problems and Applications', Second Edition, Khanna Publishers 2013.
3. Joseph. A.Edminister, 'Schaum's Outline of Electromagnetics, Fifth Edition (Schaum's Outline Series), McGraw Hill, 2018.
4. S.P.Ghosh, Lipika Datta, 'Electromagnetic Field Theory', First Edition, McGraw Hill Education(India) Private Limited, 2017.

SKILL DEVELOPMENT ACTIVITIES:

(Group Seminar / Mini Project /Assignment /Content Preparation / Quiz/ Surprise Test / Solving GATEquestions/ etc)

1. Data collection and Interpretation/discussion on electromagnetic field sources and their effects on human and environment and EMF exposure limits as per International Standards like IEEE, ICNIRP, etc.
2. Familiarization of any software tool like MATLAB to compute, visualize and analyze gradient, divergent and curl fields.
3. Familiarization of any EMF solvers to compute, visualize and analyze the Electric and Magnetic fields for configurations discussed in theory
4. Design and practical implementation of applications of electromagnetic fields like Van de Graaff generators, actuator, Magnetic levitation, Rail guns, Solenoid based applications, Faradays disk generator and metal detectors, wireless power transfer units etc. to improve the ability to implement the concepts studied.

REFERENCES FOR SKILL DEVELOPMENT ACTIVITIES:

1. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 2010.
2. **ICNIRP** guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz).
3. **IEEE C 95.6 -2002** IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0–3 kHz
4. **IEEE C95.1-2019 -** IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz
5. **Measurements and predictions of electric and magnetic fields from power lines Charalambos P. Nicolaoua, Antonis P. Papadakisb, Panos A. Razisa, George A. Kyriacouc, John N. Sahalosd.**
6. Electric- and Magnetic-Field Measurements in an Outdoor Electric Power Substation, Anastasia S. Safigianni, *Member, IEEE*, and Christina G. Tsompanidou, IEEE transactionson Power Delivery, vol. 24, no. 1, January 2009.
7. **Karl E.Lonngren, Sava V. Savov and Randy. J.Jost, 'Fundamentals Of Electromagnetics With MATLAB', SciTech Publishing Inc; 2nd edition (31 October 2007)**

23EET302 **ELECTRICAL MACHINES - I** **L T P C**

3 1 0 4

COURSE OBJECTIVES:

- To understand the concept of electromechanical energy conversion system.
- To identify the appropriate DC generators for a given application based on its characteristics.
- To identify the appropriate test to determine the performance parameters of a given DC motors.
- To familiarize with the equivalent circuit of transformer and procedure for predetermining the efficiency and regulation.
- To deliberate the working of auto transformer and three phase transformers.

UNIT I ELECTROMECHANICAL ENERGY CONVERSION 9 + 3

Fundamentals of Magnetic circuits- Statically and dynamically induced EMF - Principle of electromechanical energy conversion forces and torque in magnetic field systems- energy balance in magnetic circuits- magnetic force- co-energy in singly excited and multi excited magnetic field system mmf of distributed windings – Winding Inductances-, magnetic fields in rotating machines- magnetic saturation and leakage fluxes. Introduction to Indian Standard Specifications (ISS) - Role and significance in testing.

UNIT II DC GENERATORS 9 + 3

Principle of operation, constructional details, armature windings and its types, EMF equation, wave shape of induced emf, armature reaction, demagnetizing and cross magnetizing Ampere turns, compensating winding, commutation, methods of improving commutation, interpoles, OCC and load characteristics of different types of DC Generators. Parallel operation of DC Generators, equalizing connections- applications of DC Generators.

UNIT III DC MOTORS 9 + 3

Principle of operation, significance of back emf, torque equations and power developed by armature, speed control of DC motors, starting methods of DC motors, load characteristics of DC motors, losses and efficiency in DC machine, condition for maximum efficiency. Testing of DC Machines: Brake test, Swinburne's test, Hopkinson's test, Field test, Retardation test, Separation of core losses-applications of DC motors.

UNIT IV SINGLE PHASE TRANSFORMER 9 + 3

Construction and principle of operation, equivalent circuit, phasor diagrams, testing - polarity test, open circuit and short circuit tests, voltage regulation, losses and efficiency, all day efficiency, back-to- back test, separation of core losses, parallel operation of single-phase transformers, applications of single-phase transformer.

UNIT V AUTOTRANSFORMER AND THREE PHASE TRANSFORMER 9 + 3

Construction and working of auto transformer, comparison with two winding transformers, applications of autotransformer. Three Phase Transformer- Construction, types of connections and their comparative features, Scott connection, applications of Scott connection.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 5th Edition, 2017.
2. P. S. Bimbhra, "Electric Machinery", Khanna Publishers, 2nd Edition, 2021.
3. Stephen J. Chapman, 'Electric Machinery Fundamentals'4th edition, McGraw Hill Education Pvt. Ltd, 4th Edition 2017.

REFERENCES:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 6th Edition 2017.
2. Sahdev S. K. "Electrical Machines", Cambridge University Press, 2018.
3. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2018.
4. M. G. Say, "Performance and design of AC machines", CBS Publishers, First Edition 2008.

COURSE OUTCOMES:

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

CO1: Apply the laws governing the electromechanical energy conversion for singly and multipleexcited systems.

CO2: Explain the construction and working principle of DC generators and interpret various characteristics of DC generators.

CO3: Explain the construction and working principle of DC motors and Compute various performance parameters of DC motors by conducting suitable tests.

CO4: Draw the equivalent circuit of transformer and predetermine the efficiency and regulation.

CO5: Describe the working principle of auto transformer, three phase transformer with different types of connections.

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	1	-	-	1	-	-	-	3	3	3	3
CO2	3	3	1	2	1	-	-	1	-	-	-	3	3	3	3
CO3	3	3	1	2	1	-	-	1	-	-	-	3	3	3	3
CO4	3	3	1	2	1	-	-	1	-	-	-	3	3	3	3
CO5	3	3	1	2	1	-	-	1	-	-	-	3	3	3	3
CO	3	3	1	2	1	-	-	1	-	-	-	3	3	3	3

23EET303 **ELECTRON DEVICES AND CIRCUITS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the structure of and operation of PN junction diode, Zener diode, LED and Laser diode and design clipper, clamper, half wave and full wave rectifier, regulator circuits using diodes.
- To familiarize the operation and applications of transistor like BJT and UJT.
- To familiarize the operation and applications of JFET.
- To learn the performance of various types of multistage amplifiers.
- To learn the operation of various feedback amplifiers and oscillators

UNIT I PN JUNCTION DEVICES **9**

PN junction diode –Structure, operation and V-I characteristics, diffusion and transition capacitance – Clipping & Clamping circuits - Rectifiers – Half Wave and Full Wave Rectifier – Zener diode - characteristics – Zener diode as regulator - Display devices - LED, Laser diodes.

