

Zeal Education Society's

ZEAL COLLEGE OF ENGINEERING & RESEARCH, PUNE – 41

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

NBA Accredited, NAAC Accredited with A+ Grade / ISO 21001:2018



DEPARTMENT OF ELECTRICAL ENGINEERING

Curriculum Structure and Syllabus of S.Y. B. Tech. – Electrical Engineering (With effect from - Academic Year 2026- 27) (2025 Course)

VISION OF THE INSTITUTE

To be a premier institute in technical education by imparting academic excellence, research, social and entrepreneurial attitude.

MISSION OF THE INSTITUTE

- To achieve academic excellence through innovative teaching and learning process.
 - To imbibe the research culture for addressing industry and societal needs.
 - To inculcate social attitude through community engagement initiatives.
 - To provide conducive environment for building the entrepreneurial skills.



DEPARTMENT OF ELECTRICAL ENGINEERING

VISION:

To be premier institute in technical education by imparting academic excellence, research, social and entrepreneurial attitude.

MISSION:

M1: To achieve academic excellence through innovative teaching and learning process

M2: To imbibe the research culture for addressing industry and societal needs.

M3: To inculcate social attitude through community engagement initiatives.

M4: To provide conducive environment for building the entrepreneurial skills.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

PEO1: Graduates will be able to apply their technical skill sets and knowledge to solve engineering-based problems in industry, academic and diverse fields of Electrical Engineering.

PEO2: Graduates will demonstrate ethical and social responsibility while engaging in research, innovative practices and entrepreneurial activities, contributing positively to society and technological advancement.

PEO3: Graduates will embrace lifelong learning and adaptability, staying updated with emerging technologies, industry trends and advancements in electrical engineering.

PROGRAM OUTCOMES (POs):

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)



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- PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6).
- PO6: The Engineer and the World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
- PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9).
- PO8: Individual and Collaborative Team Work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
- PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
- PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
- PO11: Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES (PSOs):

- PSO1:** To apply knowledge to build ability to design analyses and solve problems in the field of electrical engineering through power systems, electrical machines, control systems, electronics and automation.
- PSO2:** To develop solution to real time problems through appropriate techniques, modern engineering hardware and software tools related Electrical engineering.



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LIST OF ABBREVIATIONS

Abbreviation	Description
BSC	Basic Science Course
ESC	Engineering Science Course
PCC	Program Core Course
PEC	Program Elective Course
MDM	Multidisciplinary Minor
OE	Open Elective - Other than a particular program
VSEC	Vocational and Skill Enhancement Course
AEC	Ability Enhancement Course
ENTR	Entrepreneurship
EC	Economics
MC	Management Courses
IKS	Indian Knowledge System
VEC	Value Education Courses
RM	Research Methodology
CEP	Community Engagement Project
FP	Field Project
PROJ	Project
INT	Internship
OJT	On Job Training
CC	Co-curricular Courses
HSSM	Humanities Social Science and Management
ELC	Experiential Learning Course
B. Tech	Bachelor of Technology
L	Lecture
P	Practical
T	Tutorial
H	Hours
CR	Credits
CIE	Continuous Internal Evaluation
ETE	End Term Evaluation
TW	Term Work
OR	Oral
PR	Project



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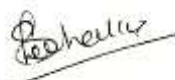
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DEPARTMENT OF ELECTRICAL ENGINEERING

Second Year B. Tech. – Electrical Engineering: Semester - III

Course Code	Course Type	Course Name	Teaching Scheme (hrs/Week)							Evaluation Scheme					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	Total
							TH	PR/Tut	Total						
25EEPC302	PCC	Network Theory	4	-	-	4	4	-	4	40	60	-	-	-	100
25EEPC302P	PCC	Network Theory Lab	-	2	-	2	-	1	1	-	-	-	-	25	25
25EEPC303	PCC	Analog & Digital Electronics	3	-	-	3	3	-	3	40	60	-	-	-	100
25EEPC303P	PCC	Analog & Digital Electronics Lab	-	2	-	2	-	1	1	-	-	-	50	-	50
25EEPC304	PCC	Power System - I	3	-	-	3	3	-	3	40	60	-	-	-	100
25EEMD301	MDM	Engineering Mathematics III	3	-	-	3	3	-	3	40	60	-	-	-	100
25ALOE301	OE	Open Elective - I [#]	2	-	-	2	2	-	2	-	-	50	-	50	100
25EEVS303	VSEC	Problem Solving Technique - I	-	2	-	2	-	1	1	-	-	25	-	-	25
25EEVS304	VSEC	Programming & Data Structure	-	2	-	2	-	1	1	-	-	25	-	-	25
25EECE301	CEP	Project Based Learning	-	2	-	2	-	1	1	-	-	25	-	-	25
25EECC305	CC	Liberal Learning-III	-	2	-	2	-	1	1	-	-	25	-	-	25
25EEIN301	ELC - INT	Internship – II*	4 Weeks				-	2	2	-	-	25	-	-	25
Total			15	12	-	27	15	8	23	160	240	175	50	75	700


BoS Chairman

Director



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DEPARTMENT OF ELECTRICAL ENGINEERING

Second Year B. Tech. – Electrical Engineering: Semester - III

- Select any one course from the given Open Elective Courses

Course Code	Course Type	Open Elective - I
25ALOE301A	OEC	Digital Literacy and Applications
25ALOE301B		Environmental Studies
25ALOE301C		Green Energy and Sustainability
25ALOE301D		Basics of Consumer Electronics
25ALOE301E		Renewable Energy Systems

* Liberal Learning – III: Choose any one from the following:

Sr. No.	Course Code	Module	Sr. No.	Course Code	Module
1.	25EECC305A	Guitar	6.	25EECC305F	Basketball
2.	25EECC305B	Singing	7.	25EECC305G	Cricket
3.	25EECC305C	Cinematography	8.	25EECC305H	Rifle and Pistol Shooting
4.	25EECC305D	Dance	9.	25EECC305I	Volleyball
5.	25EECC305E	Synthesizer	10.	25EECC305J	Football

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Second Year B. Tech. – Electrical Engineering: Semester - IV

Course Code	Course Type	Course Name	Teaching Scheme (hrs/Week)							Evaluation Scheme					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	Total
							TH	PR/Tut	Total						
25EEPC405	PCC	Theory of Electrical Machines - I	3	-	-	3	3	-	3	40	60	-	-	-	100
25EEPC405P	PCC	Theory of Electrical Machines – I Lab	-	2	-	2	-	1	1	-	-	-	25	-	25
25EEPC406	PCC	Power Electronics and its Application	3	-	-	3	3	-	3	40	60	-	-	-	100
25EEPC406P	PCC	Power Electronics and its Application Lab	-	2	-	2	-	1	1	-	-	-	25	-	25
25EEPC407	PCC	Computational Methods & Programming	3	-	-	3	3	-	3	40	60	-	-	-	100
25EEPC407P	PCC	Computational Methods & Programming Lab	-	2	-	2	-	1	1	-	-	-	25	-	25
25EEMD402	MDM	Microcontrollers: Architecture and Interfacing	2	2	-	4	2	1	3	40	60	-	-	-	100
25ALOE402	OE	Open Elective - II [#]	2	-	-	2	2	-	2	-	-	50	-	50	100
25EEMC403	HSSM-MC	Project Management System-I	-	2	-	2	-	1	1	-	-	25	-	-	25
25EEAE401	AEC	Problem Solving Technique - II	-	2	-	2	-	1	1	-	-	25	-	-	25
25EEVS405	VSEC	Electrical Workshop	-	2	-	2	-	1	1	-	-	25	-	-	25
25EECC406	CC	Liberal Learning-IV	-	2	-	2	-	1	1	-	-	25	-	-	25
25EEIN402	ELC - INT	Internship – III*	4 Weeks				-	2	2	-	-	25	-	-	25
Total			13	16	-	29	13	10	23	160	240	175	75	50	700


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Second Year B. Tech. – Electrical Engineering: Semester - IV

# - Select any one course from the given Open Elective Courses		
Course Code	Course Type	Open Elective – II
ALOE402A	OEC	Cyber Security and Laws
ALOE402B		Sustainability and Climate Change
ALOE402C		Energy Audit and Electrical Safety
ALOE402D		Digital Marketing
ALOE402E		Entrepreneurship and Innovations

*** Liberal Learning – IV: Choose any one from the following:**

Sr. No.	Course Code	Module	Sr. No.	Course Code	Module
1.	25EECC406A	Guitar	6.	25EECC406F	Basketball
2.	25EECC406B	Singing	7.	25EECC406G	Cricket
3.	25EECC406C	Cinematography	8.	25EECC406H	Rifle and Pistol Shooting
4.	25EECC406D	Dance	9.	25EECC406I	Volleyball
5.	25EECC406E	Synthesizer	10.	25EECC406J	Football

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Second Year B. Tech.: Semester – IV			
1	25EEPC405	Theory of Electrical Machines - I	66
2	25EEPC405P	Theory of Electrical Machines – I Lab	69
3	25EEPC406	Power Electronics and its Application	71
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5	25EEPC407	Computational Methods & Programming	76
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7	25EEMD402	Microcontrollers: Architecture and Interfacing	81
8	25ALOE402	Open Elective - II [#]	84
9	25EEMC403	Project Management System-I	98
10	25EEAE401	Problem Solving Technique - II	99
11	25EEVS405	Electrical Workshop	100
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SYLLABUS

SEMESTER - III

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Program: B. Tech. (Electrical Engineering)							Semester: III		
Course: Network Theory							Code: 25EEPC302		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
04	-	-	04	40	60	-	-	-	100
Prerequisites:									
Engineering Physics, Basic Electrical Engineering, Basic Calculus (Differentiation, Integration), Algebra and Linear Equations, First order, second order differential equation, Laplace transform.									
Course Objectives:									
1. To build a strong foundation in the basic concepts and classifications of electrical networks. 2. To develop analytical skills in solving electrical circuits using various network theorems. 3. To understand and analyze the transient behavior of electrical circuits using classical method and Laplace transform techniques. 4. To apply network laws and two-port network theory for the analysis of electrical circuits.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Classify various types of electrical circuits and analyze those using node and mesh analysis techniques.								
CO2	Apply network theorems to simplify complex AC circuits.								
CO3	Analyze transient response of RL, RC and RLC circuits using classical method.								
CO4	Analyze transient response of RL, RC and RLC circuits using Laplace transform method.								
CO5	Evaluate two-port electrical networks and assess their interrelationships.								
CO6	Investigate and interpret network functions, including driving point and transfer functions.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Basics of Electrical Circuits: Classification of circuits: Active, passive, unilateral, bilateral, linear, non-linear, lumped, distributed, time variant and time invariant, Types of sources: Dependent and independent voltage and current sources, source transformation, Concept of voltage and current divider, Node and Mesh Analysis: Node and mesh equation (KVL, KCL), matrix approach of complicated network containing dependent and independent voltage and current sources, Concept of super node and super mesh, concept of duality.								09
2.	AC Network Theorems: Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Millman's theorem to AC circuits (Circuits with dependent and independent sources).								10
3.	Transient Analysis using Classical Method: Transient behavior, concept of complex frequency, analysis of RC, RL and RLC networks with and without initial conditions with Classical method (derivation and numerical).								08
4.	Transient Analysis using Laplace Transform Method:								09

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	Properties of Laplace transform: Linearity, time shifting, frequency shifting, time scaling, differentiation and integration in time domain, Initial value and final value theorem, Inverse Laplace transform using - partial fraction method and convolution theorem, analysis of RC, RL and RLC networks with Laplace transforms (derivation and numerical).	
5.	Two Port Network: Z, Y, h and transmission parameters: condition for symmetry, condition for reciprocity and numerical, Interrelations between Z, Y, h and transmission parameters.	08
6.	Network Functions: Network functions for the one port and two port networks, Poles and zeros of network functions, Restrictions on poles and zeros locations for transfer functions and driving point function, Stability of active networks.	08
TOTAL		52
Text Books:		
1. Van Valkenburg, M. E. "Network Analysis", 3rd ed. Prentice Hall of India Private Limited. 2. Mittal G. K, "Network Analysis & Synthesis", Khanna Publication. 3. Singh Ravish R. "Network Analysis and Synthesis", McGraw Hill. 4. Alexander and Sadiku, "Introduction to Electric Circuits", McGraw Hill. 5. Chakraborty S., "Introduction to Electric Circuits", Dhanpat Rai & Co. 6. Gupta B. R. & Vandana Singhal, "Fundamentals of Electrical Networks", S. Chand Publication. 7. Ramesh Babu P, "Electrical Circuit Analysis", 2nd ed. SciTech Publication India Pvt. Ltd.		
Reference Books:		
1. Cramer, "Network Analysis", McGraw Hill Publication. 2. Hayt, William H., Jr. and Jack E. Kimberly, "Engineering Circuit Analysis", McGraw Hill Publication. 3. "Schaum's Outline of Electric Circuits". 7th ed. McGraw-Hill Education. 4. Choudhury D. Roy, "Networks and Systems", 2nd ed. New Age International Publishers, 2013. 5. Kelkar and Pandit, "Linear Network Theory", Pratibha Publication.		
E- Resources:		
1. NPTEL Course on "Basic Electrical Circuits", By Prof. Gajendranath Chowdary, IIT Hyderabad, https://onlinecourses.nptel.ac.in/noc23_ee81/preview 2. NPTEL Course on "Network Analysis", By Prof. Tapas kumar Bhattacharya, IIT Kharagpur. https://archive.nptel.ac.in/courses/108/105/108105159/		

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Program: B. Tech. (Electrical Engineering)							Semester: III		
Course: Network Theory Lab							Code: 25EEPC302P		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
-	02	-	01	-	-	-	-	25	25
Prerequisites:									
Engineering Physics, Basic Electrical Engineering, Basic Calculus (Differentiation, Integration), Algebra and Linear Equations, First order, second order differential equation, Laplace transform.									
Course Objectives:									
1. To develop practical understanding of fundamental network theorems through experimental verification using electrical circuits. 2. To investigate and analyze the transient behavior of RC, RL, and RLC circuits using simulation and/ or experimental observations. 3. To develop understanding of two-port networks through simulation, measurement, and determination of network parameters.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Apply software/ laboratory tools to model and simulate electrical networks for verification of Kirchhoff's laws.								
CO2	Analyze electrical networks using software simulation and/or hardware experimentation to validate fundamental network theorems.								
CO3	Analyze the transient responses of RC, RL, and RLC circuits using simulation/ experimental observations.								
CO4	Evaluate two-port network parameters using simulated/ experimentally obtained electrical quantities.								
List of Experiments:									
Any eight experiments from the following list									
1. Verification of Kirchhoff's laws in A.C. circuits. 2. Verification of Superposition theorem in A.C. circuits. 3. Verification of Thevenin's theorem in A.C. circuits. 4. Verification of Reciprocity theorem in A.C. circuits. 5. Verification of Millmans' theorem. 6. Verification of Maximum Power Transfer theorem in A.C. circuits. 7. Determination of time response of R-C circuit to a step D.C. voltage input. (Charging and discharging of a capacitor through a resistor) 8. Determination of time response of R-L circuit to a step D.C. voltage input. (Rise and decay of current in an inductive circuit) 9. Determination of time response of R-L-C series circuit to a step D.C. voltage input. 10. Determination of parameter of Two Port Network.									
Reference Books:									
1. Cramer, "Network Analysis", McGraw Hill Publication. 2. Hayt, William H., Jr. and Jack E. Kimberly, "Engineering Circuit Analysis", McGraw Hill Publication.									