UNIT II Transistor Circuits **9**

UJT - Construction, operation and characteristics - BJT – CB, CE and CC transistor configuration - Construction, Biasing, operation and characteristics. BJT small signal model – Construction, Operation and Analysis of CE, CB, CC amplifiers - Frequency response

UNIT III FET Circuits **9**

JFET & MOSFET- Construction, Biasing, operation and characteristics –MOSFET small signal model– Analysis of CS, CD and CG amplifier – Gain and frequency response - Low frequency response of JFET amplifier

UNIT IV MULTISTAGE AMPLIFIERS **9**

Differential amplifier – Common mode and Difference mode analysis – Single tuned amplifiers – Gain and frequency response – Neutralization methods - Power amplifiers – Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS **9**

Advantages of negative feedback – Voltage / Current, Series / Shunt feedback – Positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Explain the structure and operation of PN junction diode, Zener diode, LED and Laser diode and design clipper, clamper, half wave and full wave rectifier, regulator circuits using diodes

CO2: Explain the structure and characteristics of UJT & BJT and analyze the performance of various configurations of BJT based amplifier

CO3: Explain the structure and characteristics of JFET & MOSFET and analyze the performance of various configurations of JFET based amplifier

CO4: Analyze the performance of various types of multistage amplifiers

CO5: Explain the operation of various feedback amplifiers and oscillators

TEXT BOOKS:

1. David A. Bell , "Electronic devices and circuits", Oxford University higher education, 5th edition 2008.
2. Robert L.Boylestad, "Electronic devices and circuit theory", 11th edition, Pearson prenticeHall 2013.
3. Albert Malvino, David J. Bates, "Electronic Principles 7th Edition, Tata McGraw Hill, 2017

REFERENCES:

1. Balbir Kumar, Shail.B.Jain, "Electronic devices and circuits" PHI learning private limited, 2nd edition 2014.
2. Thomas L.Floyd, "Electronic devices" Conventional current version, Pearson prentice hall,10th Edition, 2017.
3. Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition,2003.
4. Robert B. Northrop, "Analysis and Application of Analog Electronic Circuits to BiomedicalInstrumentation", CRC Press, Second edition, 2012

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	2	-	-		-	-	-	1	3		1
CO2	2	2	3	2	2	-	-		-	-	-	1	3		1
CO3	2	2	3	2	2	-	-		-	-	-	1	3		1
CO4	2	2	3	2	2	-	-		-	-	-	1	3		1
CO5	2	2	3	2	2	-	-		-	-	-	1	3		1
CO	2	2	3	2	2	-	-		-	-	-	1	3		1

23EET304 **DIGITAL LOGIC CIRCUITS**

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To study various number systems and characteristics of digital logic families
- To study the combinational circuits and its implementations by simplifying the Boolean functions.
- To study the design of various synchronous and asynchronous circuits
- To understand about the asynchronous sequential circuits and programmable logic devices
- To introduce digital simulation techniques for development of application oriented logiccircuit

UNIT I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES 9

Number system, error detection, corrections & codes conversions, Boolean algebra: De-Morgan's theorem, - Digital Logic Families -comparison of RTL, DTL, TTL, ECL and MOS families - operation, characteristics of digital logic family.

UNIT II COMBINATIONAL CIRCUITS 9

Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps - Quine McCluskey method, simplification and implementation of combinational logic – multiplexers and de multiplexers - code converters, adders, subtractors, Encoders and Decoders.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Mealy models- Counters, state diagram; state reduction; state assignment.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABLE LOGIC DEVICES

Asynchronous sequential logic Circuits-Transition stability, flow stability-race conditions, hazards &errors in digital circuits; analysis of asynchronous sequential logic circuits-introduction to Programmable Logic Devices: PROM – PLA –PAL, CPLD-FPGA.

UNIT V VHDL 9

RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages – Subprograms – Test bench. (Simulation /Tutorial Examples: adders, counters, flip flops, Multiplexers & De multiplexers).

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

CO1: Explain various number systems and characteristics of digital logic families

CO2: Apply K-maps and Quine McCluskey methods to simplify the given Boolean expressions and explain the implementation of combinational circuit

CO3: Design various synchronous and asynchronous circuits using Flip Flops

CO4: Explain asynchronous sequential circuits and programmable logic devices

CO5: Use VHDL for simulating and testing RTL, combinatorial and sequential circuits

TEXTBOOKS:

1. Morris Mano.M, 'Digital Logic and Computer Design', Prentice Hall of India, 3rd Edition, 2005.
2. Thomas L Floyd, 'Digital fundamentals', Pearson Education Limited, 11th Edition, 2018
3. Donald D.Givone, 'Digital Principles and Design', Tata McGraw Hill,1st Edition, 2003
4. A Anand Kumar, 'Fundamentals of Digital Circuits' Prentice Hall of India, 4th Edition, 2016.

REFERENCES:

1. Tocci R.J., Neal S. Widmer, 'Digital Systems: Principles and Applications', Pearson Education Asia, 12th Edition, 2017.
2. Donald P Leach, Albert Paul Malvino, Goutam Sha, 'Digital Principles and Applications', Tata McGraw Hill, 7th Edition, 2010.

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	3	3	1	3	-	-	-	-	-	1	3	-	3	2
CO2	3	3	3	1	3	-	-	-	-	-	1	3	-	3	2
CO3	3	3	3	1	3	-	-	-	-	-	1	3	-	3	2
CO4	3	3	3	1	3	-	-	-	-	-	1	3	-	3	2
CO5	3	3	3	1	3	-	-	-	-	-	1	3	-	3	2
CO	3	3	3	1	3	-	-	-	-	-	1	3	-	3	2

23GET101 PROBLEM SOLVING AND PYTHON PROGRAMMING

L T P C

3 0 0 3

COURSE OBJECTIVES:

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart,programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, and guess an integer number in a range, Towers of Hanoi.

UNIT II VARIABLES, DATA TYPES, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode,debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS, STRINGS 9

Conditionals:Boolean values and operators, conditional (if), alternative (if-else),chained conditional (if-elif-else);Iteration: state, while, for, break, continue, pass; Fruitful functions: return values,parameters, local and global scope, function composition, recursion; Strings: string slices,immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, GCD, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT V FILES, MODULES, PACKAGES 9

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs using conditionals and loops for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6: Read and write data from/to files in Python programs.

TEXT BOOKS:

1. Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O’Reilly Publishers, 2016.
2. Karl Beecher, “Computational Thinking: A Beginner's Guide to Problem Solving and Programming”, 1st Edition, BCS Learning & Development Limited, 2017.

REFERENCES:

1. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, “Computational Thinking: A Primer for Programmers and Data Scientists”, 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data”, Third Edition, MIT Press, 2021
4. Eric Matthes, “Python Crash Course, A Hands - on Project Based Introduction to Programming”, 2nd Edition, No Starch Press, 2019.
5. https://www.python.org/
6. Martin C. Brown, “Python: The Complete Reference”, 4th Edition, Mc-Graw Hill, 2018.

23EEP301 ELECTRICAL MACHINES LABORATORY - I

L T P C
0 0 3 1.5

COURSE OBJECTIVES:

- To expose the students to determine the characteristics of DC machines and transformers byperforming experiments on these machines.
- To provide hands on experience to evaluate the performance parameters of DC machines andtransformer by conducting suitable tests.

LIST OF EXPERIMENTS:

1. Open circuit and load test on DC shunt generator- calculation of critical resistance and critical speed.
2. Load test on DC compound generator with differential and cumulative connections.
3. Load test on DC shunt motor.
4. Load test on DC compound motor.
5. Load test on DC series motor.
6. Swinburne's test and speed control of DC shunt motor.
7. Hopkinson's test on DC motor – generator set.
8. Load test on single-phase transformer and three phase transformers.
9. Open circuit and short circuit tests on single phase transformer.
10. Sumpner's test on single phase transformers.
11. Separation of no-load losses in single phase transformer.
12. Study of starters and 3-phase transformers connections.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Experimentally determine the characteristics of different types of DC machines..

CO2: Demonstrate the speed control techniques for a DC motor for industrial applications.

CO3: Identify suitable methods for testing of transformer and DC machines.