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| <ol style="list-style-type: none">3. “Schaum's Outline of Electric Circuits”. 7th ed. McGraw-Hill Education.4. Choudhury D. Roy, “Networks and Systems”, 2nd ed. New Age International Publishers, 2013.5. Kelkar and Pandit, “Linear Network Theory”, Pratibha Publication. |
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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Electrical Engineering)						Semester: III			
Course: Analog and Digital Electronics						Code: 25EEPC303			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Basic Electronics, Number system and algebra.									
Course Objectives:									
1. To learn semiconductor devices.									
2. To understand combinational circuits.									
3. To analyze sequential circuits.									
4. To study Operational Amplifier.									
5. To study digital memory.									
6. To understand Regulators, Waveform generators & Filters.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Study of semiconductor devices.								
CO2	Study of combinational circuits.								
CO3	Understand sequential circuits.								
CO4	Learn Operational Amplifier & its applications.								
CO5	Understand digital memory and logic family.								
CO6	Analyze Regulators, Waveform generators & Filters.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Semiconductor devices: Diode rectifier: Introduction, Single phase half wave rectifier with R, RL loads. Single phase full wave rectifier - Center tap and bridge rectifier supplying R and RL load and performance parameters. Three phase full wave bridge rectifier with R load, Special purpose diodes - Varactor, light emitting diodes, Laser diodes. Comparison of single-phase half wave and full wave rectifiers and comparison of single-phase full wave and three phase full wave rectifier.								07
2.	Combinational circuits: Number system: BCD code, grey code, and excess – 3 code, binary weighted codes, signed numbers, Binary arithmetic: - addition and subtraction by 1’s and 2’s compliment. Combinational circuits: Boolean equations, canonical logic forms, sum of product & product of sums, two, three and four variable Karnaugh maps, Encoder, decoder, half and full adder, Mux and Demux.								07
3.	Sequential circuits: Flip flops: R-S, Clocked S-R, D latches, Edge Triggered D flip-flops, Edge triggered JK flip flops, JK Master - slave flip flop, Register: Shift registers, ring and twisted ring counters. Counter: Asynchronous counters, synchronous counter, up - down counter, N – module Counters.								08

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4.	Operational Amplifier & Applications: Op-Amp Basics, practical Op-Amp circuits, Block diagrams of IC 741, open loop and close loop configuration of Op-Amp. Applications of Op - Amp-Comparator, Schmitt trigger, zero crossing detectors, V-I and I-V converters, Instrumentation amplifier, peak detector.	07
5.	Digital memories and logic families: A) Digital memories: RAM, ROM, SRAM, DRAM, EPROM. B) Digital logic families: PAL, PLA, CPLD, FPGA.	06
6	Regulators, Waveform generators & Filters: Voltage regulators using ICs 78xx, 79xx, LM 317, Waveform generation using Op-amp - sine, square, saw tooth and triangular generator, Active filters & its configuration with frequency response, Analysis of first order low pass and high pass filters, IC 555 –construction, working and modes of operation- astable and monostable multi vibrators, Sequence generator.	07
TOTAL		42
Text Books:		
1. R. P. Jain, “Digital Electronics”, Tata McGraw Hill, New Delhi. 2. Floyd and Jain, “Digital Fundamentals”, Pearson Education. 3. Mottershed, “Electronics Devices & Circuits”, PHI New Delhi. 4. Muhammad H. Rashid, “Power Electronics: Circuits, Devices and Applications”, 3 rd edition, Pearsons Education. 5. Floyd, “Electronics Devices”, Pearson Education. 6. Malvino, “Digital Computer Electronics- An Introduction to Microcomputers,” Tata McGraw Hill.		
Reference Books:		
1. P John Paul, “Electronics Devices and circuits”, New Age International Publications. 2. Tokheim, “Digital Electronics-Principles & Application”, 6 th edition, Tata McGraw Hill, New Delhi. 3. A Jaico and Charles H. Roth Jr., “Fundamentals of Logic Design” Charles H Publication, 4 th Edition. 4. K. R. Botkar, “Integrated Circuits”, Khanna Publication, New Delhi. 5. P. S. Bimbhra, “Power Electronics”, Khanna Publications. 6. Jacob Millman, and C.C. Halkias, “Electronic devices and circuits”, TMH Publications.		
E- Resources:		
1. NPTEL Course on “Analog Electronic Circuit”, By Prof. Shouribrata chatterjee, IIT Delhi, https://onlinecourses.nptel.ac.in/noc20_ee89/preview 2. NPTEL Course on “Digital Electronic Circuits”, By Prof. Gautam Saha, IIT Kharagpur. https://onlinecourses.nptel.ac.in/noc20_ee32/preview		

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Electrical Engineering)						Semester: III			
Course: Analog and Digital Electronics Lab						Code: 25EEPC303P			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
-	02	-	01	-	-	-	50	-	50
Prerequisites:									
Basic Electronics, Number system and algebra.									
Course Objectives:									
1. To develop practical skills in the simulation, implementation, and analysis of semiconductor-based rectifier circuits. 2. To provide hands-on experience in the design and implementation of combinational and sequential digital circuits for various applications. 3. To develop skills in the design, testing, and analysis of operational amplifier-based circuits for signal conditioning and measurement applications. 4. To develop practical competency in designing and testing waveform generators, multivibrators, active filters, and application-oriented analog and digital circuits.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Analyze the performance of single-phase rectifier circuits using simulation/ experimental results.								
CO2	Design combinational logic circuits for code conversion, arithmetic, and decoding applications.								
CO3	Analyze Op-Amp based comparator, Schmitt trigger, instrumentation amplifier, and zero-crossing detector circuits.								
CO4	Design waveform generators, multivibrators, and active filters for specified circuit requirements.								
CO5	Develop sequential and display-based digital circuits for simple application-oriented systems.								
List of Experiments:									
Lab Experiments (Any Seven from Expt. No. 01 to 10, and any one case study from Expt. No. 11 and 12)									
1. Design of single-phase bridge rectifier with output voltage and specified ripple (Software) 2. Design logical circuit to convert binary to EXCESS 3/Gray number system. 3. Design three-bit full adder using any open-source software. 4. Design 3:8 decoder for binary to octal decoding. 5. Design of comparator and schmitt trigger. 6. Study of Instrumentation amplifier using three Op-amp, CMRR measurement. 7. Design sine, and triangular wave generator. 8. Find phase angle difference between same frequency signal using ZCD and AND gate. 9. Design astable multivibrator and monostable mutivibrator using IC555. 10. Design first order high pass and low pass filter. 11. Design digital clock or stop watch using decade counter. (IC74192). – Case study. 12. Design of logical circuit for display of decimal number on seven segment display – Case study.									
Reference Books:									



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1. P John Paul, “Electronics Devices and circuits”, New Age International Publications.
2. Tokheim, “Digital Electronics-Principles & Application”, 6th edition, Tata McGraw Hill, New Delhi.
3. A Jaico and Charles H. Roth Jr., “Fundamentals of Logic Design” Charles H Publication, 4th Edition.
4. K. R. Botkar, “Integrated Circuits”, Khanna Publication, New Delhi.
5. P. S. Bimbhra, “Power Electronics”, Khanna Publications.
6. Jacob Millman, and C.C. Halkias, “Electronic devices and circuits”, TMH Publications.

E- Resources:

3. NPTEL Course on “Analog Electronic Circuit”, By Prof. Shouribrata chatterjee, IIT Delhi,
https://onlinecourses.nptel.ac.in/noc20_ee89/preview
4. NPTEL Course on “Digital Electronic Circuits”, By Prof. Gautam Saha, IIT Kharagpur.
https://onlinecourses.nptel.ac.in/noc20_ee32/preview

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Electrical Engineering)							Semester: I		
Course: Power Systems - I							Code: 25EEPC304		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Basic Electrical Engineering, Fundamentals of Power Generation System.									
Course Objectives:									
1. Understand the mechanical design and components of overhead transmission lines.									
2. Learn the resistance, inductance and associated effects in transmission lines.									
3. Understand the capacitance of transmission lines and its calculations.									
4. Analyze the performance of short and medium transmission lines.									
5. Understand the per unit system and its application in power system analysis.									
6. Learn tariff types and their application in electrical energy billing.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Calculate sag, string efficiency, and loading effects in overhead lines.								
CO2	Determine the resistance and inductance of transmission lines.								
CO3	Calculate the capacitance of single-phase and three-phase transmission lines.								
CO4	Evaluate transmission line performance using appropriate models.								
CO5	Solve network reduction problems using the per unit system.								
CO6	Analyze and calculate electricity tariffs using different tariff methods.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Mechanical Design of Overhead Transmission Lines: Components of overhead lines, Types of line supports, Insulators: Pin type insulator, Suspension type insulator, Strain insulator, Shackle insulator, Potential distribution over suspension insulator string, String efficiency, its mathematical expression and numerical based on it, Sag in overhead lines – Calculation of sag when supports are at equal and unequal level, Effect of wind and ice loading on Sag (Numerical).								07
2.	Resistance and Inductance of Transmission Line: Resistance of transmission line, Skin effect and proximity effect, Factors responsible for production of these effects, Internal and external flux linkages of single conductor, Inductance of single phase two wire line, Necessity of transposition, Inductance of three phase line with Symmetrical and unsymmetrical spacing with transposition, Concept of G.M.R and G.M.D, Inductance of bundled conductors.								07
3.	Capacitance of Transmission Line:								

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	Electric potential at single charged conductor, Potential at conductor in a group of charged conductors, Capacitance of single-phase line, Concept of G.M.R and G.M.D for capacitance calculations, Need of transposition for capacitance calculations, Capacitance of three phase line with symmetrical, and unsymmetrical spacing with transposition. Expression of capacitance for single circuit three-phase line, Expression of capacitance for double circuit three phase line, Numerical based on all above topics.	07
4.	Performance of Transmission Line: Classification of overhead transmission lines, Performance of short transmission lines with voltage current relationship and phasor diagram, Representation of medium lines as 'Nominal Π ' and 'Nominal T' circuits using R, L and C parameters, Determination of Generalized Constants for short transmission, nominal Π , nominal T lines, Numerical based on all above topics.	07
5.	Per unit system: Single line diagram, Impedance and reactance diagrams and their uses, per unit quantities, relationships, selection of base, change of base, reduction to common base, advantages and application of per unit system. Numerical based on network reduction by using per unit system.	07
6.	Tariff: Tariff-Definition, objective and desirable characteristics of tariff, Types of tariffs-Simple tariff, Flat rate tariff, Block rate tariff, Two-part tariff, Maximum demand tariff, Power factor tariff, Three-part tariff, and numerical based on tariff.	07
TOTAL		42
Industrial Visit:		
Mandatory visit to LV/HV substation/ generating station.		
Text Books:		
1. V. K. Mehta, Rohit Mehta, "Principles of Power System", S. Chand Publication. 2. J. B. Gupta, "Transmission and Distribution", S. K. Kataria and Sons, New Delhi. 3. J. B. Gupta, "Generation and Economic Considerations", S. K. Kataria & Sons, New Delhi. 4. C. L. Wadhwa, "Electrical Power Systems", New Delhi: New Age International Publishers. 5. A Chakraborty, M. L. Soni, P.V. Gupta, U. S. Bhatnagar, "A text book on Power System Engineering", Dhanpatrai & Co, Delhi. 6. S. N. Singh, "Electric Power Generation, Transmission and Distribution", Prentice Hall of India.		
Reference Books:		
1. Weedy B. M. and Cory B. J., "Electric Power Systems" 4th Edition, Wiley, India. 2. Grainger J. J. and Stevenson W. D., "Elements of Power System Analysis", Tata McGraw – Hill Publishing Company Limited. 3. D. Das, "Electrical Power System", New Age Publication. 4. Nagrath & Kothari, "Power System Engineering", Tata McGraw Hill Publications.		



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5. NPTEL course on Power System Engineering, IIT Kharagpur.

E - Resources:

1. NPTEL course on “Power System Analysis” by, Prof. Debapriya Das, IIT Kharagpur.
https://onlinecourses.nptel.ac.in/noc22_ee120/preview
2. NPTEL course on “Modelling of Power System Analysis” by, Prof. Arindam Ghosh, IIT Kanpur.
<https://nptel.ac.in/courses/108104051>

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Program: B. Tech. (Electrical Engineering)							Semester: III		
Course: Engineering Mathematics - III							Code: 25EEMD301		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites: Calculus (differentiation, integration, and series), basic ordinary differential equations, fundamental algebra including partial fractions and introductory probability and statistics concepts.									
Course Objectives:									
1. To study the fundamentals Differential equations.									
2. To study the concept of Laplace transforms.									
3. To understand concept of Fourier transforms.									
4. Understand basic statistics and probability.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Solve higher-order linear differential equations to model and analyze electrical circuits.								
CO2	Apply Laplace Transform to solve differential equations in engineering problems.								
CO3	Apply Inverse Laplace Transform to solve engineering problems.								
CO4	Apply Fourier Transform concepts in signal processing.								
CO5	Evaluate Z-Transform techniques to analyze discrete-time systems.								
CO6	Apply statistics and probability to analyze data and model uncertainty in engineering.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Linear Differential Equations (LDE): Linear Differential Equation of n^{th} order with constant coefficients, Complementary Function, Particular Integral, Method of variation of parameters, Cauchy's and Legendre's Differential Equation, Simultaneous Differential Equation. Modeling of Electrical circuits.								07
2.	Laplace Transforms: Definition, Properties and Theorems of Laplace Transform, Laplace Transform of derivative of $f(t)$, Laplace Transform of Integral of $f(t)$, Laplace Transform of $t.f(t)$, Laplace Transform of $f(t)/t$, Convolution Theorem, Unit-step Function. Dirac-Delta Functions, Periodic Functions.								07
3.	Inverse Laplace Transforms: Definition, Properties and Theorems, multiplication by S , division by S , First Shifting Property, Second Shifting Property, Inverse Laplace Transform of derivatives, Inverse Laplace Transform of Integrals, Partial Fractions Method, Inverse Laplace Transform by Convolution, Application of LT to solve LDE.								07
4.	Fourier Transforms: Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem (without proof), Fourier Transform, Inverse Fourier Transform,								07