CO4: Predetermine the performance parameters of transformers and DC motor.

CO5: Understand DC motor starters and 3-phase transformer connections.

MAPPING OF COs WITH POs AND PSOs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**P06**	**P07**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**	**PS03**
CO1	3	3	1	1	-	-	-	-	3	2	1	3	2	-	3
CO2	3	3	1	1	-	-	-	-	3	2	1	3	2	-	3
CO3	3	3	1	1	-	-	-	-	3	2	1	3	2	-	3
CO4	3	3	1	1	-	-	-	-	3	2	1	3	2	-	3
CO5	3	3	1	1	-	-	-	-	3	2	1	3	2	-	3
CO	3	3	1	1	-	-	-	-	3	2	1	3	2	-	3

23EEP302 ELECTRONIC DEVICES AND CIRCUITS LABORATORY

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To enable the students to understand the behavior of semiconductor device based onexperimentation.
- Be exposed to active and passive circuit elements.
- Familiarize the operation and characteristics of transistor like BJT and FET.
- Explore the characteristics of amplifier gain and frequency response.
- Learn the required functionality of positive and negative feedback systems.

LIST OF EXPERIMENTS:

1. Measurement of frequency and phase angle using CRO
2. Characteristics of Semiconductor diode, Zener diode , photo diode , and photo transistor,
3. Characteristics of NPN Transistor under common emitter , common collector andcommon base configurations
4. Characteristics of JFET and draw the equivalent circuit
5. Characteristics of UJT and generation of saw tooth waveforms
6. Design and frequency response characteristics of a Common Emitter amplifier
7. Characteristics of light activated relay circuit
8. Design and testing of RC phase shift and LC oscillators
9. Characteristics of Single Phase half-wave and full wave rectifiers with inductive andcapacitive filters
10. Design of Differential amplifiers using FET

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

CO1: Analyze the characteristics of PN, Zener diode and BJT in CE,CC,CB configurations experimentally

CO2: Analyze the characteristics of JFET and UJT experimentally

CO3: Analyze frequency response characteristics of a Common Emitter amplifier experimentally

CO4: Analyze the characteristics of RC phase shift and LC oscillators experimentally

CO5: Analyze the characteristics of half-wave and full-wave rectifier with and without filters experimentally

CO6: Analyze the characteristics of FET based differential amplifier experimentally

CO7: Calculate the frequency and phase angle using CRO experimentally

CO8: Analyze the frequency response characteristics of passive filters experimentally

23GEP301 PROFESSIONAL DEVELOPMENT L T P C
0 0 2 1

COURSE OBJECTIVES:

To be proficient in important Microsoft Office tools: MS WORD, EXCEL, POWERPOINT.

- To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the presentability and overall utility value of content.
- To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize, interlink, and utilizing many more critical features offered
- To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, presentability, aesthetics, using media elements and enhance the overall quality of presentations.

MS WORD: 10

Create and format a document
Working with tables
Working with Bullets and Lists
Working with styles, shapes, smart art, charts
Inserting objects, charts and importing objects from other office tools
Creating and Using document templates
Inserting equations, symbols and special characters
Working with Table of contents and References, citations
Insert and review comments
Create bookmarks, hyperlinks, endnotes footnote
Viewing document in different modes
Working with document protection and security
Inspect document for accessibility

MS EXCEL: 10

Create worksheets, insert and format data
Work with different types of data: text, currency, date, numeric etc.
Split, validate, consolidate, Convert data
Sort and filter data
Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,)
Work with Lookup and reference formulae
Create and Work with different types of charts
Use pivot tables to summarize and analyse data
Perform data analysis using own formulae and functions
Combine data from multiple worksheets using own formulae and built-in functions to generate results
Export data and sheets to other file formats
Working with macros
Protecting data and Securing the workbook

MS POWERPOINT: **10**

Select slide templates, layout and themes
Formatting slide content and using bullets and numbering
Insert and format images, smart art, tables, charts
Using Slide master, notes and handout master
Working with animation and transitions
Organize and Group slides
Import or create and use media objects: audio, video, animation
Perform slideshow recording and Record narration and create presentable videos

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements
- Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding
- Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.

Subject code: 23GET401 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C 2 0 0 2

COURSE OBJECTIVES:

- To study the nature of environment and biodiversity.
- To impart knowledge on the causes, effects and control/prevention measures of environmental pollution.
- To facilitate the understanding of renewable energy resources.
- To understand the social aspects of environment.
- To study the information related to environment and society.

UNIT I ENVIRONMENT AND BIODIVERSITY 6

Definition, scope and importance of environment – need for public awareness. Eco-system and energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity. Values of biodiversity, hot-spots of biodiversity.Threats to biodiversity: habitat loss, poaching of wildlife and man-wildlife conflicts. Conservation of biodiversity: In-situ and ex-situ. Ecosystems:Forest ecosystem and grassland ecosystem.

UNIT II ENVIRONMENTAL POLLUTION 6

Causes, effects,prevention and treatment technologies for Air,Water,Soil. Solid waste management and R principle.Solid, hazardous and E-waste management,Industrial safety measures.

UNIT III RENEWABLE ENERGY RESOURCES 6

Deforestation. New Energy Sources: Need of new energy resources. Different energy resources: Tidal, Solar, Wind, Nuclear and Biomass energy resources. Applications of Hydrogen energy, Ocean energy resources and Tidal energy conversion.

UNIT IV SOCIAL ISSUES OF ENVIRONMENT 6

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people. Environmental ethics: Issues and possible solutions – Climate change, Global warming, Acid rain, Ozone layer depletion, Central and state pollution control boards. Waste product and consumerism.

UNIT V ENVIRONMENT AND HUMAN POPULATIONS 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education, Professional ethics – HIV / AIDS – women and child welfare – Role of information technology in environment and human health.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

- CO1: To familiar the functions of ecosystems, environment and biodiversity.
- CO2: To know well about the effects of environmental pollutions.
- CO3: To inculcate the basic knowledge of renewable energy resources.
- CO4: To differentiate various social problems.
- CO5: To know the importance/impacts of population growth.

TEXT BOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', 3rd edition, Tata McGraw-Hill, New Delhi, 2017.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004
3. Anubha Kaushik and C.P. Kaushiks, 'Perspectives in Environmental Studies, 6th edition, New Age International Publishers, 2018.
4. A.K. De, 'Environmental Chemistry, New Age International Publishers, New Delhi, 2016.

REFERENCES:

1. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia, Jaico Publishing House, Mumbai, 2001.
2. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure, 'Oxford University Press, 3rd edition, 2015.
3. Erach Bharucha, 'Textbook of Environmental Studies for Undergraduate Courses, Orient Black swan Private limited, 2013.

COs-POs MAPPING

Programme Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	-	-	-	1	3	-	-	1	-	1
CO2	3	2	1	-	-	1	3	-	-	1	1	1
CO3	3	2	-	-	-	1	3	-	-	1	-	1
CO4	3	2	-	-	-	1	3	-	-	1	-	1
CO5	3	2	1	-	-	1	3	-	-	1	1	1

23EET401 **ELECTRICAL MACHINES – II**

L T P C
3 0 0 3

COURSE OBJECTIVES:

To impart knowledge on the following Topics

- Construction and performance of salient and non – salient type synchronous generators.
- Principle of operation and performance of synchronous motor.
- Construction, principle of operation and performance of induction machines.
- Starting and speed control of three-phase induction motors.
- Construction, principle of operation and performance of single phase induction motors and specialmachines.

UNIT I SYNCHRONOUS GENERATOR **9**

Constructional details – Types of rotors –winding factors- EMF equation – Synchronous reactance – Armature reaction – Phasor diagram -Synchronizing and parallel operation – Synchronizing torque - Voltage regulation – EMF, MMF, ZPF and A.S.A method – steady state power- angle characteristics– Two reaction theory –slip test -short circuit transients - Capability Curves.

UNIT II SYNCHRONOUS MOTOR **9**

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

UNIT III THREE PHASE INDUCTION MOTOR **9**

Constructional details – Types of rotors –- Principle of operation – Slip –cogging and crawling- Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of losses – Double cage induction motors –Induction generators – Synchronous induction motor.

UNIT IV 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 and pole changing – Cascaded Connection-V/f control – Slip power recovery Scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES **9**

Constructional details of single phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor – Construction, working principle and applications of Linear induction motor – BLDC motor - Hysteresis motor - AC series motor - Stepper motors - introduction to magnetic levitation systems

.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the construction and working principle of Synchronous generator

CO2: Understand the construction and working principle of Synchronous Motor

CO3: Understand the construction and working principle of Three Phase Induction Motor

CO4: Acquire knowledge about the starting and speed control of induction motors.

CO5: Gain knowledge about the basic principles and working of Single phase induction motors and Special Electrical Machines.

TEXT BOOKS:

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 5th Edition 2017
2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, edition 2, 2021.
3. A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', Mc Graw Hill publishing Company Ltd, 6th Education 2017.
4. Stephen J. Chapman, 'Electric Machinery Fundamentals', 4th edition, McGraw Hill Education Pvt. Ltd, 4th Edition 2017.

REFERENCES:

1. Vincent Del Toro, 'Basic Electric Machines', Pearson India Education, 2016.
2. M.N. Bandyo padhyay, 'Electrical Machines Theory and Practice', PHI Learning Pvt. Ltd., New Delhi, 2011.
3. B.R.Gupta, 'Fundamental of Electric Machines', New age International Publishers, 3rd Edition, Reprint 2015.
4. Murugesh Kumar, 'Synchronous and Induction machines', Vikas Publishing House Pvt. Ltd, First edition 2010.
5. M. G. Say, 'Performance and design of AC machines', CBS Publishers, First Edition 2008.

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	3	2	2	1	1	-	-	-	-	-	3	2	2	3
CO2	3	3	2	2	1	1	-	-	-	-	-	3	2	2	3
CO3	3	3	2	2	1	1	-	-	-	-	-	3	2	2	3
CO4	3	3	2	2	1	1	-	-	-	-	-	3	2	2	3
CO5	3	3	2	2	1	1	-	-	-	-	-	3	2	2	3
CO	3	3	2	2	1	1	-	-	-	-	-	3	2	2	3

23EET402 TRANSMISSION AND DISTRIBUTION L T P C
3 0 0 3

COURSE OBJECTIVES:

- To impart knowledge about the configuration of the electrical power systems.
- To study the line parameters and interference with neighboring circuits.
- To understand the mechanical design and performance analysis of transmission lines.
- To learn about different insulators and underground cables.
- To understand and analyze the distribution system.

UNIT I TRANSMISSION LINE PARAMETERS 9

Structure of electric power system – introduction to EHVAC and HVDC Parameters of single and three phase transmission lines with single and double circuits -Resistance, inductance, and capacitance of solid, stranded, and bundled conductors - Typical configuration, conductor types - Symmetrical and unsymmetrical spacing and transposition – application of self and mutual GMD; skin and proximity effects - Interference with neighboring communication circuits.

UNIT II MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Performance of Transmission lines – short line, medium line and long line – equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance – transmission efficiency and voltage regulation – introduction to FACTS - Power Circle diagrams – Ferranti effect – Formationof Corona – Critical Voltages – Effect on line Performance.

UNIT III SAG CALCULATION AND LINE SUPPORTS 9

Mechanical design of overhead lines – Line Supports –Types of towers – Tension and Sag Calculation for different weather conditions – Methods of grounding - Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators.

UNIT IV UNDERGROUND CABLES 9

Underground cables – Types of cables – Construction of single-core and 3-core belted cables – Insulation Resistance – Potential Gradient – Capacitance of single-core and 3-core belted cables – Grading of cables – DC cables.

UNIT V DISTRIBUTION SYSTEMS 9

Distribution Systems – General Aspects – Kelvin's Law –DC distributions –Concentrated and Distributed loading- Techniques of Voltage Control and Power factor improvement – Distribution Loss – Types of Substations (DC distribution problems only)

TOTAL: 45 PERIODS

TEXT BOOKS:

1. D.P.Kothari, I.J. Nagarath, 'Power System Engineering', Mc Graw-Hill Publishing Company limited, New Delhi, Third Edition, 2019.
2. C.L.Wadhwa, 'Electrical Power Systems', New Age International Ltd, seventh edition 2022.
3. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of IndiaPvt. Ltd, New Delhi, Second Edition, 2008.
4. John J. Grainger and WUliam D. Stevenson, Jr., 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 1994.

REFERENCES:

1. B.R.Gupta, 'Power System Analysis and Design' S. Chand, New Delhi, Sixth Edition, 2011.
2. Luces M.Fualken berry, Walter Coffer, 'Electrical Power Distribution and Transmission', PearsonEducation, 2007.
3. Arun Ingole, "Power transmission and distribution" Pearson Education, first edition, 2018
4. J.Brian Hardy and Colin R.Bayliss 'Transmission and Distribution in Electrical Engineering',Newnes; Fourth Edition, 2011.
5. G.Ramamurthy, "Handbook of Electrical power Distribution," Universities Press, 2013.
6. V.K.Mehta, Rohit Mehta, 'Principles of power system', S. Chand & Company Ltd, New Delhi,2013
7. Hadi Saadat, 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 3rd Edition,23rd reprint, 2015.
8. R.K.Rajput, 'A Text Book of Power System Engineering' 2nd edition, Laxmi Publications Ltd., New Delhi, 2016.

COURSE OUTCOMES:

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

CO1 : Understand the structure of power system, computation of transmission line parameter fordifferent configurations and the impact of skin and proximity effects.

CO2 : Model the transmission lines to determine the line performance and to understand the impactof Ferranti effect and corona on line performance.

CO3 : Do Mechanical design of transmission lines, grounding and to understand about the insulatorsin transmission system.

CO4 : Design the underground cables and understand the performance analysis of undergroundcable.

CO5 : Understand the modelling, performance analysis and modern trends in distribution system.

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	2	1	-	-	-	-	-	1	-	-	-	-	3	1	3
CO2	3	2	1	1	-	1	-	2	-	-	-	-	3	2	3
CO3	3	2	1	1	-	1	-	2	-	-	-	-	3	3	3
CO4	3	2	1	1	-	1	-	2	-	-	-	-	3	3	3
CO5	3	2	1	1	-	1	-	2	-	-	-	-	3	3	3
CO	2.8	1.8	1	1	-	1	-	1.8	-	-	-	-	3	2.4	3

23EET403 **CONTROL SYSTEMS** **LT P C**
3 0 0 3

COURSE OBJECTIVES:

- To make familiarize with various representations of systems.
- To analyze the stability of linear systems in the time domain.
- To analyze the stability of linear systems in the frequency domain.
- To design compensator based on the time and frequency domain specifications.
- To develop linear models: mainly state variable model and Transfer function model

UNIT I MODELING OF LINEAR TIME INVARIANT SYSTEM (LTIV) **9**

Control system: Open loop and Closed loop – Feedback control system characteristics – First principle modeling: Mechanical, Electrical and Electromechanical systems – Transfer function representations: Block diagram and Signal flow graph.