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	Fourier Sine transform, Fourier Cosine transform, Inverse Fourier Sine Transform, Inverse Fourier Cosine Transform.	
5.	Z- Transforms: Introductory Z-Transform (ZT): Definition, Standard Properties of Z-transform, Z-transform of Standard Sequences Change of Scale, Shifting Property, Multiplication by k, Division by k, Inverse of Z-transform by Binomial Expansion and Partial Fraction.	07
6.	Statistics and Probability: Measures of Central Tendency, Arithmetic Mean, Median, Mode, Standard Deviation, Covariance, Karl Pearson's coefficient of correlation, Lines of Regression. Probability: Concept of probability, Random variables, Discrete and Continuous distributions, Poisson distribution, Normal distribution, Binomial distribution. Hypothesis testing-Chi square test.	07
TOTAL		42
Text Books:		
1. Wartikar P. N. & Wartikar, J. N. "Applied Mathematics" Volume I and II, Pune Vidyarthi Griha Prakashan, Pune. 2. Ramana, B.V. "Engineering Mathematics", Tata McGraw-Hill Publication. 3. Grewal B. S. "Higher Engineering Mathematics" Khanna Publication, Delhi.		
Reference Books:		
1. O'Neil Peter V. , "Advanced Engineering Mathematics", Cengage Learning. 2. Greenberg M. D. , "Advanced Engineering Mathematics", Pearson Education Publication. 3. Wylie C.R. & Barrett L.C., "Advanced Engineering Mathematics", McGraw-Hill Publication. 4. Kreyszig Erwin, "Advanced Engineering Mathematics", Wiley Eastern Ltd. 5. Dass H.K. ,Higher Engineering Mathematics , S. Chand Publication 6. Harman Thomas L., Dabney James and Richert Norman, "Advanced Engineering Mathematics with MATLAB", Brooks/Cole-Thomson Learning Publication.		
E-Resources:		
NPTEL Online Courses:		
1. https://onlinecourses.nptel.ac.in/noc25_ma85 2. https://onlinecourses.nptel.ac.in/noc25_ma90		

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ZEAL COLLEGE OF ENGINEERING & RESEARCH, PUNE – 41

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OPEN ELECTIVE - I

**(Select any one course from the given Open
Elective Courses)**

**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Common to all Programs)							Semester: III		
Course: Open Elective – I (Digital Literacy and Applications)							Code: 25ALOE301A		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Basic computer knowledge, Familiarity with using internet and mobile devices									
Course Objectives:									
1. To introduce students to fundamental digital skills and online applications. 2. To enhance understanding of modern information and communication technologies (ICT). 3. To develop practical skills in digital tools, online collaboration, and data management. 4. To promote safe, ethical, and effective use of technology in professional and personal life.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Demonstrate proficiency in using essential digital tools for everyday tasks.								
CO2	Apply safe and secure practices while using the internet and online services.								
CO3	Utilize online collaboration platforms for communication and teamwork.								
CO4	Develop simple digital content (documents, presentations, basic websites).								
CO5	Leverage emerging digital applications for academic, professional, and social needs.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Digital Literacy: Evolution of Digital Technology – Role of ICT in modern life – Hardware and Software basics – Overview of digital devices (Computers, Smartphones, Tablets) – Operating Systems and Applications.								04
2.	Internet and Web Fundamentals: Basics of Internet – Web Browsers – Search Engines – Online Communication Tools (Email, Chat, Video Conferencing) – Netiquette – Cloud Storage and File Sharing.								04
3.	Digital Tools for Productivity: Word Processing (MS Word/Google Docs) – Spreadsheet Fundamentals (MS Excel/Google Sheets) – Presentation Tools (PowerPoint/Canva) – Templates and Online Collaboration (Google Workspace, MS Teams).								05
4.	Cyber Safety and Digital Ethics: Online Security Threats – Password Management – Safe Browsing – Data Privacy – Cyberbullying – Digital Footprint – Intellectual Property Rights in the digital era.								05



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5.	Social media and Online Applications: Role of social media in Communication – Online Professional Networking (LinkedIn) – Blogging and Content Sharing Platforms – Basics of Digital Marketing – E-Governance and Online Services (Banking, Payments, Education Portals).	04
6.	Introduction to Web and Mobile Applications: Creating a Simple Blog/Portfolio Website (Using WordPress/Wix) – Overview of Mobile Apps for Education and Productivity – Emerging Technologies (Cloud Computing, IoT, AI) in everyday life.	04
TOTAL		26
Text Books:		
1. Pradeep K. Sinha, Priti Sinha, “Computer Fundamentals”, BPB Publications. 2. Rajaraman, “Fundamentals of Computers”, PHI Learning.		
Reference Books:		
1. Alan Evans, Kendall Martin, Mary Anne Poatsy, “Technology in Action”, Pearson Education. 2. Daniel Scott, “Digital Literacy Unpacked”, Facet Publishing.		
E-Resources:		
1. NPTEL: https://nptel.ac.in 2. Digital Literacy Course, Google: https://learndigital.withgoogle.com 3. Microsoft Learn: https://learn.microsoft.com 4. W3Schools Basics: https://www.w3schools.com		

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Common to all Programs)							Semester: III		
Course: Open Elective – I (Environmental Studies)							Code: 25ALOE301B		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Course Objectives:									
1. To understand the structure and functions of ecosystems and the importance of biodiversity. 2. To study advanced energy systems and their role in sustainable development. 3. To learn concepts of natural resource management and disaster management through case studies. 4. To understand sources, impacts, and control measures of environmental pollution and waste management. 5. To create awareness about global environmental issues and environmental toxicology. 6. To gain knowledge of environmental assessment, management systems, and pollution control tools.									
Course Outcomes: After the completion of course, students will be able to									
CO1	Understand the structure and functions of major ecosystems and the significance of biodiversity conservation								
CO2	Evaluate various advanced energy systems in terms of their merits, demerits, and global applications								
CO3	Apply concepts of natural resource management and disaster management using relevant case studies.								
CO4	Analyse the sources, impacts, and control measures of environmental pollution and waste management practices.								
CO5	Assess global environmental concerns and suggest sustainable solutions for issues like climate change and groundwater depletion.								
CO6	Utilize environmental management tools and prepare environmental impact assessments following legislative guidelines.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Ecosystems (Structure and Function): Forest, Desert, Wetlands, River, Oceanic and Lake. Biodiversity: Types, Value, Hot-spots, Threats and Conservation of biodiversity, Forest Wealth and Deforestation.								05
2.	Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind. Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable mining, case studies, and Carbon Trading.								04

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3.	Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Groundwater Pollution, Noise pollution, Soil Pollution and Air Pollution. Waste Management & Public Health Aspects: Bio-medical Wastes, Solid waste, Hazardous wastes, E-wastes, Industrial and Municipal Sludge.	05
4.	Global Environmental Concerns (Concept, policies and case-studies): Groundwater depletion/recharging, Climate Change, Acid Rain, Ozone Depletion, Radon and Fluoride problem in drinking water, Resettlement and rehabilitation of people, Environmental Toxicology.	03
5.	Latest Developments in Environmental Pollution Mitigation Tools (Concept and applications): G.I.S. & Remote Sensing, Environmental Management Systems, ISO14001, Environmental Stewardship- NGOs.	04
6.	Environmental Assessment, Management and Legislation Aims and objectives of Environmental Impact Assessment (EIA), Environmental Impact Statement (EIS). EIA Guidelines, Impact Assessment Methodologies, Procedure for reviewing EIA of developmental project, Life-cycle analysis, cost benefit analysis, Guidelines for Environmental Audit.	05
TOTAL		26
Text Books:		
1. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T., "Environmental Encyclopedia", Jaico Publications House, 1st edition, 2000. 2. Agarwal, K.C, "Environmental Biology", Nidhi Publishers, 2nd edition, 2008.		
Reference Books:		
1. Erach Bharucha, "The Biodiversity of India", Mapin Publishing Pvt. Ltd., 1st Edition, 2002. 2. Brendan Gleeson and Nicholas Low (Eds.), "Global Ethics and Environment", Routledge, London, 1999. 3. Peter H. Gleick, "Water in Crisis", Pacific Institute for Studies in Development, Environment & Security, Stockholm Environment Institute, Oxford University Press, 1993. 4. Martha J. Groom, Gary K. Meffe, and Carl Ronald Carroll, "Principles of Conservation Biology", Sinauer Associates, Sunderland, 2006. 5. R. Edward Grumbine and M. K. Pandit, "Threats from India's Himalaya Dams", Science, Vol. 339, pp. 36–37, 2013. 6. Patrick McCully, "Rivers No More: The Environmental Effects of Dams", pp. 29–64, Zed Books, 1996.		
E-Resources:		
1. NPTEL video lecture on Environmental Impact Assessment https://www.youtube.com/watch?v=_iLdyhgFv1U 2. Sustainability Concepts - Innovations and Challenges https://www.youtube.com/watch?v=A9PGRnkLubE&list=PLbRMhDVUMngd2-jPdQSk3QNBtf2n7FxxU&index=2 3. Natural Resources Management		



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<https://www.youtube.com/watch?v=vsXv3anIBSU&list=PLwdnzlV3ogoV162m7Q1rCQamsvKWT9D08>

4. Biodiversity & conservation

<https://www.youtube.com/watch?v=eJBfZGEzUfA&list=PLwdnzlV3ogoV162m7Q1rCQamsvKWT9D08&index=9>

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Common to all Programs)							Semester: III		
Course: Open Elective – I (Green Energy and Sustainability)							Code: 25ALOE301C		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Renewable energy, power generation technology									
Course Objectives:									
1. To study cleaner production and life cycle assessment. 2. To understand green fuels. 3. To learn green technology and green engineering. 4. To learn waste management. 5. To study sustainable technologies.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Understand green technology principles, green chemistry, and process intensification for sustainable industries.								
CO2	Evaluate the benefits, challenges, and environmental impact of green fuels compared to conventional fossil fuels.								
CO3	Apply cleaner production principles and life cycle assessment for sustainability.								
CO4	Assess waste types, audits, and management strategies with focus on health and environmental impact.								
CO5	Explain sustainable technologies considering ecological, economic, and social dimensions.								
CO6	Analyze practical challenges, case studies, and laws in implementing green technologies.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Principles of Green Technology and Green Engineering: Processes and products for green safe and economically acceptable to the society, green chemistry and Process intensification. Green Industrial Processes: Pollution statistics from various industries. A greener approach towards all these industries.								05
2.	Green Fuels: Definition of Green Fuels, their benefits and challenges, comparison of green fuels with conventional fossil fuels with reference to environmental, economic and social impacts, public policies and market driven initiatives, Biomass energy: Concept of biomass energy utilization, types of biomass.								05
3.	Cleaner Production: Definition, Importance, Principles of Cleaner Production and its Benefits, Role of industry, Clean development mechanism, Reuse, Recovery, Recycle, Raw								04

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	material substitution- Wealth from waste. Role of CP in Achieving Sustainability, Benefits, Role of Industry, Government and Institutions, Environmental Management, Pollution Prevention and Cleaner Production Awareness Plan, Environmental Statement, Carbon credit, Carbon trading. Introduction to Life Cycle Assessment (LCA) and Elements of LCA.	
4.	Waste Management: Waste stream assessment (WSA), Waste generation and composition, Waste characteristics (physical and chemical), Waste audit, Health and Environmental effects (public health and environmental), Comparative assessment of waste generation and Composition of developing and developed nations, a case study results from an Indian city, Handouts on solid waste compositions. E-waste generation.	04
5.	Sustainable Technology: Understand the Sustainable Technology, three principle dimensions: the ecological, the economic and the social dimension, including intergenerational justice; use a systems perspective, to describe sustainability challenges and possibilities for major technical systems and for their transformation to meet sustainability requirements.	04
6	Challenges and Practical Implementation: Responsibilities and potentials of companies for action. Green Productivity and emerging technologies. Implementation of the practical applications of Green emerging technologies and sustainable development. Case studies in Green Technology. Green laws compliance.	04
TOTAL		26
Text Books:		
1. Matlack A.S., “Introduction to Green Chemistry”, Marcel Dekker Publication. 2. Modak P., Visvanathan C. and Parasnis M., “Cleaner Production Audit Environmental System Reviews”, Asian Institute of Technology Publication. 3. Anastas P.T. and Warner J.C., “Green Chemistry: Theory and Practice”, Oxford University Press. 4. Bishop P. L., “Pollution Prevention: Fundamentals and Practice”, McGraw-Hill Publication, Boston. 5. Clark J.H. and Macquarie D.J., “Handbook of Green Chemistry and Technology”, Wiley Blackwell Publication.		
Reference Books:		
1. Sawyer C.N, McCarty P.L and Parkin G.F., “Chemistry for Environmental Engineering and Science”, 5th ed. McGraw-Hill Professional Publication. 2. Paul L Bishop, “Pollution Prevention: Fundamentals and practice”, McGraw-Hill International Publication. 3. Das A. K, “Environmental Chemistry with Green Chemistry”, Books and Allied (P) Ltd. Publication. 4. V.K. Ahluwalia, “Green Chemistry Environmentally Benign Reactions”, springer publication.		



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5. V.K. Ahluwalia, Ane. “Green Chemistry: Environmentally Benign Reactions”, springer publication.
6. Mike Lancaster, “Green Chemistry: An Introductory Text”, Royal Society of Chemistry publication.

E-Resources:

1. NPTEL Course on “Energy Resources, Economics and Sustainability”, By Prof. Pratham Arora, IIT Roorkee,
https://onlinecourses.nptel.ac.in/noc25_hs86/preview
2. NPTEL Course on “Sustainable Energy Technology”, By Prof. Sayak Banerjee, IIT Hyderabad.
https://onlinecourses.nptel.ac.in/noc23_me138/preview

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Common to all Programs)							Semester: III		
Course: Open Elective – I (Basics of Consumer Electronics)							Code: 25ALOE301D		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Basic understanding current, voltage, and electronics components									
Course Objectives:									
1. Understand principles and components of audio, video, and communication systems. 2. Develop practical skills in installation, operation, and maintenance of electronics. 3. Prepare students for technical roles in electronics service and support industry.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Understand the working principles and components of basic audio systems and home theatre setups.								
CO2	Explain the functioning of modern video display technologies and remote-control operations.								
CO3	Identify and describe the types, specifications, and working of projectors and CCTV systems.								
CO4	Describe satellite communication principles and DTH system setup and components.								
CO5	Explain the construction, working, and common issues in basic household appliances like washing machines, mixers, and induction cooktops.								
CO6	Understand the operation and features of kitchen and office equipment such as microwave ovens, printers, and scanners.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Audio Systems: Introduction to audio systems, Audio amplifier, Microphone, Loudspeaker, Public address system, DJ system: concept and components, Audio as Data and Signal, Digital Audio Processes: Time Compression & Expansion, Block diagram and working of home theatre system								05
2.	Video Systems and Display Technologies: Elements of TV communication system, Scanning process and its necessity, Comparison: CRT, LCD, and LED TVs, LCD and LED TV: principles and section-wise working, 3D TV: Basic working principle, IPS panels and features, Interfaces: HDMI, USB, RGB, etc., TV remote control: types, IR code transmission/reception, functions, faults								05
3.	Projectors and Surveillance Systems: LCD vs. LED Projectors: differences and specs, working principle and faults in LED projectors, CCTV Cameras: types and specifications, CCTV setup and components, Digital Video Recorders: types and working								04

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4.	Satellite Communication and DTH Technology: Basics of satellite communication, Merits, demerits, and applications, Satellite types, orbits, frequency bands, Components of DTH: PDA, LNBC, satellite receiver, dish alignment, Cable types, impedance, MDU design, Set Top Box: block diagram, features, I/O ports, Cable modem termination system, software, CPE	04
5.	Domestic Appliances – Part I: Washing Machines: types, parts, block diagrams, timers, motors, Vacuum Cleaner: block diagram, working, features, motors, circuits, Mixer/Grinder: parts, speed control, auto overload protection, Electric Iron & Steam Iron: principle, thermostat, parts, Water Purifiers: RO/UV principles, components, faults, Immersion Heater: working, insulation, Induction Cooktop: principle, tubes, heat sinking, fault identification	04
6.	Domestic Appliances – Part II and Office Equipment: Microwave Oven: types, block & wiring diagram, microwave generation, Food Processors: parts and working, Printers: dot matrix, inkjet, laser; advantages, disadvantages, connectivity, Digital Electronic Lock, Xerox Machine, Scanner, Fax Machine	04
TOTAL		26
Text Books:		
1. S. P. Bali, "Consumer Electronics", 1st Edition, Paperback, English. 2. B. R. Gupta, "Consumer Electronics", Paperback, English. 3. Dr. J. S. Chitode, "Consumer Electronics – A Conceptual Approach". 4. Douglas Kinney, "A Beginner's Guide to Consumer Electronics Repair: Handbook and Tutorial". 5. Anand, "Consumer Electronics". 6. H. Davidson, "Troubleshooting Consumer Electronics Audio Circuits".		
Reference Books:		
1. Dennis Roddy, "Satellite Communications", McGraw Hill. 2. R. G. Gupta, "Audio Video Systems – Principles, Maintenance and Troubleshooting", Tata McGraw-Hill. 3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press. 4. S. P. Sharma, "Appliance Servicing and Repair Guide", Katson Books		
E-Resources:		
1. Audio System Engineering (IIT Kharagpur), Course page: https://nptel.ac.in/courses/117/105/117105133 2. Satellite Communication & DTH NOC: Satellite Communication Systems (IIT Kharagpur) Course page: https://archive.nptel.ac.in/courses/117/105/117105131/		

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Common to all Programs)							Semester: III		
Course: Open Elective – I (Renewable Energy Systems)							Code: 25ALOE301E		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Fundamentals of Mechanical Engineering, Physics, Thermodynamics									
Course Objectives:									
1. Discuss the global and national energy scenarios and environmental impacts and sustainability concerns associated with fossil fuel use. 2. Identify and explain the working principles of solar radiation measuring instruments including pyrheliometers, pyranometers, and sunshine recorders. 3. Classify various types of wind-mills and describe their structural components. 4. Introduce biomass as an energy source and describe biomass conversion technologies. 5. Describe the construction, working, and applications of various renewable energy sources.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Identify and describe the main types of renewable energy sources and their respective limitations.								
CO2	Compare various types of solar collectors based on design and performance.								
CO3	Identify and explain factors affecting wind characteristics and wind energy generation.								
CO4	Interpret the advantages and limitations of biomass energy in comparison with other renewable sources.								
CO5	Apply energy conversion principles to assess the feasibility of alternative energy systems.								
CO6	Compare the suitability of renewable energy technologies (like fuel cells) for specific applications.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Renewable Energy: Environmental consequence of fossil fuel, Limits Of Fossil Fuel, Energy Scenario, Classification of Energy Sources, types of renewable energy sources, limitations.								04
2.	Solar Energy: Environmental impacts of solar energy, Solar radiation measurements, Solar constant, Solar Radiation Measuring Instruments (Radiometers): Pyrheliometers, Pyranometers, Sunshine recorder, classification of solar collectors								05
3.	Wind Energy: Factors affecting the wind, Classification of Wind-mills, Main Components of a wind-mill, wind speed prediction, Advantages of Fixed and variable speed systems,								04



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4.	Biomass Energy: Introduction, Biomass Conversion, Types of biogas plants: Floating dome type, Fixed dome type, Biodiesel, Significance of biodiesel	04
5.	Other Forms of Renewable Energy Sources: Introduction, hydro energy, geothermal energy, wave & tidal energy, Energy Conversion Principles, Environmental considerations	04
6.	Applications of Renewable Energy Sources: Photovoltaic (PV) cell, Solar water heater, Crop And Grain Drying, Space And Water Heating, Solar Energy Applications for Agriculture, Fuel Cell	05
TOTAL		26
Text Books:		
1. S. P. Sukhatme and J. K. Nayak, "Solar Energy: Principles of Thermal Collection and Storage", 3rd Edition, Tata McGraw-Hill Education Pvt. Ltd., 2008. 2. J. Twidell and Tony Weir, "Renewable Energy Resources", 2nd Edition, Taylor & Francis, 2006. 3. B. H. Khan, "Non-Conventional Energy Resources", 2nd Edition, Tata McGraw-Hill Education Pvt. Ltd., 2009. 4. Prabir Basu, "Biomass Gasification, Pyrolysis and Torrefaction", Academic Press, Elsevier, 2013.		
Reference Books:		
1. O. P. Gupta, "Energy Technology", Khanna Book Publishing, New Delhi. 2. V. V. N. Kishore, "Renewable Energy Engineering and Technology: Principles and Practice", Routledge, 1st Edition, 2019. 3. N. Jenkins and J. Ekanayake, "Renewable Energy Engineering", Cambridge University Press, 1st Edition, 2017. 4. G. Boyle, "Renewable Energy", OUP Oxford, 2nd Edition, 2009.		
E-Resources:		
1. https://onlinecourses.nptel.ac.in/noc22_ph44/preview 2. https://nptel.ac.in/courses/103103206 3. https://onlinecourses.swayam2.ac.in/nou22_ge71/preview 4. https://www.coursera.org/specializations/renewable-energy 5. https://www.coursera.org/learn/exploring-renewable-energy 6. https://www.youtube.com/watch?v=VfowJHJz6-s		

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Program: B. Tech. (Electrical Engineering)							Semester: I		
Course: Problem Solving Techniques - I							Code: 25EEVS303		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Interactive mind-set for practical.									
Course Objectives:									
1. To acquire basic knowledge of Problem-solving techniques.									
2. To understand the structured way of solving problems with the right tools.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Know the problem and types of problem.								
CO2	Understand the structured way of solving a problem.								
CO3	Understand the basic tools and its application.								
CO4	Apply the learning to solve simple problem cases as a team.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Problem Understanding: Define problem, Types of Problem, What is problem solving? Structured way of Problem solving – Step by Step.								06
2.	Problem Solving Approach: Structured step by step working model, Principles to think and apply.								06
3.	Basic Tools for Problem Solving: Knowing the tools and applying the right tools at the right step of problem-solving, Problem-solving case study.								16
TOTAL								28	
Text Books:									
1. M.T. Somashekara, “Problem Solving and Programming Concepts”, PHI Learning.									
2. Dheeraj Sharma, “Problem Solving and Decision Making”, McGraw-Hill Education.									
Reference Books:									
1. Willian Henderson, “Master Critical Thinking, Creative, Logic & Problem solving skills”, Peak Publish LLC.									
2. Sharma Narender, “Handbook 7 QC tools”, Shakehand with Life.									
E-Resources:									
1. Coursera: “Creative Problem Solving” - https://www.coursera.org/learn/creative-problem-solving .									
2. MindTools – “Problem Solving Techniques”, https://www.mindtools.com/cx4ems0/problem-solving .									

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Electrical Engineering)							Semester: III		
Course: Programming & Data Structure							Code: 25EEVS304		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Course Objectives:									
1. Understand the fundamentals of computers including hardware components.									
2. Develop algorithmic thinking by learning problem-solving strategies.									
3. Gain proficiency in C++ programming language, covering core concepts.									
4. Understand and implement structures and classes to support object-oriented programming principles.									
5. Explore pointers and dynamic memory allocation to manage memory effectively									
Course Outcomes: After completion of this course, students will able to -									
CO1	Design algorithms for solving simple mathematical problems including computing, searching and sorting.								
CO2	Compare and contrast algorithms in terms of space and time complexity to solve simple mathematical problems.								
CO3	Explore the internals of computing systems to suitably develop efficient algorithms.								
CO4	Examine the suitability of data types and structures to solve specific problems.								
CO5	Apply control structures to develop modular programs to solve mathematical problems.								
CO6	Understand the concept of abstract data types and apply them in real-world applications.								
Course Contents:									
Unit	Description								
Unit 1	Fundamentals of Computers- Components of a computers, Problems, Flowcharts, Memory, Variables, Values, Instructions, Programs. Algorithmic approach, characteristics of algorithm, Problem-solving strategies: Top-down approach, Bottom-up approach, Number systems and data representation.								
Unit 2	Elements of C++ programming language- Data types, constants, and variables, expressions and assignment statements, input and output statements, conditional and branch statements: If-else, Switch case constructs, iteration statements: while, do-while, for, Arrays – Single and Multi-Dimensional Arrays, strings. Bit-wise operations.								
Unit 3	Functions and Recursion- Modular approach for solving real time problems, user defined functions, library functions, parameter passing - call by value, call by reference, return values, passing arrays as parameters to functions Recursion. Structures and Classes - Declaration, member variables, member functions, access modifiers, function overloading, Problems on Complex numbers, Date, Time, Large Numbers.								
Unit 4	Pointers and Files- Introduction to pointers and dynamic allocation, String processing, File operations- create, read and write.								
Unit 5	Searching and sorting- Linear and binary search, selection sort, bubble sort, insertion sort, merge sort, quick sort.								
Unit 6	Data structures-								



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	Abstract Data Types (ADTs) – Stack ADT – Array-Based Implementation of Stack – Applications, Queue ADT – Array-Based Implementation – Applications
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List of Experiments: (Any 8)

1. Develop a C++ program to compute electricity bills using slab rates based on energy consumption.
2. Write a C++ program to calculate electrical parameters (V, I, R) using Ohm's Law for given inputs.
3. Implement matrix operations (addition and multiplication) for 3-phase voltage and current data to compute total power.
4. Design a structure to store details of electrical appliances and calculate daily energy consumption.
5. Develop a C++ class to model transformer specifications and compute efficiency and voltage transformation ratio.
6. Use recursion and user-defined functions to compute electrical values like factorial (for harmonic order) and total resistance in parallel circuits.
7. Demonstrate pointer operations in C++ to process voltage/current sensor data stored in arrays.
8. Perform file operations to log daily energy meter readings and compute the total monthly consumption.
9. Implement sorting algorithms (bubble, insertion) to organize electrical loads based on power ratings.
10. Simulate stack and queue data structures to manage electrical system tasks such as postfix evaluation and appliance load scheduling.

Text Books:

1. Walter Savitch, Problem Solving with C++, Pearson, 2014, Ninth Edition.
2. Cay Horstmann, Timothy Budd, Big C++, Wiley, 2009, Second Edition.

Reference Books:

1. R.G. Dromey, How to solve it by Computer, Pearson, 2008.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education, 2006, Third Edition.

E-Resources:

1. Prof. Partha Pratim Das, "Programming in C++", IIT Kharagpur
<https://nptel.ac.in/courses/106105151>
2. Prof. Abhiram Ranade, "An Introduction to Programming Through C++", IIT Bombay
<https://nptel.ac.in/courses/106101208>

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Program: B. Tech. (Electrical Engineering)							Semester: III		
Course: Project-Based Learning							Code: 25EECE301		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Course Objectives:									
1. Enable students to apply fundamental concepts of Electrical Engineering to real-world solutions. 2. Strengthen interdisciplinary integration by combining knowledge of hardware and software tools (such as simulation platforms, embedded systems and microcontrollers) to build simple engineering prototypes. 3. Enhance critical thinking and collaborative problem-solving by encouraging students to design, implement and test solutions within defined project constraints. 4. Cultivate problem-solving, teamwork, communication and time management skills essential for engineering practice and professional development.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Analyze the basic engineering problem to determine possible solutions.								
CO2	Apply knowledge of mathematics, basic sciences and electrical engineering fundamentals to develop project solutions.								
CO3	Collaborate effectively in teams to plan and execute project tasks.								
CO4	Recognize and appreciate the strengths and skills within themselves and their team members.								
CO5	Synthesize information from diverse sources to summarize the key findings.								
CO6	Demonstrate project results clearly and confidently using verbal explanations, visual aids, and written documentation.								
Procedure:									
1. A group of 3 to 4 students will be assigned to a faculty member as their mentor. 2. Under the guidance of a mentor, the group will identify a project problem based on their fundamental engineering knowledge and relevant societal or industry challenges. 3. The mentor will assist the group in planning the project by defining clear expected outcomes and dividing the work into specific tasks with set targets and deadlines. 4. Weekly meeting will be conducted with mentor to assess progress, discuss completed tasks and provide further guidance. 5. The project will conclude with a final presentation, project demonstration and the submission of a comprehensive report. 6. Students are encouraged to take part in competitions.									
Assessment:									
The department and mentors are dedicated to assessing both student performance and the overall effectiveness of the Project-Based Learning (PBL) approach. The progress of each PBL activity is monitored weekly by the mentor, who, along with relevant authorities, conducts continuous assessment and evaluation of both individual and group performance throughout the process. Students must uphold a culture of authentic collaboration, self-motivation, peer learning and personal accountability. To support this, the institution and department should provide necessary guidance through orientation programs and ensure access to appropriate resources and support services. Active participation from both,									

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mentors and students are essential in the assessment and evaluation process. Student groups may showcase their learning outcomes through a solution to the identified problem, a public product, a detailed report, and/or a formal presentation.

Assessment will include:

- **Individual assessment:** Evaluating each student's understanding, role, and level of involvement in the project.
- **Group assessment:** Reviewing task distribution, defined roles, team communication, and overall collaboration.
- **Documentation and presentation:** Assessing the quality of project documentation and effectiveness of the final presentation.

Evaluation and Continuous Assessment:

All activities related to Project-Based Learning (PBL) should be regularly assessed and documented in a designated PBL workbook. This workbook must be systematically updated and maintained by mentors and the department to ensure accurate tracking of student progress and performance.

Detailed rubric structure based on:

- **Weekly Attendance & Reporting:** 10 Marks
- **Review 1:** 30 Marks
- **Review 2:** 30 Marks
- **Average of both reviews:** Scaled to 15 Marks
- **Final Total = Weekly Attendance & Reporting + Average of both reviews:** 25 Marks

Evaluation scheme:

Weekly Attendance & Reporting (10 Marks)

Objective: Ensure regular student participation, guidance seeking, and record maintenance.

Criteria	Max Marks
Weekly attendance /guidance sessions	04
Weekly progress	03
Maintenance of PBL workbook	03
Total	10

Review 1 Evaluation Rubric (30 Marks)

Purpose: To assess the understanding of the problem, background work, and initial progress.

Criteria	Max Marks
Understanding of the problem and objectives	05
Literature review and relevance	05
Methodology and planning	05
Individual role clarity and involvement	05
Technical depth and preliminary implementation	05
Communication skills during a review	05
Total	30

Review 2 Evaluation Rubric (30 Marks)

Purpose: To assess progress made, technical outcomes, documentation, and presentation.