UNIT II TIME DOMAIN ANALYSIS **9**

Standard test inputs – Time response – Time domain specifications – Stability analysis: Concept of stability – Routh Hurwitz stability criterion – Root locus: Construction and Interpretation. Effect of adding poles and zeros

UNIT III FREQUENCY DOMAIN ANALYSIS **9**

Bode plot, Polar plot and Nyquist plot – Frequency domain specifications - Introduction to closed loop - Frequency Response - Effect of adding lag and lead compensators.

UNIT IV DESIGN OF FEED BACK CONTROL SYSTEM **9**

Design specifications – Lead, Lag and Lag-lead compensators using Root locus and Bode plot techniques – PID controller - Design using reaction curve and Ziegler-Nichols technique - PID control in State Feedback form.

UNIT V STATE VARIABLE ANALYSIS **9**

State variable formulation – Non uniqueness of state space model – State transition matrix –Eigen values – Eigen vectors - Free and forced responses for Time Invariant and Time Varying Systems – Controllability – Observability

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Represent simple systems in transfer function using block diagram reduction technique and signal flow graph.

CO2: Analyze simple systems in time domain.

CO3: Analyze stability of linear systems in frequency domain using different plots.

CO4: Analyze the design of different compensators based on time and frequency domain and infer the stability of systems in time and frequency domain.

CO5: Interpret the characteristics of the system and find out the solution for simple control problems using state variable model.

TEXT BOOKS:

1. Nagarath, I.J. and Gopal, M., "Control Systems Engineering", New Age International
2. Benjamin C. Kuo, "Automatic Control Systems", 7th edition PHI Learning Private Ltd, 2010.

REFERENCES:

1. Richard C.Dorf and Bishop, R.H., "Modern Control Systems", Education Pearson, 3 Impression 2009.
2. John J.D., Azzo Constantine, H. and Houpis Sttuart, N Sheldon, "Linear Control System Analysis and Design with MATLAB", CRC Taylor& Francis Reprint 2009.
3. Katsuhiko Ogata, "Modern Control Engineering", PHI Learning Private Ltd, 5th Edition, 2010
4. NPTEL Video Lecture Notes on "Control Engineering" by Prof.S.D.Agashe, IIT Bombay.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	1	-	-	-	3	3	3	3
CO2	3	3	3	3	3	-	-	1	-	-	-	3	3	3	3
CO3	3	3	3	3	3	-	-	1	-	-	-	3	3	3	3
CO4	3	3	3	3	3	-	-	1	-	-	-	3	3	3	3
CO5	3	3	3	3	3	-	-	1	-	-	-	3	3	3	3
Avg.	3	3	3	3	3	-	-	1	-	-	-	3	3	3	3

23EET404 **LINEAR INTEGRATED CIRCUITS** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

To impart knowledge on the following topics

- Monolithic IC fabrication process and fabrication of diodes, capacitance, resistance and PV Cell.
- AC and DC characteristics of Op-Amp
- Applications of Op-amp.
- Functional blocks and the applications of special ICs like Timers, PLL circuits.
- Applications of ICs in Instrumentation amplifier, fixed and variable voltage regulator, SMPS and function generator

UNIT I IC FABRICATION **9**

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities - Realisation of monolithic ICs and packaging - Fabrication of diodes, capacitance, resistance and PV Cell.

UNIT II CHARACTERISTICS OF OPAMP **9**

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, frequency response of OP-AMP; differential amplifier, Voltage-shunt feedback and inverting amplifier - Voltage series feedback: and Non-Inverting Amplifier.

UNIT III APPLICATIONS OF OPAMP **9**

Instrumentation amplifier and its applications for transducer Bridge – summer, differentiator, Integrator - V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector- D/A converter (R- 2R ladder and weighted resistor types), A/D converters (Successive Approximation (SAR) ADC and Flash ADC types).

UNIT IV SPECIAL ICs **9**

Functional block, characteristics of 555 Timer and its PWM application - IC-566 voltage controlledoscillator IC; 565-phase locked loop IC, AD633 Analog multiplier ICs.

UNIT V APPLICATION ICs **9**

AD623 Instrumentation Amplifier and its application as load cell weight measurement - IC voltage regulators – LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317, 723 Variability voltage regulators, switching regulator - SMPS.

TOTAL :45 PERIODS

COURSE OUTCOMES:

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

CO1: Explain monolithic IC fabrication process and fabrication of diodes, capacitance, resistance and PV Cell

CO2: Analyze the AC and DC characteristics of Op-Amp

CO3: Explain circuit for various applications of Op-Amp

CO4: Explain the functional blocks, characteristics and applications of Timer, VCO, PLL, analog multiplier ICs

CO5: Explain the applications of ICs in Instrumentation amplifier, fixed and variable voltage Regulator and SMPS

TEXT BOOKS:

1. D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', , New Age, Fourth Edition, 2018.
2. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, PHI 2021.
3. David A. Bell, 'Op-amp & Linear ICs', Oxford, Third Edition, 2011

REFERENCES:

1. Robert F.Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', Pearson, 6th edition,2012.
2. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', McGraw Hill,2016 – Fourth Edition.
3. Fiore,"Opamps & Linear Integrated Circuits Concepts & applications", Cengage, 2010.
4. Floyd ,Buchla,"Fundamentals of Analog Circuits, Pearson, 2013.
5. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system',McGraw Hill, 2nd Edition, 2017.
6. Muhammad H. Rashid,' Microelectronic Circuits Analysis and Design' Cengage Learning, 2nd Edition, 2012.

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	3	3	2	2	1	-	-	-	-	2	2	1	2	3
CO2	3	3	3	2	2	1	-	-	-	-	2	2	1	2	3
CO3	3	3	3	2	2	1	-	-	-	-	2	2	1	2	3
CO4	3	3	3	2	2	1	-	-	-	-	2	2	1	2	3
CO5	3	3	3	2	2	1	-	-	-	-	2	2	1	2	3
CO	3	3	3	2	2	1	-	-	-	-	2	2	1	2	3

23EET405 MEASUREMENTS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To educate the fundamental concepts and characteristics of measurement and errors
- To impart the knowledge on the functional aspects of measuring instruments
- To educate the fundamental working of sensors and transducers and their applications
- To infer the importance of various bridge circuits used with measuring instruments.
- To summarize the overall measurement and instrumentation with the knowledge on digitalinstrumentation principles.

UNIT I CONCEPTS OF MEASUREMENTS 9

Instruments: classification, applications – Elements of a generalized measurement system - Static and dynamic characteristics - Errors in measurement - Statistical evaluation of measurement data - Instrument standards.

UNIT II MEASUREMENT OF PARAMETERS IN ELECTRICAL SYSTEMS 9

Classification of instruments – moving coil and moving iron meters – Induction type, dynamometer type watt meters – Energy meter – Megger – Instrument transformers (CT & PT)

UNIT III TRANSDUCERS FOR MEASUREMENT OF NON- ELECTRICAL PARAMETERS 9

Classification of transducers – Measurement of pressure (Capacitive and Piezoelectric type) - Measurement of temperature - Measurement of displacement (Linear Variable Differential Transducer) - Measurement of flow (Electromagnetic and Ultrasonic type) - Measurement of angular velocity – Digital transducers – Smart Sensors.