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Criteria	Max Marks
Project implementation and progress	05
Technical knowledge/ innovation	05
Team coordination and collaboration	05
Report/documentation quality	05
Presentation (content, delivery, structure)	05
Participation in any competition	05
Total	30

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Liberal Learning - III

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Program: B. Tech (Electrical Engineering)							Semester: III		
Course: Liberal Learning – III (Guitar)							Code: 25EECC305A		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music and Guitar musical instrument.									
Course Objectives:									
1. To develop advanced guitar techniques, including scales, arpeggios, fingerstyle, and lead guitar skills. 2. To strengthen students’ understanding of music theory, chord construction, harmony, improvisation, and melodic phrasing. 3. To enhance ensemble performance, stage confidence, musical communication, and readiness for intermediate-level performances.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Perform advanced scales, arpeggios, chord progressions, and fingerstyle techniques with accuracy.								
CO2	Apply music theory concepts in lead guitar playing, improvisation, and melodic expression.								
CO3	Demonstrate confident solo and ensemble performances with effective musical expression and stage readiness.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Revision of Semester II concepts, Warm-up & Finger Independence								2
2.	Major & Minor Scale Revision (Two Octaves)								2
3.	Pentatonic Scales & Blues Scale								2
4.	Arpeggios and Picking Exercises								2
5.	Chord Construction & Extended Chords (7th, Maj7, m7)								2
6.	Chord Progressions in Different Keys								2
7.	Fingerstyle Techniques – Patterns & Independence								2
8.	Lead Guitar Techniques – Hammer-ons, Pull-offs, Slides								2
9.	Improvisation using Pentatonic Scale								2
10.	Genre-based Playing (Blues, Rock, Pop)								2
11.	Ensemble Playing & Rhythm Coordination								2
12.	Solo Performance Practice & Individual Corrections								2
13.	Mock Performance & Stage Preparation								2
TOTAL								26	
Text Books:									
1. Hal Leonard Corporation, "Hal Leonard Guitar Method – Complete Edition", Hal Leonard Publications.									



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2. Mel Bay, "Modern Guitar Method – Grades 1, 2 & 3", Mel Bay Publications.
3. William Leavitt, "A Modern Method for Guitar (Books 1–3)", Berklee Press.
4. Richard Chapman, "The Complete Guitar Manual", DK Publishing.
5. Ralph Denyer, "The Guitar Handbook", Knopf Publishing..

Reference Books:

1. Troy Stetina, "Fretboard Mastery", Hal Leonard Publications.
2. Tom Kolb, "Music Theory for Guitarists", Hal Leonard Publications.
3. Don Latarski, "Practical Theory for Guitar", Alfred Music.
4. Bruce Buckingham, "Scales and Modes for Guitar", Hal Leonard Publications.
5. Mark Phillips and Jon Chappell, "Guitar For Dummies", Wiley Publishing.

E-Resources:

1. **Berklee Online** – Guitar lessons, music theory, ear training, and performance resources. <https://online.berklee.edu>
2. **Justin Guitar** – Structured guitar lessons from beginner to advanced. <https://www.justinguitar.com>
3. **Fender Play** – Interactive lessons on chords, scales, techniques, and songs. <https://www.fender.com/play>
4. **TrueFire** – Professional online guitar courses covering multiple genres and techniques. <https://truefire.com>
5. **Ultimate Guitar** – Tabs, chord charts, scales, and community resources. <https://www.ultimate-guitar.com>
6. **MuseScore** – Free music notation software and sheet music library. <https://musescore.org>
7. **MusicTheory.net** – Interactive music theory lessons and exercises. <https://www.musictheory.net>
8. **Yamaha Music India** – Educational resources on guitar fundamentals and musicianship. <https://in.yamaha.com>

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Course: Liberal Learning – III (Singing)							Code: 25EECC305B		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music in singing.									
Course Objectives:									
1. To develop students’ understanding of prescribed ragas and talas through theoretical and practical study. 2. To enhance vocal skills through Alankar practice in Shuddha and Vikrit (Komal) Swaras and different musical forms. 3. To strengthen rhythmic knowledge, musical expression, voice culture, and stage performance skills.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate understanding of prescribed ragas, talas, and Alankars through accurate vocal performance.								
CO2	Apply rhythmic patterns such as Bhajani Theka and Jhaptal in prescribed vocal compositions.								
CO3	Perform festival songs, ghazals, and vocal compositions with proper pitch, voice control, musical expression, and stage confidence.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Detailed Study of Prescribed Ragas: Raga Bageshree ,Raga Des, Raga Khamaj								6
2.	Study of Prescribed Talas: Bhajani Theka, Jhaptal								4
3.	Basic theory concepts								2
4.	Identification of Raga Characteristics and Tala Structure								2
5.	Festival Songs								2
6.	Gazals								2
7.	Soulful / Light Vocal Songs								2
8.	Interpretation and Presentation of Different Song Styles								2
9.	Practice of Ten Alankars in Shuddha/ Komal swaras								2
10.	Alankars based on the Prescribed Ragas								2
TOTAL								26	
Text Books:									
1. V. N. Bhatkhande, "Kramik Pustak Malika (Vol. III & IV)", Publications. 2. V. D. Paluskar, "Sangeet Bal Prakash", Publications.									
Reference Books:									
1. V. N. Bhatkhande, "Hindustani Sangeet Paddhati (Vol. I–IV)", Publications. 2. Ashok Da. Ranade, "Hindustani Music: Tradition in Transition", Publications. 3. S. N. Ratanjankar, "Abhinav Geet Manjari", Publications.									



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E-Resources:
1. Sangeet Natak Akademi - All India Radio (Akashvani) 2. SwarGanga Music Foundation 3. YouTube – Sangeet Natak Akademi Channel 4. Digital Tanpura and Tabla Applications (e.g., iTanpura, Riyaz, NaadSadhana)

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)							Semester: III		
Course: Liberal Learning – III (Cinematography)							Code: 25EECC305C		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
A basic understanding of film theory, Camera operation, Lighting techniques and visual storytelling is essential for cinematography.									
Course Objectives:									
1. To identify and operate camera equipment while understanding camera functions and exposure settings.									
2. To develop skills in composition, framing, perspective, and lighting techniques.									
3. To create visual stories through different photography genres and creative image-making.									
4. To apply basic photo editing and post-processing techniques using editing software.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Operate cameras and apply appropriate settings, exposure, and lighting techniques to capture quality photographs.								
CO2	Compose visually appealing photographs using principles of composition, design, and creative framing.								
CO3	Capture photographs across different genres such as portrait, landscape, product, event, and wildlife photography.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Introduction to Videography								2
2.	Basics of Video Camera operations								2
3.	Techniques for steady shooting (Tripod, Gimble)								2
4.	Basics shot types (Wide, Medium, Close-up)								2
5.	Basics shot types (Wide, Medium, Close-up)								2
6.	Camera Movement (Pan, Tilt, Roll)								2
7.	Practical								2
8.	Composition Technique - Focus and Depth of field								2
9.	Natural vs artificial lighting								2
10.	Practical								2
11.	Filming Techniques								2
12.	Audio Recording								2
13.	Practical Session								2
TOTAL								26	
Text Books:									
1. Peterson, B., "Understanding Exposure – Theory + Fundamentals", Amphoto Books.									



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2. Kelby, S., "The Digital Photography Book – Practical + Shooting", Rocky Nook.

Reference Books:

1. Langford, M., "Langford's Basic Photography – Technical Concepts", Focal Press.
2. Freeman, M., "The Photographer's Eye – Composition, Visual Balance, Framing, Perspective", Ilex Press.

E-Resources:

1. <https://www.youtube.com/watch?v=xKRh4PI-BKg>
2. <https://www.youtube.com/@StudioBinder/videos>

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)							Semester: III		
Course: Liberal Learning – III (Dance)							Code: 25EECC305D		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Good stamina, flexibility and familiarity with simple rhythmic patterns and beats.									
Course Objectives:									
1. To strengthen students' technical proficiency through advanced Adavus, Jathis, and rhythmic patterns. 2. To develop expressive skills (Abhinaya) by interpreting simple classical compositions. 3. To enhance coordination, balance, posture, and stage presence through regular practical training. 4. To introduce students to intermediate Bharatanatyam repertoire such as Jatiswaram and improve performance skills.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate dance techniques with precision, balance, posture, and rhythmic accuracy.								
CO2	Apply musicality, synchronization, expression, and storytelling in solo and group performances.								
CO3	Create dance combinations using choreography principles with confidence, creativity, and stage presence.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Introduction to forms and previous year revision								2
2.	Choreography on song/ composition								6
3.	Application and introduction to emotions for better understanding of movements								4
4.	Rhythm and rhythmic movements								6
5.	Introduction to different forms other than the teaching format								2
6.	Insights to choreographies and partner motions in folk forms								4
7.	Mock performance training and presentation with costumes								2
TOTAL								26	
Text Books:									
1. Bharata Muni, "Natya Shastra", translated by Manomohan Ghosh, Asiatic Society, Kolkata. 2. Nandikeshvara, "Abhinaya Darpana", translated by Manomohan Ghosh. 3. Balasaraswati, T., "Bharatanatyam", Madras Music Academy. 4. Krishna Iyer, E., "Bharatanatyam", Ganesh & Co., Chennai.									
Reference Books:									
1. Kothari, Sunil, "Bharatanatyam", Marg Publications, Mumbai. 2. Vatsyayan, Kapila, "Classical Indian Dance in Literature and the Arts", Sangeet Natak Akademi.									



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3. Subramaniam, Padma, "Bharata's Art: Then and Now", Bharata Ilango Foundation.
4. Vatsyayan, Kapila, "Indian Classical Dance", Publications Division, Government of India.
5. Srinivasan, Priya, "Sweating Saris: Indian Dance as Transnational Labor", Temple University Press.
6. Sangeet Natak Akademi, "Bharatanatyam – A Reader", Sangeet Natak Akademi, New Delhi.

E-Resources:

1. <https://youtu.be/XONKu803dAk?si=LkLbNKPUvKpfZJkF>
2. <https://youtu.be/D0Ow529EHSo?si=upTtBpNp1lODzHMq>
3. <https://youtu.be/JDfYT3Ax7mE?si=Q9VYWj95cnLikw2V>
4. <https://youtu.be/GcZJMiHds3U?si=AXAMwJ37YuDEVbTF>
5. <https://youtu.be/2j9KmG25l8g?si=zH9rKV-VY7RPirgD>

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)							Semester: III		
Course: Liberal Learning – III (Synthesizer/Keyboard)							Code: 25EECC305E		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music and Keyboard musical instrument.									
Course Objectives:									
1. To strengthen students’ understanding and practical application of major/minor scales, chords, chord progressions, and inversions. 2. To develop skills in Western Staff Notation, accompaniment techniques, melody integration, and left-hand coordination. 3. To enhance technical proficiency, musical expression, rhythmic accuracy, ensemble coordination, and stage confidence.									
Course Outcomes:									
CO1	Apply scales, chords, chord progressions, and inversions in keyboard performance.								
CO2	Perform musical compositions using Indian and Western Staff Notation with suitable accompaniment techniques.								
CO3	Demonstrate technical proficiency, musical interpretation, ensemble coordination, and stage confidence.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Revision of all Major Scales								2
2.	Revision of all Minor Scales (Natural, Harmonic & Melodic)								2
3.	Revision of Major and Minor Chords,								2
4.	Revision of Chord Progression, Family chords, Chords Inversion								2
5.	Playing Simple Songs with Indian Notation								2
6.	Introduction to Staff Notation								2
7.	Understanding the Difference between Indian and Western Staff Notation								2
8.	Reading and Playing Simple Melodies from Staff Notation								2
9.	Playing Songs using Both Indian and Staff Notation								2
10.	Fundamentals of Keyboard Accompaniment								2
11.	Accompaniment using Major and Minor Chords								2
12.	Accompaniment with Scales and Simple Songs								2
13.	Group Performance								2
TOTAL								26	
Text Books:									
1. Aaron, M., "Michael Aaron Piano Course – Grade 2", Alfred Music.									



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2. Thompson, J., "John Thompson's Modern Course for the Piano – Second Grade", Willis Music.
3. Hanon, C. L., "The Virtuoso Pianist in Sixty Exercises", G. Schirmer.
4. Agay, D., "Learning to Play Piano – Book 2", Yorktown Press.

Reference Books:

1. Thompson, J., "Modern Course for the Piano", Willis Music.
2. Aaron, M., "Piano Course", Alfred Music.
3. Hanon, C. L., "The Virtuoso Pianist", G. Schirmer.
4. Harrison, M., "Contemporary Music Theory", Hal Leonard.
5. ABRSM, "Music Theory in Practice (Grades 1–5)", Associated Board of the Royal Schools of Music.

E-Resources:

1. <https://www.youtube.com/watch?v=5nA245TZvBY>
2. <https://www.youtube.com/watch?v=h4YGP7GyZNU&list=PLUPHIkAcHm-SvoAmFIkec2STxRdvJnYYF>

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)							Semester: III		
Course: Liberal Learning – III (Basketball)							Code: 25EECC305F		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop fundamental basketball skills, physical fitness, teamwork, and understanding of rules and strategies to enable effective participation and performance in the game.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate basic basketball skills such as dribbling, passing, shooting, and defensive fundamentals effectively.								
CO2	Apply offensive and defensive strategies, including transition play, during gameplay and scrimmages.								
CO3	Understand and implement basketball game rules and referee gestures accurately in practical situations.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Fundamentals Skill Review: Refresh all core basketball skills. Perform all basic techniques confidently.								2
2.	Skill Circuit: Practice all basic skills in rotation. Improve overall basketball fundamentals.								2
3.	Small Group Practice: Apply skills in partner and group activities. Work effectively with teammates.								2
4.	Player Stance & Footwork: Improve movement and body balance. Apply proper stance during movement.								2
5.	Passing Under Movement: Practice passing while changing positions. Execute accurate passes while moving.								2
6.	Dribbling Around Cones: Improve control through obstacle drills. Maintain dribbling control in different directions.								2
7.	Assessment- V								2
8.	Shooting Practice: Practice shooting from different spots. Improve shooting accuracy.								2
9.	Rebounding Drills: Practice timing and ball recovery. Perform effective rebounding.								2
10.	Individual Defense: Practice defensive movement in simple drills. Apply defensive techniques effectively.								2
11.	Body Technique: Improve body positioning and balance. Demonstrate better body								2



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	control.	
12.	Combined Fundamental Drills: Integrate all basketball skills. Execute skills smoothly in sequence, Practice skills with a partner. Improve teamwork and communication	2
14.	Assessment – VI	2
TOTAL		26
Text Books:		
1. FIBA, "Official Basketball Rules", International Basketball Federation (FIBA) 2. Dr. James Naismith, "Basketball: Its Origin & Development", 3. John R. Wooden, "Practical Modern Basketball", Allyn & Bacon		
Reference Books:		
1. James Naismith – Basketball: Its Origin and Development – University of Nebraska Press. 2. Jerry V. Krause & Don Meyer – Basketball Skills & Drills – Human Kinetics		
E-Resources:		
1. Rules of Basketball : How to Play Basketball : Basketball Rules for Beginners 2. How To Dribble A Basketball For Beginners! Basketball Basics for Kids Basketball Training 3. How To Shoot A Basketball For Beginners! Basketball Basics [SECRETS] 4. Basketball: Rebounding		