UNIT IV AC/DC BRIDGES 9

Wheatstone bridge, Kelvin bridge and Kelvin double bridge - Maxwell, Hay, Wien and Schering bridges – Errors and compensation in A.C. bridges

UNIT V DIGITAL INSTRUMENTATION 9

Measurement of voltage, Current, frequency and phase - DSO - Data Loggers – Basics of PLC programming - Introduction to Virtual Instrumentation

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the fundamental concepts of measurement and the structural elements of various instruments

CO2: Describe the working principle of various instruments used for measuring parameters in electrical systems.

CO3: Understand about various transducers and their characteristics.

CO4: Design the different types of bridge circuits.

CO5: Understand the concept of digital instrumentation and virtual instrumentation.

TEXT BOOKS:

1. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements &Instrumentation', Dhanpat Rai and Co, New Delhi, Edition 2011.
2. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010.

REFERENCES:

1. M.M.S. Anand, 'Electronics Instruments and Instrumentation Technology', Prentice Hall India,New Delhi, 2009.
2. J.J. Carr, 'Elements of Electronic Instrumentation and Measurement', Pearson Education India,New Delhi, 2011.
3. W.Bolton, 'Programmable Logic Controllers', 6th Edition, Elseiver, 2015.
4. R.B. Northrop, 'Introduction to Instrumentation and Measurements', Taylor & Francis, New Delhi,3rd Edition 2014.
5. E. O. Doebelin and D. N. Manik, 'Measurement Systems – Application and Design', TataMcGraw-Hill, New Delhi, 6th Edition 2017.
6. R. K. Rajput, 'Electrical and Electronics Measurements and Instrumentation', Chand Pub, 2016.

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	3	3	1	2	2	-	2	2	-	-	3	3	3	3
CO2	3	3	3	1	2	2	-	-	2	-	-	3	3	3	3
CO3	3	3	3	1	2	2	-	-	2	-	-	3	3	3	3
CO4	3	3	3	1	2	2	-	-	2	-	-	3	3	3	3
CO5	3	3	3	1	2	2	-	-	2	-	-	3	3	3	3
CO	3	3	3	1	2	2	-	2	2	-	-	3	3	3	3

23EEP401 ELECTRICAL MACHINES LABORATORY - II L T P C
0 0 4 2

COURSE OBJECTIVES:

- To expose the students to the operation of synchronous machines and induction motors and give them experimental skill.

LIST OF EXPERIMENTS

1. Computation of voltage regulation of three phase alternator by EMF and MMF methods.
2. Computation of voltage regulation of three phase alternator by ZPF method.
3. Regulation of three phase salient pole alternator by slip test.
4. Measurements of negative sequence and zero sequence impedance of alternators.
5. V and Inverted V curves of Three Phase Synchronous Motor.
6. Load test on three-phase induction motor.
7. No load and blocked rotor tests on three-phase induction motor (Determination of equivalentcircuit parameters).
8. Load test on single-phase induction motor.
9. No load and blocked rotor test on single-phase induction motor.
10. Separation of No-load losses of three-phase induction motor.
11. Study of Induction Motor Starters

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand and analyze EMF, MMF and ZPF methods

CO2: Acquire hands on experience of conducting various tests on alternators and obtaining their performance indices using standard analytical as well as graphical methods to understand the importance of Synchronous machines

CO3: Analyze the characteristics of V and Inverted V curves

CO4: Acquire hands on experience of conducting various tests on induction motor and obtaining their performance indices using standard analytical as well as graphical methods. to understand the importance of single and three phase Induction motors

CO5: Acquire knowledge on separation of losses and starters

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	3	1	2	-	-	-	-	2	-	-	3	3	3	3
CO2	3	3	1	2	-	-	-	-	2	-	-	3	3	3	3
CO3	3	3	1	2	-	-	-	-	2	-	-	3	3	3	3
CO4	3	3	1	2	-	-	-	-	2	-	-	3	3	3	3
CO5	3	3	1	2	-	-	-	-	2	-	-	3	3	3	3
CO	3	3	1	2	-	-	-	-	2	-	-	3	3	3	3

23EEP402 CONTROL AND INSTRUMENTATION LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To make the students familiarize with various physical systems and simulate the performance in analog and digital platform.
- To develop the different compensators based on time and frequency domain specifications.
- To make the students to design and implement simple controllers in standard forms.
- To make the students to design a complete closed loop control system and evaluate its performance.
- To develop the stability of a physical system in both continuous and discrete domains.

LIST OF EXPERIMENTS

1. Analog (op amp based) simulation of linear differential equations.
2. Numerical Simulation of given nonlinear differential equations.
3. Real time simulation of differential equations.
4. System Identification through process reaction curve.
5. Stability analysis using Pole zero maps and Routh Hurwitz Criterion in simulation platform.
6. Root Locus based analysis in simulation platform.
7. Determination of transfer function of a physical system using frequency response and Bode's asymptotes.
8. Design of Lag, lead compensators and evaluation of closed loop performance.
9. Design of PID controllers and evaluation of closed loop performance.
10. Discretization of continuous system and effect of sampling.
11. Test of controllability and observability in continuous and discrete domain in simulation platform.
12. State feedback and state observer design and evaluation of closed loop performance.
13. Mathematical modeling and simulation of physical systems in at least two fields.
    - Mechanical
    - Electrical
    - Chemical process

Mini Project 1: Simulation of complete closed loop control systems including sensor and actuator dynamics.

Mini Project 2: Demonstration of a closed loop system in hardware.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Model and analyze simple physical systems and simulate the performance in analog and digital platform.

CO2: Design compensators based on time and frequency domain specifications.

CO3: Design and implement simple controllers in standard forms.

CO4: Analyze a complete closed control loop system and evaluate its performance for simple physical systems.

CO5: Model and simulate physical systems in different fields.

MAPPING OF COs WITH POs AND PSOs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**P06**	**P07**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**	**PS03**
CO1	3	3	3	2	3	2		2	3	2	-	3	2	2	2
CO2	3	3	3	2	3	2		2	3	2	-	3	2	2	2
CO3	3	3	3	2	3	2		2	3	2	-	3	2	2	2
CO4	3	3	3	2	3	2		2	3	2	-	3	2	2	2
CO5	3	3	3	2	3	2		2	3	2	-	3	2	2	2
CO	3	3	3	2	3	2		2	3	2	-	3	2	2	2

23EEP403 LINEAR AND DIGITAL CIRCUITS LABORATORY

L T P C
0 0 3 1.5

COURSE OBJECTIVES:

- To learn design, testing and characterizing of circuit behavior with combinational logic gate ICs.
- To learn design, testing and characterizing of circuit behavior with register/ counter and sequential logic ICs.
- To learn design, testing and characterizing of circuit behavior with OPAMP ICs.
- To learn design, testing and characterizing of circuit behavior with analog ICs like 555 Timer, VCO and regulators.
- To learn design, testing and characterizing of circuit behavior with digital ICs like decoders, Multiplexers.

LIST OF EXPERIMENTS:

1. Implementation of Boolean Functions, Adder and Subtractor circuits.
2. Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa.
3. Parity generator and parity checking.
4. Encoders and Decoders.
5. Counters: Design and implementation of 3-bit modulo counters as synchronous and Asynchronous types using FF IC's and specific counter IC.
6. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.
7. Study of multiplexer and demultiplexer
8. Timer IC application: Study of NE/SE 555 timer in Astable, Monostable operation.
9. Application of Op-Amp: inverting and non-inverting amplifier, Adder, comparator, Integrator and Differentiator.
10. Voltage to frequency characteristics of NE/ SE 566 IC.
11. Variable Voltage Regulator using IC LM317.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand Boolean Functions and implement Adder/ Subtractor circuits.
CO2: Design and implement the Combinational circuits (Code converters & Shift registers)
CO3: Design and implement circuits with digital ICs like decoders, multiplexers,register.
CO4: Demonstrate the applications of Op-Amp (inverting and non-inverting amplifier, Adder, comparator, Integrator and Differentiator)
CO5: Design and implement counters using analog ICs like timers, VCOs and digital ICs like Flip-flops and counters.