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)							Semester: III		
Course: Liberal Learning – III (Cricket)							Code: 25EECC305G		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop basic cricket skills. Fitness, teamwork, and knowledge of rules and strategies for effective game performance.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Analyze batting, bowling, fielding, and match strategies across T20, ODI, and Test cricket formats.								
CO2	Apply tactical decision-making, leadership, field placements, and performance analysis during competitive matches.								
CO3	Demonstrate effective cricket performance by integrating sports psychology, nutrition, injury prevention, and technology in match situations.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Batting Strategies: Build innings in different formats								2
2.	Bowling Plans: Field settings and tactical bowling								2
3.	Captaincy & Leadership: Decision-making and leadership								2
4.	Match Strategy: Powerplay, middle overs, death overs								2
5.	T20 Cricket Strategies: Aggressive tactics								2
6.	ODI Cricket Strategies / Test Cricket Strategies: Rotation of strike and partnerships / Patience and long-form tactics								2
7.	Assessment – V								2
8.	Advanced Field Placements: Offensive and defensive setups								2
9.	Sports Psychology: Confidence and concentration								2
10.	Nutrition for Cricketers: Performance nutrition								2
11.	Injury Prevention & Recovery: Basic sports medicine								2
12.	Technology in Cricket: DRS, Hawk-Eye, performance analysis								2
14.	Assessment – VI								2
TOTAL								26	
Text Books:									
1. Sanjay Manjrekar, "Cricket Fundamentals", Orient BlackSwan									
2. Ravi Shastri, "Winning Cricket: Skills and Strategies", Notion Press									
3. R. Sridhar, "Coaching Beyond", Rupa Publications India									



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Reference Books:
1. Rob Eastaway, "Cricket Explained: From Grubbers to Googlies", St. Martin's Griffin
2. Surendra Shrivastava, "Cricket – Khel Aur Niyam", Prabhat Prakashan
E-Resources:
1. Sports and Performance Nutrition, IIT Madras, https://onlinecourses.nptel.ac.in/noc24_hs82/
2. How to Play Cricket
3. Cricket rules explained in 2 minutes
4. Every Cricket Shot Explained in 21 Minutes

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)							Semester: III		
Course: Liberal Learning – III (Rifle and Pistol Shooting)							Code: 25EECC305H		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop safe shooting skills, accuracy concentration, and proper shooting techniques in students. It also aims to build discipline, confidence and prepare shooters for competitive events.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Explain safe rifle handling, range discipline, equipment, and match procedures.								
CO2	Demonstrate proper shooting techniques, physical coordination, and shooting posture.								
CO3	Apply mental focus, concentration, and scientific principles to improve shooting performance.								
CO4	Demonstrate sportsmanship, discipline, and overall proficiency in competitive shooting.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Recoil Management: How to avoid recoil								2
2.	Loading and Unloading Procedures: Procedure to load a gun.								2
3.	Malfunction Identification and Clearance: What is malfunction and its solutions								2
4.	PGun Cleaning and Maintenance: Process to open a gun and clean it								2
5.	Ammunition Types and Selection: Selecting a perfect ammunition from different ammunition companies								2
6.	Environmental Effects on Shooting: Effect on a shot of environment								2
7.	Assessment – V								2
8.	Scoring Systems: How to read score.								2
9.	Competition Rules: Explaining the rules and commands								2
10.	Match Preparation: Physical and mental preparation of a shooter for match								2
11.	Mental Conditioning and Concentration: Making a shooter mentally strong and increasing concentration process								2
12.	Time-Controlled Shooting: Procedure to fire a shot in given time								2
13.	Assessment – VI								2
TOTAL								26	
Text Books:									
1. International Shooting Sport Federation (ISSF), "ISSF Official Statutes, Rules and Regulations", International Shooting Sport Federation (ISSF)									
2. National Rifle Association (NRA), "The NRA Guide to the Basics of Pistol Shooting", National Rifle Association of America									



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3. National Rifle Association (NRA), "The NRA Guide to the Basics of Rifle Shooting", National Rifle Association of America

Reference Books:

1. National Rifle Association (NRA), "The Fundamentals of Rifle Marksmanship", National Rifle Association of America
2. International Shooting Sport Federation (ISSF), "ISSF Official Statutes, Rules and Regulations", International Shooting Sport Federation (ISSF)
3. National Rifle Association (NRA), "The NRA Guide to the Basics of Pistol Shooting", National Rifle Association of America
4. National Rifle Association (NRA), "The NRA Guide to the Basics of Rifle Shooting", National Rifle Association of America

E-Resources:

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras,
<https://nptel.ac.in/courses/109106406>
2. [Open Sight Air Rifle Shooting Sports For Beginners. @TheGunzoneNetwork - YouTube](#)
3. [Basics of the Standing Position | Sauer Academy](#)
4. [The Ideal Air Rifle Shooter with Abhinav Bindra \[IND\]](#)

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Course: Liberal Learning – III (Volleyball)							Code: 25EECC305I		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To equip participants with the essential skills and knowledge of volleyball, enabling them to perform fundamental techniques, understand basic rules, and participate in basic gameplay scenarios confidently.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Explain safe rifle handling, range discipline, equipment, and match procedures.								
CO2	Demonstrate proper shooting techniques, physical coordination, and shooting posture.								
CO3	Apply concentration, mental focus, and scientific principles to improve shooting performance.								
CO4	Demonstrate discipline, sportsmanship, and overall proficiency in competitive shooting.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Double Blocking Technique: Introduction to double blocking, stance and ready position, footwork for lateral movement, timing the jump with the attacker, hand positioning over the net, coordination between middle and wing blocker, drills on blocking angles and recovery.								2
2.	Advance Digging: Advanced defensive posture, digging against hard-driven spikes, rolling and diving techniques, pancake save, anticipation and reading the attacker, transition from defense to offense, reaction drills.								2
3.	Advance Setting: Jump setting, back setting, quick setting, setting accuracy under pressure, decision-making, communication with hitters, setter movement and transition drills.								2
4.	Cross Court And Line Spiking: Approach mechanics, body positioning, wrist action, cross-court attack, line attack, shot placement, attacking against blockers, controlled hitting drills.								2
5.	Advanced Blocking: Single, double and triple blocking strategies, reading setter intentions, block coverage, penetration over the net, transition after blocking, tactical blocking drills.								2
6.	Libero Skills: Role and responsibilities of the libero, serve receive, defensive positioning, emergency setting, court communication, floor defense techniques, specialized libero drills.								2
7.	Assessment – V								2

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8.	Offensive Systems (5-1): Introduction to the 5–1 offensive system, player rotations, setter responsibilities, transition from defense to offense, positional responsibilities, team coordination.	2
9.	Offensive Combinations: Quick attacks, tandem attack, slide attack, combination plays, synchronization between setter and attackers, offensive communication and execution drills.	2
10.	Team Defensive System: Perimeter defense, rotational defense, block-defense coordination, defensive coverage, court positioning, communication, transition to counterattack.	2
11.	Tactical Serving: Float serve and jump serve placement, serving strategies against different formations, targeting weak receivers, serving under pressure, tactical decision-making.	2
12.	Competitive Match Practice: Full competitive matches following official rules, tactical implementation, referee signals, teamwork, leadership, sportsmanship, and post-match performance evaluation.	2
13.	Assessment – VI	2
TOTAL		26
Text Books:		
1. Fédération Internationale de Volleyball (FIVB), "Official Volleyball Rules", FIVB Publications 2. Bonnie Kenny & Cindy Gregory, "Volleyball: Steps to Success", Human Kinetics 3. Anita Bean, "The Complete Guide to Sports Nutrition", Bloomsbury Sport 4. Ian Jeffreys, "The Warm-Up", Human Kinetics		
Reference Books:		
1. Pete Waite, "Aggressive Volleyball", Human Kinetics 2. Bob Bertucci, "Volleyball Drill Book", Human Kinetics		
E-Resources:		
1. Volleyball Rules : How to Play Volleyball : The Rules of Volleyball EXPLAINED! 2. 6 Basic Skills in Volleyball - YouTube 3. Everything You Need to Know About the Game of Volleyball - YouTube		

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)							Semester: III		
Course: Liberal Learning – III (Football)							Code: 25EECC305J		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To enhance football players’ technical skills, tactical understanding, physical fitness, teamwork, and sportsmanship, fostering a comprehensive understanding and appreciation of the game.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Explain attacking, defensive, formation, and set-piece principles in football.								
CO2	Apply possession, counter-attacking, and transition strategies in match situations.								
CO3	Analyze performance using psychology, nutrition, injury management, and technology.								
CO4	Demonstrate teamwork, decision-making, and tactical skills during matches.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Principles of Attack: Understand and apply the principles of attack, including creating space, supporting teammates, progressing the ball, and creating goal-scoring opportunities.								2
2.	Principles of Defense: Understand and apply the principles of defense, including pressure, cover, balance, marking, and communication to effectively prevent opponents from scoring.								2
3.	Team Formations: Understand and apply different team formations to improve player positioning, tactical organization, and overall team performance.								2
4.	Transition Play: Understand and apply effective transition play by quickly switching between attacking and defensive phases to maintain team advantage.								2
5.	Possession-Based Football: Develop possession-based football skills by improving ball retention, passing accuracy, movement, and decision-making to control the game effectively.								2
6.	Counter-Attacking Football: Understand and apply counter-attacking principles by transitioning quickly from defense to attack through speed, movement, and effective decision-making.								2
7.	Assessment-V								2
8.	Set-Piece Organization: Understand and apply set-piece organization by developing effective attacking and defensive strategies for free kicks, corners, and restarts.								2

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9.	Sports Psychology: Develop mental skills such as confidence, focus, motivation, resilience, and decision-making to enhance football performance and overall sporting attitude.	2
10.	Injury Management: Understand basic injury management practices, including prevention, immediate care, recovery strategies, and safe return-to-play procedures for football players.	2
11.	Technology in Football: Understand the role of technology in football by exploring tools for performance analysis, player development, match decisions, and injury prevention.	2
12.	Full Match Analysis: Analyze full match performance by evaluating tactics, player decisions, team organization, strengths, and areas for improvement.	2
13.	Assessment-VI	2
TOTAL		26
Text Books:		
1. Fédération Internationale de Football Association (FIFA), "Laws of the Game", FIFA 2. International Football Association Board (IFAB), "Laws of the Game", IFAB		
Reference Books:		
1. Charles Hughes, "The Winning Formula in Soccer", Meyer & Meyer Sport 2. Fédération Internationale de Football Association (FIFA), "Laws of the Game", FIFA 3. International Football Association Board (IFAB), "Laws of the Game", IFAB		
E-Resources:		
1. Udemy – Soccer Courses - https://www.udemy.com/topic/soccer/ 2. Beginner's guide to football Football for dummies 3. Every position in soccer explained 4. Rules Of Soccer : How to play Soccer : Soccer Rules for Beginners		

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Program: B. Tech. (Electrical Engineering)							Semester: III		
Course: Internship – I*							Code: 25EEIN301		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	02	-	-	25	-	-	25
Preamble:									
Internships serve as vital educational and career development experiences, offering practical exposure in a specific field. Employers seek individuals who possess the necessary skills and an understanding of industry environments, practices, and cultures. This internship is designed as a structured, short-term, supervised training program, often centered on specific tasks or projects with clear timelines. The primary goal is to immerse technical students in an industrial setting, providing experiences that cannot be replicated in the classroom. This exposure aims to develop competent professionals who understand the social, economic, and administrative factors influencing the operations of industrial organizations.									
Course Objectives:									
1. Exposure to students to the industrial environment, which cannot be provided in the classroom and hence creating deployable professionals for the industry. 2. Learn to implement the technical knowledge in real industrial situations.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Gain exposure to industry practices and understand how academic concepts are applied in professional settings.								
CO2	Develop and demonstrate effective communication and teamwork skills within a work environment.								
CO3	Improve your problem-solving and time management skills by working in real-world industry settings.								
Internship Requirements									
1. Internship Duration: It is mandatory for all students to undergo an internship after every semester during vacations for the duration of 4 weeks. Internships completed during this period will be considered for the assessment of Term Work (TW). 2. Internship Opportunities: Students can explore various opportunities for internships at: a) Industries b) Research labs or organizations c) Collegiate clubs d) In-house research projects e) Online internships 3. Support and Assistance: Students can seek assistance for securing internships from: a) The Training and Placement cell, along with departmental coordinators b) Department or institute faculty members c) Personal contacts d) Directly connecting with industries or organizations 4. Request Letter: Once an industry, research organization, or collegiate club is identified, students must obtain a request letter from the concerned department or placement office. This letter, in the standard format must be duly signed by the authority, should be addressed to the HR manager or relevant authority.									



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5. **Confirmation Letter:** Students must submit the confirmation letter from the industry, research organization, or collegiate club to the Internship Coordinator and the Head of Department (HOD) office.
6. **Joining Report:** Upon commencing the internship, students must submit the joining report, joining letter, or a copy of the confirmation email to the Internship Coordinator and the HOD office.
7. **Faculty Mentor:** A faculty member will be assigned as a mentor to a group of students. The mentor will be responsible for monitoring, evaluating, and assessing student internship activities. The faculty mentor is also required to visit the internship location and submit formal feedback to the Internship Coordinator.
8. **Faculty Visits:** Faculty members are advised to visit the internship site once or twice during the internship period to monitor progress.
9. **Progress Report:** Students must submit progress report fortnightly to their faculty guide and the final internship report to the Internship Coordinator and department office.
10. **Evaluation Report:** After the completion of the internship, the mentor, along with the assessment panel members, should submit the evaluation report of the students to the department office and the Internship Coordinator.
11. **Internship Certificate:** Students must receive the Internship Certificate from the industry and submit it to the Internship Coordinator and department office.
12. **Presentation and Assessment:** Students are required to give a presentation on their internship work as part of the term work. The internship diary and report will also be verified and assessed.