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	3	3	3	3	-	-	-	2	2	2	3	-	3	3
CO2	3	3	3	3	3	-	-	-	2	2	2	3	-	3	3
CO3	3	3	3	3	3	-	-	-	2	2	2	3	-	3	3
CO4	3	3	2	3	3	-	-	-	2	1	2	3	-	3	3
CO5	3	3	3	3	3	-	-	-	2	1	2	3	-	3	3
CO	3	3	3	3	3	-	-	-	2	1	2	3	-	3	3

23EET501 **POWER SYSTEM ANALYSIS**

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand and model various power system components under steady state operating condition.
- To understand and apply iterative techniques for power flow analysis
- To model and carry out short circuit studies on power system
- To acquire knowledge on Fault analysis.
- To model and analyze stability problems in power system.

UNIT I Introduction **9**

Need for system planning and operational studies - Power scenario in India - Power system components – Representation - Single line diagram - per unit quantities - p.u. impedance diagram - p.u. reactance diagram - Network graph, Bus incidence matrix, Primitive parameters, Bus admittance matrix from primitive parameters - Representation of off- nominal transformer - Formation of bus admittance matrix of large power network.

UNIT II POWER FLOW ANALYSIS **9**

Bus classification - Formulation of Power Flow problem in polar coordinates - Power flow solution using Gauss Seidel method - Handling of Voltage controlled buses - Power Flow Solution by Newton Raphson method**.**

UNIT III SYMMETRICAL FAULT ANALYSIS **9**

Assumptions in short circuit analysis - Symmetrical short circuit analysis using Thevenin's theorem - Bus Impedance matrix building algorithm (without mutual coupling) - Symmetrical fault analysis through bus impedance matrix - Post fault bus voltages - Fault level.

UNIT IV UNSYMMETRICAL FAULT ANALYSIS **9**

Symmetrical components - Sequence impedances - Sequence networks - Analysis of unsymmetrical faults at generator terminals: LG, LL and LLG - unsymmetrical fault occurring at any point in a power system - computation of post fault currents in symmetrical component and phasor domains.

UNIT V STABILITY ANALYSIS **9**

Classification of power system stability – Rotor angle stability - Swing equation - Swing curve - Power-Angle equation - Equal area criterion - Critical clearing angle and time - Classical step-by-step solution of the swing equation – modified Euler method.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: understand and model various power system components under steady state operating condition.

CO2: Apply iterative techniques for power flow analysis.

CO3: Model and carry out short circuit studies on power system.

CO4: Acquire knowledge on Fault analysis.

CO5: Model and analyze stability problems in power system.

TEXT BOOKS:

1. John J. Grainger, William D. Stevenson, Jr, 'Power System Analysis', Mc Graw Hill Education (India) Private Limited, New Delhi, 2015.
2. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
3. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.

REFERENCES:

1. Pai M A, 'Computer Techniques in Power System Analysis', Tata Mc Graw-Hill Publishing Company Ltd., New Delhi, Second Edition, 2007.
2. J. Duncan Glover, Mulukutla S.Sarma, Thomas J. Overbye, 'Power System Analysis & Design', Cengage Learning, Fifth Edition, 2012.
3. Gupta B.R., 'Power System - Analysis and Design', S. Chand Publishing, 2001.
4. Kundur P., 'Power System Stability and Control', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	3	3	1	1	1	-	-	2	-	-	3	3	1	3
CO2	3	3	3	2	1	1	-	-	2	-	-	3	3	-	3
CO3	3	3	3	2	1	1	-	-	2	-	-	3	3	-	3
CO4	3	3	3	2	2	1	-	-	2	-	-	3	3	1	3
CO5	3	3	3	2	2	1	-	-	2	-	-	3	3	-	3
CO	3	3	3	1.8	1.4	1	-	-	2	-	-	3	3	1	3

23EET502 **POWER ELECTRONICS**

L T P C
3 0 0 3

COURSE OBJECTIVES:

To impart knowledge on the following Topics

- Different types of power semiconductor devices and their switching
- Operation, characteristics and performance parameters of controlled rectifiers
- Operation, switching techniques and basics topologies of DC-DC switching regulators.
- Different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- Operation of AC voltage controller and various configurations.

UNIT I POWER SEMI-CONDUCTOR DEVICES 9

Study of switching devices, SCR, TRIAC, GTO, BJT, MOSFET, IGBT and IGCT- Static characteristics: SCR, MOSFET and IGBT - Triggering and commutation circuit for SCR- Introduction to Driver and snubber circuits.

UNIT II DC TO DC CONVERTERS 9

Step-down and step-up chopper-control strategy– Introduction to types of choppers-A, B, C, D and E -Switched mode regulators- Buck, Boost, Buck- Boost regulator, Introduction to Resonant Converters, Applications-Battery operated vehicles.

UNIT III DC TO AC CONVERTERS 9

Single phase and three phase voltage source inverters (both 120^0 mode and 180^0 mode)– Voltage& harmonic control--PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM – Introduction to space vector modulation –Current source inverter, Applications-Induction heating, UPS.

UNIT IV 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 .

UNIT V AC TO DC CONVERTERS 9

2-pulse, 3-pulse and 6-pulse converters– performance parameters –Effect of source inductance— Firing Schemes for converter - Applications-light dimmer, Excitation system, Solar PV systems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Analyse AC-AC and DC-DC and DC-AC converters.
- Choose the converters for real time applications.

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.

REFERENCES:

1. Joseph Vithayathil,' Power Electronics, Principles and Applications', McGraw Hill Series, 6th Reprint, 2013.
2. Philip T. Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.
3. L. Umanand, "Power Electronics Essentials and Applications", Wiley, 2010.
4. Ned Mohan Tore. M. Undel and, William. P. Robbins, 'Power Electronics: Converters, Applications and Design', John Wiley and sons, third edition, 2003.
5. S.Rama Reddy, 'Fundamentals of Power Electronics', Narosa Publications, 2014.
6. M.D. Singh and K.B. Khanchandani, "Power Electronics," Mc Graw Hill India, 2013.
7. JP Agarwal," Power Electronic Systems: Theory and Design" 1e, Pearson Education, 2002.

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	3	3	3	-	-	2	1	-	-	3	3	3	3	3
CO2	3	3	3	3	-	-		1	-	-	-	-	3	3	3
CO3	3	3	3	3	-	-	2	1	-	-	2	-	3	3	3
CO4	3	3	3	3	-	-	1	1	-	-	2	3	3	3	3
CO5	3	3	3	3	-	-	1	1	-	-	2	3	3	3	3
CO	3	3	3	3	-	-	1.5	1	-	-	2.25	3	3	3	3

23EET503 MICROPROCESSOR AND MICROCONTROLLER

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3	0	0	3

COURSE OBJECTIVES:

- To study the architecture & instruction set of 8085 and to develop skills in simple program writing in assembly languages
- To introduce commonly used peripheral/interfacing ICs used with 8085
- To study the architecture & instruction set of 8051
- To study peripheral interfacing with 8051
- To study the advanced architecture based microcontroller

UNIT I 8085 MICROPROCESSOR ARCHITECTURE AND PROGRAMMING 9

Architecture of 8085 -Bus structure –Interrupt structure -Timing Diagram – Instruction format and addressing modes – Instruction set – Simple programming.