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Zeal Education Society's

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SYLLABUS

SEMESTER - IV

**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Electrical Engineering)							Semester: IV		
Course: Theory of Electrical Machine - I							Code: 25EEPC405		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Basic Electrical Engineering, Magnetic Circuit Law, Flemings Rule.									
Course Objectives: The objectives of this course are									
1. Study magnetic materials, electromechanical energy conversions, principle and operation of DC machines and transformers and starters.									
2. Understand the constructional details of DC machines and Transformers.									
3. Analyze the performance characteristics of DC machines and transformer.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Acquire knowledge about constructional details of DC machines.								
CO2	Describe the performance characteristics of DC generators.								
CO3	Describe the principle of operation of DC motors and select appropriate motor types for different applications.								
CO4	Evaluate the performance of single-phase transformer using equivalent circuits and phasor diagrams.								
CO5	Describe the constructional details and modes of operation of three phase transformer.								
CO6	Discuss the principle of operation of Autotransformer.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Electromechanical Energy Conversion Constructional details of dc machines - armature winding- single layer winding, double layer winding- lap and wave, equalizer rings, dummy coils, MMF of a winding, EMF developed, electromagnetic torque - numerical problems.								07
2.	D. C. Generator DC generator –principle of operation, EMF equation, excitation, armature reaction– demagnetising and cross magnetising ampere turn, compensating windings, interpoles, commutation, OCC, voltage build up and load characteristics, parallel operation. Power flow diagram– numerical problems								07
3.	D.C. Motor DC motor –back emf, generation of torque, torque equation, performance characteristics – numerical problems. Starting of dc motors- starters –3point and 4-point starters (principle only). Speed control of dc motors - field control, armature control. Braking of dc motors. Power flow diagram – losses and								07

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	efficiency. Testing of DC motors – Swinburne's test, Hopkinson's test, and retardation test. DC motor applications – numerical problems. - Applications of DC motors	
4.	Single-Phase Transformer Single phase transformers –constructional details, principle of operation, EMF equation, ideal transformer, dot convention, magnetising current, transformation ratio, phasor diagram, operation on no load and on load, equivalent circuit, voltage regulation. Transformer losses and efficiency, condition for maximum efficiency, kVA rating. Testing of transformers– polarity test, open circuit test, short circuit test, Sumpner's test – separation of losses, all day efficiency. Parallel operation of single-phase transformers– numerical problems.	07
5.	Three Phase Transformers: Three-phase transformer connections- Star-Star (Y-Y), Delta-Delta (Δ - Δ), Star Delta (Y- Δ) and Delta-Star (Δ -Y) (Numerical). Vector groups and phase shift between primary and secondary. Scott connection and V connections. Protection mechanisms-Buchholz relay and conservator tank function, Cooling and Maintenance.	07
6.	Autotransformer Autotransformer – saving of copper –rating of autotransformers. Three winding transformer – stabilization by tertiary winding. Tap changing transformers – no load tap changing, on load tap changing.	07
TOTAL		42
Industrial Visit:		
Minimum one visit to above machines manufacturing industry (mentioned in syllabus) is recommended.		
Text Books:		
1. Edward Hughes “Electrical Technology”, ELBS, Pearson Education. 2. Ashfaq Husain, “Electrical Machines”, Dhanpat Rai & Sons. 3. S. K. Bhattacharya, “Electrical Machine”, Tata McGraw Hill publishing Co. Ltd, 2nd Edition. 4. Nagrath & Kothari, “Electrical Machines”, Tata McGraw Hill. 5. Bhag S Guru, Husein R. Hiziroglu, “Electrical Machines”, Oxford University Press. 6. K Krishna Reddy, “Electrical Machines- I and II”, SciTech Publications (India) Pvt. Ltd. Chennai.		
Reference Books:		
1. A.E. Clayton and N. N. Hancock, “Performance and Design of Direct Current Machines”, CBS Publishers, 3rd Edition. 2. A.E. Fitzgerald, Charles Kingsley, Stephen D. Umans, “Electrical Machines”, Tata McGraw Hill Publication Ltd., 5th Edition. 3. A.S. Langsdorf, “Theory and performance of DC machines”, Tata McGraw Hill. 4. M.G. Say, “Performance and Design of AC. Machines”, CBS Publishers and Distributors. 5. Samarjit Ghosh, “Electrical Machines”, Pearson Education, New Delhi. 6. Charles I Hubert, “Electrical Machines Theory, Application & Control”, Pearson Education, New Delhi, 2nd Edition.		



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E-Resources:
1. NPTEL course on “Electrical Machines – I”, Prof. Tapas Kumar Bhattacharya, IIT Kharagpur, https://nptel.ac.in/courses/108105155

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DEPARTMENT OF ELECTRICAL ENGINEERING

Program: B. Tech. (Electrical Engineering)						Semester: IV			
Course: Theory of Electrical Machine – I Lab						Code: 25EEPC405P			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
-	02	-	01	-	-	-	25	-	25
Prerequisites:									
Basic Electrical Engineering, Magnetic Circuit Law, Flemings Rule.									
Course Objectives: The objectives of this course are									
1. To provide hands-on exposure to the construction, connections, operation, and testing of transformers and electrical machines. 2. To develop experimental skills for determining equivalent circuit parameters, losses, efficiency, regulation, and other performance characteristics of transformers. 3. To familiarize students with practical aspects of transformer connections, parallel operation, motor starting, and speed control techniques. 4. To develop competency in conducting standard tests, recording and interpreting experimental data, and assessing the performance of transformers and DC machines.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Apply speed control techniques, starting mechanisms, and direct/indirect testing methods to evaluate the efficiency and characteristics of DC machines.								
CO2	Determine parameters, equivalent circuits, and performance profiles of single/three-phase transformers using load, non-load, Scott-connection, and parallel configurations.								
List of Experiments: (Minimum 08 Experiments are compulsory)									
Group A (Compulsory Experiment):									
1. To perform Open circuit and load characteristics of DC shunt generator- critical resistance and critical speed. 2. To obtain speed control of dc shunt motor using a) Armature resistance control b) Field control 3. To conduct load test on DC shunt motor. 4. Polarity, Voltage Ratio and Load Test on Single phase Transformer. 5. OC and SC Test on Transformer. (Equivalent Circuit parameter, Regulation and efficiency). 6. Sumpner’s Test on two Identical Single –phase Transformers. (Back-to-Back)									
Group B (Optional)									
1. To conduct load test on dc shunt generator and obtain external characteristics and internal characteristics. 2. To Study the different types of starters for DC motor. 3. Swinburne Test on DC Shunt Motor. 4. Hopkinson’s Test on DC Motor-Generator Set. 5. To perform load Test on Single phase transformer.									



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6. Scott-Connection. (Three phase to two phase conversion).
7. Parallel operation of two transformers. (Polarity check at Secondary winding terminal and Load sharing)

Reference Books:

1. A.E. Clayton and N. N. Hancock, “Performance and Design of Direct Current Machines”, CBS Publishers, 3rd Edition.
2. A.E. Fitzgerald, Charles Kingsley, Stephen D. Umans, “Electrical Machines”, Tata McGraw Hill Publication Ltd., 5th Edition.
3. A.S. Langsdorf, “Theory and performance of DC machines”, Tata McGraw Hill.
4. M.G. Say, “Performance and Design of AC. Machines”, CBS Publishers and Distributors.
5. Samarjit Ghosh, “Electrical Machines”, Pearson Education, New Delhi.
6. Charles I Hubert, “Electrical Machines Theory, Application & Control”, Pearson Education, New Delhi, 2nd Edition.

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Electrical Engineering)							Semester: IV		
Course: Power Electronics and Its Application							Code: 25EEPC406		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Knowledge of semiconductor material, basic electronics, diode, BJT, UJT, FET and its characteristics. Working of Diode based rectifier, concept of RMS and average value.									
Course Objectives:									
1. Understand the working and characteristics of power semiconductor devices. 2. Learn the operation and analysis of controlled rectifiers. 3. Study DC-DC converters and AC voltage regulators. 4. Explore inverter types and their applications. 5. Learn multilevel inverter techniques and control methods. 6. Apply power electronics in drives, EVs, and renewable systems.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Analyze thyristor-based power devices and evaluate suitable protection techniques.								
CO2	Compare transistor-based and wide bandgap power devices based on performance and applications.								
CO3	Evaluate single-phase and three-phase controlled rectifiers for various loads.								
CO4	Apply control methods in DC-DC converters and AC voltage regulators.								
CO5	Analyze operation of single-phase and three-phase inverters for typical applications.								
CO6	Understand multilevel inverter types and control techniques for industrial use.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Thyristor-Based Power Devices: SCR (Silicon-Controlled Rectifier): Structure, working, static & dynamic characteristics, Triggering and commutation techniques, Snubber circuit design and protection schemes (over-voltage, over-current, thermal), Numerals based on snubber circuit for a Thyristor. GTO (Gate Turn-Off): Construction, operation, characteristics, applications. TRIAC: Four-quadrant operation, firing circuits, dynamic characteristics, AC power control applications. Applications: Light dimmers, heater control, fan regulators								07
2.	Transistor-Based Power Devices: MOSFET (Metal Oxide Semiconductor Field Effect Transistor): Structure, Working Principles, Characteristics, Types: Enhancement and Depletion mode,								07

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	IGBT (Insulated Gate Bipolar Transistor): Construction, operation, characteristics, Comparison with MOSFET & GTO. Wide Bandgap (WBG) Semiconductor Devices: Introduction to WBG materials, Silicon Carbide (SiC) & Gallium Nitride (GaN), SiC MOSFET (Metal-Oxide-Semiconductor Field-Effect Transistors), GaN HEMT (High Electron Mobility Transistors), Applications in EVs, renewable energy systems, and high-frequency power supplies.	
3.	AC-DC Converters (Controlled Rectifiers): Single Phase Converters: Fully-controlled & half-controlled converters (R and RL load). Output voltage equations (Avg., RMS), power factor, THD, TUF. Numerical based on output voltage and current calculations, Single phase dual converter Three Phase Converters: Fully and half-controlled converters with R, RL loads. Output voltage derivation and performance metrics. Application: Speed control of DC motors.	07
4.	DC-DC Converters and AC Voltage Regulators: DC-DC Choppers: Principle of operation and quadrant classification (Types: A, B, C, D, E). Control techniques: CLC, TRC, PWM, FM. Step-up chopper analysis with RLE load. Applications: Battery charging, EVs. AC Voltage Regulators: AC Voltage regulator; operation with R and RL Load, derivation of Average and RMS output voltage. Concept of two stage AC voltage regulator.	07
5.	DC-AC Converters (Inverters): Single Phase Inverters: Full-bridge VSI operation, derivation of output voltage and current, Current source inverter, Application: UPS, induction heating. Three Phase Inverters: Three phase VSI: 120° and 180° mode operation and their comparison, Application: UPS Induction motor drives.	07
6.	Multilevel Inverters and Control Techniques: Voltage control and harmonic reduction methods: Single Pulse Modulation, Multilevel Control, Space Vector Modulation. PWM based VSI Multilevel Inverter Types: Neutral Point Clamped (NPC), Flying Capacitor (FC), Cascaded Multilevel Inverter (CMI), Performance comparison. Application: Speed control of 3-phase induction motors, renewable energy systems.	07
TOTAL		42
Text Books:		



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1. Dr. P.S. Bimbhra, “Power Electronics”, 3rd Edition, Khanna Publication.
2. Muhammad H. Rashid, “Power Electronics Devices, Circuits, and Applications”, 4th Edition, 2014.
3. Barry W Williams, “POWER ELECTRONICS, Devices, Drivers, Applications, and Passive Components”, McGraw Hill Higher Education, 2006.
4. B. Jayant Baliga, “Wide Bandgap Power Semiconductor Devices”, Springer, 1st Edition, 2013.
5. Ashfaq Ahmed- Power Electronics for Technology, LPE Pearson Edition.

Reference Books:

1. Muhammad H. Rashid, “Power Electronics Handbook”, Elsevier, 3rd Edition, 2011.
2. M. D. Singh and K. B. Khandchandani, “Power Electronics”, Tata McGraw Hill.
3. Ned Mohan, Tore M. Undeland-, William P. Robbins, “Power Electronics: Converters, Applications, and Design”, Wiley, 3rd Edition, 2003.
4. V.R. Moorthi, Power Electronics Devices, circuits, and Industrial applications, Oxford University Press.

E-Resources:

1. **Power Electronics – Prof. G. Bhuvaneshwari, IIT Delhi.**
(SCR, TRIAC, MOSFET, IGBT, converters, inverters), <https://nptel.ac.in/courses/108102145>
2. **Fundamentals of Power Electronics – Prof. L Umanand, IISc Bangalore.**
(Converters, switching devices, simulations), https://onlinecourses.nptel.ac.in/noc21_ee01
3. **Power Electronics with Wide Bandgap Devices – Prof. Moumita Das, IIT Mandi.**
(SiC, GaN devices and applications), https://onlinecourses.nptel.ac.in/noc24_ee126
4. **Advanced Power Electronics – Prof. Bhim Singh, IIT Delhi.**
(Multilevel inverters, control techniques, drives), https://onlinecourses.nptel.ac.in/noc25_ee02

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Electrical Engineering)							Semester: IV		
Course: Power Electronics and Its Application Lab							Code: 25EEPC406P		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
-	02	-	01	-	-	-	25	-	25
Prerequisites:									
Knowledge of semiconductor material, basic electronics, diode, BJT, UJT, FET and its characteristics. Working of Diode based rectifier, concept of RMS and average value.									
Course Objectives:									
1. To provide experimental exposure to the operating behaviour and control requirements of conventional and emerging power semiconductor devices. 2. To develop practical insight into the conversion and control of electrical power using different power electronic converter configurations. 3. To familiarize students with hardware and simulation approaches for investigating converter performance under different operating and loading conditions. 4. To provide exposure to modern power conversion technologies, modulation techniques, and their engineering applications through laboratory and industrial learning.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Analyze the static characteristics and gate-control behaviour of power semiconductor devices.								
CO2	Evaluate the performance of controlled AC–DC converters for different load conditions and circuit configurations.								
CO3	Analyze the operating characteristics of DC–DC and AC–AC converters through hardware and/or simulation.								
CO4	Evaluate inverter performance for different switching, modulation, and output configurations using simulation and/or experimentation.								
List of Experiments:									
Part A: Minimum Four experiments from the following list (either hardware or simulation):									
1. Study of Static V-I Characteristics of SCR/ GTO. 2. Static VI characteristic of TRIAC. 3. Study of Gate firing circuits of SCR (R, RC & UJT). 4. Study of Output and Transfer Characteristic of MOSFET and IGBT. 5. Study of SiC/GaN Diodes. 6. Single phase Half controlled converter with R and RL load. 7. Single Phase fully controlled converter with and without Free-Wheeling diode with RL load.									
Part B: Minimum Four experiments from the following list (either hardware or simulation):									
1. Three phase AC-DC fully controlled bridge converter R and RL load. 2. Study of DC step down chopper. 3. Single phase A.C. voltage regulator with R and RL load. 4. Study of PWM controls of a single-phase inverter.									



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5. Simulation and Analysis of Three phase voltage source inverter using 120° and 180° mode.
6. Simulation and Analysis of three phase Multi level Inverter (VSI).
7. Industrial Visit to Power Electronics manufacturing unit/Renewable energy power plant.

Reference Books:

1. Muhammad H. Rashid, “Power Electronics Handbook”, Elsevier, 3rd Edition, 2011.
2. M. D. Singh and K. B. Khandchandani, “Power Electronics”, Tata McGraw Hill.
3. Ned Mohan, Tore M. Undeland-, William P. Robbins, “Power Electronics: Converters, Applications, and Design”, Wiley, 3rd Edition, 2003.
4. V.R. Moorthi, Power Electronics Devices, circuits, and Industrial applications, Oxford University Press.