UNIT II INTERFACING BASICS AND ICS 9

Memory interfacing - Study of Architecture and programming of ICs: 8255 PPI, 8259PIC, 8251 USART, 8279 Keyboard display controller and 8254 Timer/Counter – Interfacing with 8085 - A/D and D/A converter interfacing.

UNIT III 8051 MICROCONTROLLER ARCHITECTURE AND PROGRAMMING 9

Functional block diagram - Instruction format and addressing modes – Interrupt structure – I/O ports – Instruction Set – Simple programming

UNIT IV INTERFACING WITH MICROCONTROLLER 9

Serial communication -Timer – keyboard and display interface – Temperature control system – stepper motor control - Usage of IDE for assembly language programming

UNIT V ADVANCED MICROCONTROLLER 9

PIC16 /18 architecture - Memory organization – Addressing modes – Instruction set - Programming techniques – Timers – I/O ports – Interrupt programming.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Describe the architecture of 8085 microprocessor and write assembly language program for microprocessor

CO2: Design and implement the interfacing of peripherals with 8085 microprocessor.

CO3: Describe the architecture of 8051 microcontroller and write assembly language program for microcontroller.

CO4: Design and implement the interfacing of peripherals with 8051 microcontroller.

CO5: Understand and appreciate the advanced architecture based microcontroller

TEXTBOOKS:

1. Ramesh S. Gaonkar, 'Microprocessor Architecture Programming and Application', Penram International (P)ltd., Mumbai, 6th Education, 2013.
2. Muhammad Ali Mazidi & Janice Gilli Mazidi, 'The 8051 MicroController and EmbeddedSystems', Pearson Education, Second Edition 2011.
3. Muhammad Ali Mazidi & Janice Gilli Mazidi, 'The PIC Micro Controller and Embedded Systems',2010

REFERENCES:

1. Douglas V. Hall, "Micro-processors & Interfacing", Tata McGraw Hill 3rd Edition, 2017.
2. Krishna Kant, "Micro-processors & Micro-controllers", Prentice Hall of India, 2007.
3. Mike Predko, "8051 Micro-controllers", McGraw Hill, 2009
4. Kenneth Ayala, 'The 8051 Microcontroller', Thomson, 3rd Edition 2004.

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	2	1	2	3	-	-	-	1	-	-	-	3	3	1	3
CO2	2	1	2	3	-	-	-	1	-	-	-	3	3	1	3
CO3	2	1	2	3	-	-	-	1	-	-	-	3	3	1	3
CO4	2	1	2	3	-	-	-	1	-	-	-	3	3	1	3
CO5	2	1	2	3	-	-	-	1	-	-	-	3	3	1	3
CO	2	1	2	3	-	-	-	1	-	-	-	3	3	1	3

23EEP501 POWER ELECTRONICS LABORATORY

L T P C
0 0 4 2

COURSE OBJECTIVES:

- To study the VI characteristics of SCR, TRIAC, MOSFET and IGBT.
- To analyze the performance of semi converter, full converter, step up, step down choppers by simulation and experimentation.
- To study the behavior of voltage waveforms of PWM inverter applying various modulationtechniques.
- To design and analyze the performance of SMPS.
- To study the performance of AC voltage controller by simulation and Experimentation.

LIST OF EXPERIMENTS:

1. Characteristics of SCR and TRIAC.
2. Characteristics of MOSFET and IGBT.
3. Single phase AC to DC half controlled converter.
4. Single phase AC to DC fully controlled converter.
5. MOSFET based Boost and Buck converter..
6. IGBT based single phase PWM inverter.
7. IGBT based three phase PWM inverter.
8. AC Voltage controller.
9. Switched mode power converter.
10. Simulation of PE circuits (Single phase & three phase semi converter, Single phase & three phase full converter, dc-dc converters, ac voltage controllers).

TOTAL :45 PERIODS

COURSE OUTCOMES:

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

CO1: Determine the characteristics of SCR, IGBT, TRIAC, MOSFET and IGBT

CO2: Find the transfer characteristics of full converter, semi converter, step up and step downchoppers by simulation and experimentation.

CO3: Analyze the voltage waveforms for PWM inverter using various modulation techniques.

CO4: Design and experimentally verify the performance of basic DC/DC converter topologiesused for SMPS.

CO5: Understand the performance of AC voltage controllers by simulation and experimentation.

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	3	3	-	-	2	-	2	3	3	2	2	1	3	-
CO2	3	3	3	-	-	2	-	2	3	3	2	2	1	3	2
CO3	3	3	3	-	-	2	-	2	3	3	2	2	1	3	-
CO4	3	3	3	2	2	2	-	2	3	3	2	2	1	3	2
CO5	3	3	3	-	3	2	-	2	3	3	2	2	1	3	2
CO	3	3	3	2	2	2	-	2	3	3	2	2	1	3	2

23EEP502 MICROPROCESSOR AND MICROCONTROLLER LABORATORY

L T P C
0 0 4 2

COURSE OBJECTIVES:

- To perform simple arithmetic operations by developing assembly language program using theinstruction set of 8085
- To perform interfacing experiments with µP8085
- To perform simple arithmetic operations by developing assembly language program using theinstruction set of 8051
- To perform interfacing experiments with µC8051.
- To simulate microcontroller based systems used for control and monitoring

PROGRAMMING EXERCISES / EXPERIMENTS WITH µP8085:

1. Simple arithmetic operations: Multi precision addition / subtraction /multiplication /division.
2. Programming with control instructions: Increment / Decrement, Ascending / Descendingorder, Maximum / Minimum of numbers, Rotate instructions, Hex / ASCII / BCD code conversions.
3. Interface Experiments: A/D Interfacing. D/A Interfacing.

PROGRAMMING EXERCISES / EXPERIMENTS WITH µC8051:

4. Simple arithmetic operations with 8051: Multi precision addition / subtraction / multiplication/ division.
5. Programming with control instructions: Increment / Decrement, Ascending / Descending.order, Maximum / Minimum of numbers, Rotate instructions, Hex / ASCII / BCD code conversions.
6. Timer programming with 8051.
7. Interface Experiments: A/D Interfacing. D/A Interfacing. Traffic light controller
8. Stepper motor/ DC motor control with 8051.
9. Displaying a moving/ rolling message in the student trainer kit's output device.
10. Programming PIC microcontroller with software tools.

TOTAL :45 PERIODS

COURSE OUTCOMES:

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

CO1: Develop assembly language program for microprocessor.

CO2: Interface peripherals with 8085 microprocessor

CO3: Develop assembly language program for microcontroller

CO4: Design and implement interfacing of peripheral with microcontroller.

CO5: Analyze, comprehend, design and simulate microcontroller based systems used for control and monitoring

MAPPING OF COs WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	2	1	2	-	-	1	-	1	3	3	3	3	1	2	2
CO2	2	1	2	-	-	1	-	1	3	3	3	3	1	2	2
CO3	2	1	2	-	-	1	-	1	3	3	3	3	1	2	2
CO4	2	1	2	-	-	1	-	1	3	3	3	3	1	2	2
CO5	2	1	2	-	-	1	-	1	3	3	3	3	1	2	2
CO	2	1	2	-	-	1	-	1	3	3	3	3	1	2	2