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Electrical Engineering)							Semester: IV		
Course: Computational Methods & Programming							Code: 25EEPC407		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Basic calculus and differential equations, linear algebra, and matrix operations.									
Course Objectives:									
1. Introduce the fundamental concepts of numerical computation and error analysis. 2. Develop the ability to apply numerical methods for solving systems of linear and nonlinear algebraic equations. 3. Develop techniques for root-finding, interpolation, and curve fitting. 4. Provide numerical solutions to ordinary differential equations and definite integrals. 5. Apply numerical methods to analyze and solve electrical engineering problems such as circuit analysis, load forecasting, system modeling, and instrumentation.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Analyze different types of numerical errors and their impact on computational accuracy, especially in electrical measurement systems.								
CO2	Apply direct and iterative numerical techniques to solve systems of linear algebraic equations relevant to electrical circuit and power system analysis.								
CO3	Implement root-finding methods along with their convergence properties to solve polynomial and transcendental equations encountered in electrical engineering problems.								
CO4	Utilize curve fitting and interpolation methods in Electrical Engineering applications.								
CO5	Utilize numerical methods to solve ordinary differential equations that model transient responses in electrical circuits and instrumentation.								
CO6	Apply numerical integration techniques to compute electrical quantities like average power, RMS values, and load demands.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Fundamentals of Numerical Computation and Error Analysis: The basic principle of numerical computation; significant digits; floating point representation of numbers along with its arithmetic operations; Errors: different types of errors: absolute error, relative error, round-off errors, chopping error, truncation error, inherent errors; causes of occurrence, and remedies to minimize them; Absolute error in summation, subtraction, multiplication, and division; Generalized error formula (Derivation and Numerical); Application: errors in electrical measurements and instrumentation.								07

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2.	Solution Methods for Systems of Linear Algebraic Equations: Direct methods - Gauss elimination method; concept of pivoting – partial and complete. Gauss-Jordan method; Iterative methods – Jacobi method and Gauss-Seidel method; Matrix Inversion using Gauss-Jordan method; Applications: solution to mesh and nodal analysis of electrical networks, solution to power load flow, operation of different electrical applications.	07
3.	Root-Finding Techniques for Polynomial and Transcendental Equations: Concept of the root of the equation; Descartes' rule of signs; Intermediate value theorem; Roots of Polynomial Equations using Birge-Vieta method (Derivations and numerical); Roots of Polynomial and Transcendental Equations using Bisection method (Derivations and numerical), Secant method (Derivations and numerical), Regula-Falsi method (Derivations and numerical), Newton Raphson method (Derivations and numerical)	08
4.	Curve Fitting and Interpolation Techniques: Curve fitting using least square approximation – fitting a straight line (first order) and fitting a parabola (second order); Introduction to interpolation; Interpolation with equal Intervals - Newton's forward, backward interpolation formula (Derivations and numerical), Stirling's and Bessel's central difference formula (Only numerical); Interpolation with unequal intervals: Newton's divided difference formula and Lagrange's interpolation (Derivations and numerical). Applications: prediction of the performance of electrical motors and generators from their practical data, application to load forecasting and generation scheduling, prediction of solar intensity and wind velocity.	08
5.	Solution Methods for Ordinary Differential Equations (ODEs): Introduction, Euler's method, and Modified Euler's method (Derivations and numerical). Runge-Kutta fourth order methods (Numerical), Adams bash forth predictor method. Applications: DC and AC transient analysis of RL and RLC circuits, solution for generator oscillations, and deflection angle in MI-type instruments.	06
6.	Numerical Differentiation and Integration: Numerical differentiation using Newton's forward and backward interpolation formula (Derivation and numerical). Trapezoidal and Simpson's rules ($1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule) as special cases of Newton-Cote's quadrature technique for single integral (Derivations and numerical). Applications: average, RMS quantity determination of electrical measuring quantities, load demand calculations.	06
TOTAL		42
Text Books:		
1. S. Arumugam, A. Thangapandi Isaac, A. Somasundaram, "Numerical Methods" SciTech Publication.		
2. M. K. Jain, S.R.K. Iyengar, R. K. Jain, "Numerical Methods for Scientific and Engineering Computations," New Age Publications.		



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3. Dr. B. S. Grewal, “Numerical Methods in Engineering & Sciences,” Khanna Publishers.
4. P.P. Gupta & G.S Malik, “Calculus of Finite Difference and Numerical Analysis,” Krishna Prakashan Media Ltd, Meerut.

Reference Books:

1. Ward Cheney, David Kincaid, “Numerical Mathematics and Computing,” Thomson Brooks/Cole, 6th edition, 2007.
2. Curtis F. Gerald, Patrick O. Wheatley, “Applied Numerical Analysis,” 7th Edition, Pearson Publication.
3. Steven Chapra, Raymond P. Canale, “Numerical Methods for Engineers,” Tata McGraw Hill Publication.
4. S.S. Sastry, “Introductory methods of Numerical Analysis,” PHI Learning Private Ltd.
5. P. Thangaraj, “Computer oriented Numerical Methods,” PHI Learning Private Ltd.

E-Resources:

1. NPTEL course on Numerical Analysis, IIT, Roorkee, <https://nptel.ac.in/courses/111107062/>
2. NPTEL course on MATLAB Programming on Numerical Computation, IIT Madras <https://nptel.ac.in/courses/103106118/>
3. NPTEL course on Python for Data Science, IIT Madras, <https://nptel.ac.in/courses/106106212/>

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Program: B. Tech. (Electrical Engineering)							Semester: IV		
Course: Computational Methods & Programming Lab							Code: 25EEPC407P		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
-	02	-	01	-	-	-	25	-	25
Prerequisites:									
Basic calculus and differential equations, linear algebra, and matrix operations.									
Course Objectives:									
1. To develop algorithmic and logical thinking for translating numerical methods into computational procedures. 2. To provide programming exposure for implementing numerical techniques using software tools. 3. To develop computational skills for solving algebraic equations, curve fitting, interpolation, differential equations, and numerical integration problems. 4. To encourage independent learning and proficiency in computational tools through structured online learning and practical programming exercises.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Develop algorithms, flowcharts, and programs for implementing numerical techniques using appropriate computational tools.								
CO2	Apply appropriate numerical techniques to obtain solutions to mathematical and engineering problems.								
CO3	Analyze discrete data using numerical approximation techniques for estimation and curve representation.								
CO4	Compute solutions of differential and integral problems using suitable numerical techniques.								
List of Experiments:									
The programs are to be executed in C/C++, MATLAB, or Python. Students are required to complete an online course related to the basics of C, or Python, or MATLAB through platforms such as Coursera, Udemy, MATLAB Onramp, or NPTEL. A copy of the course completion certificate is mandatory to be attached to the laboratory record/file. • Compulsory Experiments: 1, 4, 5, 6, 9, 10 • Anyone from 2 or 3 and anyone from 7 or 8. • Mandatory: Course completion certificate 1. Develop an algorithm, draw a flow chart, and write a program to implement the Birge-Vieta method. 2. Develop an algorithm, draw a flow chart, and write a program to implement Gauss elimination/Jordan. 3. Develop an algorithm, draw a flow chart, and write a program to implement Gauss Jacobi/Seidel. 4. Develop an algorithm, draw a flow chart, and write a program to implement the following: a) for loop and while loop-- application in Descartes's rule of sign.									

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- b) if-else and functions-- application in Intermediate value theorem.
5. Develop an algorithm, draw a flow chart, and write a program to implement the Bisection/Secant method/ Regula-Falsi /Newton-Raphson method (single variable).
 6. Develop an algorithm, draw a flow chart, and write a program to implement curve fitting using a least square approximation.
 7. Develop an algorithm, draw a flow chart, and write a program to apply Newton's forward/backward interpolation method.
 8. Develop an algorithm, draw a flow chart, and write a program to apply Newton's divided difference/Lagrange's interpolation method.
 9. Develop an algorithm, draw a flow chart, and write a program to implement Modified Euler's/s⁴th order RK method.
 10. Develop an algorithm, draw a flow chart, and write a program to implement the trapezoidal/ Simpson 1/3rd rule.

Reference Books:

1. Ward Cheney, David Kincaid, "Numerical Mathematics and Computing," Thomson Brooks/Cole, 6th edition, 2007.
2. Curtis F. Gerald, Patrick O. Wheatley, "Applied Numerical Analysis," 7th Edition, Pearson Publication.
3. Steven Chapra, Raymond P. Canale, "Numerical Methods for Engineers," Tata McGraw Hill Publication.
4. S.S. Sastry, "Introductory methods of Numerical Analysis," PHI Learning Private Ltd.
5. P. Thangaraj, "Computer oriented Numerical Methods," PHI Learning Private Ltd.

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Electrical Engineering)							Semester: IV		
Course: Microcontrollers: Architecture and Interfacing							Code: 25EEMD402		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
02	02	-	2	40	60	-	-	-	100
Prerequisites:									
Knowledge of numbering systems and Boolean algebra.									
Knowledge of combinational and sequential logic circuits.									
Course Objectives:									
1. To explain the microcontroller architecture & describe the features of a typical microcontroller.									
2. To use the 8051 addressing modes and instruction set and apply this knowledge to develop programs in assembly language and C language.									
3. To define the protocol for serial communication and understand the microcontroller development systems.									
4. To introduce students to Global System for Mobile Communication (GSM).									
5. Explain the interrupt structure of the microcontroller and to develop programs related to interrupt handling.									
6. To provide students with interfacing concepts and develop interfacing circuits for simple devices.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Describe the architecture and features of various types of the microcontroller.								
CO2	Illustrate addressing modes and execute programs in assembly language for the microcontroller.								
CO3	Write programs in C language for microcontroller 8051.								
CO4	Elaborate interrupt structure of 8051 and program to handle interrupt and ADC809.								
CO5	Define the protocol for serial communication and understand the microcontroller development systems.								
CO6	Interface input output devices and measure electrical parameters with 8051 in real time.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Microcontroller: Concept of microcontroller, Intel 8051 Functional block diagram, Functions of pins of 8051, Memory organization of 8051, PSW and Flag Bits, Stack and Stack pointer. Overview of special function registers, Data transfer instructions and programs in assembly language.								06
2.	8051 Assembly language programming: Arithmetic and logical instructions and programs in assembly language. Boolean and Program Branching instructions and programs in assembly language. Addressing modes of 8051.								05

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3.	8051 C Programming: Data types in C, Ports of 8051, their use and programming in C (Byte Level and Bit-level), Time delay programming in C, Timers and counters in 8051, Timer modes 0,1,2 and its programming in C and counter programming.	05
4.	Interrupts: structure of 8051 and SFR associated with interrupts. Programming of External hardware interrupts in C. Interfacing of ADC 0809 with 8051.	04
5.	Serial port Structure in 8051: Programming of Serial port for transferring and receiving data in C in mode 1.	04
6.	Interfacing of 8051: Measurement of electrical parameters such as voltage and current (Theoretical Treatment only). Interfacing of Stepper motor with 8051 and its programming in C. Interfacing and programming of single Key, LED and Relay with 8051 in C.	04
TOTAL		28

List of Experiments:

(Minimum 08 Experiments are compulsory)

1. To study and use of 8051 Microcontroller trainer kit.
2. Assembly Language Programming for arithmetic operation of 8-bit numbers.
3. Assembly Language Programming for Largest number and smallest number from a given array of 8-bit numbers.
4. Assembly Language Programming to arrange numbers in Ascending and Descending order from a given array of 8-bit numbers.
5. Assembly Language Program for data conversion.
6. Assembly Language Program for use of Timer/Counter for various applications.
7. Implementation of serial communication using 8051 serial ports.
8. Interfacing of DAC 0808 with 8051 microcontrollers.
9. Interfacing of 8-bit ADC 0809 with 8051 microcontrollers.
10. Interfacing of relay with 8051 microcontrollers.
11. Stepper motor control using 8051 microcontrollers.
12. Interfacing of Matrix Keyboard with 8051 Microcontroller.

Text Books:

1. Muhammad Ali Mazidi, J.G. Mazidi, "The 8051 Microcontroller and Embedded Systems", Pearsons Publishers.
2. V Udayashankara and M S Mallikarjuna Swamy, "8051 Microcontroller, Hardware, software and applications", TATA McGraw Hill.
3. Ajay Deshmukh, "Microcontroller 8051" –TATA McGraw Hill.
4. Theagrajan, "Microprocessor and Microcontroller", BS Publication.
5. K. J. Ayala, "The 8051 Microcontrollers- Architecture, Programming and Applications", Peram International Publications.
6. Subrata Ghoshal, "8051 microcontrollers", Pearsons Publishers.
7. Han-Way Huang, "Embedded System Design with C8051", Cengage Learning.

Reference Books:



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- | |
|---|
| <ol style="list-style-type: none">1. Scott Mackenzie, “8051 Microcontroller”, Pearson Education.2. Intel Microcontroller data book.3. Intel Corporation 1990- 8-bit embedded controller handbook. |
|---|

E-Resources:

- | |
|--|
| <ol style="list-style-type: none">1. NPTEL course on microcontroller 8051, IIT, Kharagpur,
https://archive.nptel.ac.in/courses/108/105/108105102/ |
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OPEN ELECTIVE - II

**(Select any one course from the given Open
Elective Courses)**

**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Common to all Programs)							Semester: IV		
Course: Open Elective – II (Cyber Security & Laws)							Code: 25ALOE402A		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Foundational knowledge in computer science, networking.									
Course Objectives:									
1. To introduce the cyber world and cyber law in general. 2. To enhance the understanding of problems arising out of online transactions and provoke them to find solutions. 3. To know the technologies that stand behind certain cyber rimes. 4. To identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Illustrate and discuss the basic concepts of cyber security, Devices.								
CO2	Understand the aspects related to personal data privacy and security.								
CO3	Understand the main components of cyber security plan.								
CO4	Understand about the type and nature of cyber-crimes.								
CO5	Articulate the well-known cyber-attack incidents, explain the attack scenarios, and explain mitigation techniques.								
CO6	Explain the difference between Systems Cyber Security, Network Cyber Security, and Cryptography, Crypto-Protocols, etc.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Cyber Security: Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security.								04
2.	Digital Devices Security, Tools and Technologies for Cyber Security: End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third-party software, Device security policy, Cyber Security best practices, Significance of host firewall, Wi-Fi security, Configuration of basic security policy and permissions.								04

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3.	Cyber security Management, Compliance and Governance: Cyber security Plan- cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.	05
4.	Cybercrimes: Targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach Cybersquatting, Pharming, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft Cyber Police stations, Crime reporting procedure, Case studies	05
5.	Cybercrime: Illustrations, Examples and Mini cases, Real-life examples, Mini Cases-Social Engineering Attacks, Illustration of financial frauds in cyber domain, Digital Signature- Related Crime scenarios, Digital forensics case Illustrations, Online scams.	04
6.	Cyber law: Cybercrime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act, 2000. Cybercrime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies-AI/ML, IOT, Block chain, Dark net and social media, Cyber Laws of other countries.	04
TOTAL		26
Text Books:		
1. Michael E. Whitman, Herbert J. Mattord, (2018), “Principles of Information Security”, 6th edition, Cenage Learning, N. Delhi. 2. Chris Reed & John Angel, “Computer Law”, OUP, New York, (2007). 3. Prasad R.S., “Cyber Crime an Introduction”. 4. Ed. Kumar Krishna, “Cyber Laws”.		
Reference Books:		
1. Angus M. Marshall, “Digital forensics: Digital evidence in criminal investigation”, John – Wiley and Sons, 2008. 2. Sushma Arora, Raman Arora, “Cyber Crimes & Laws”, 4th Edition 2021, Publisher: Taxmann, 3. N S Nappinai, “Technology Laws Decoded”, 1st Edition, Publisher: Lexis Nexis.		
E-Resources:		
1. https://onlinecourses.nptel.ac.in/noc23_cs127/preview 2. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview 3. https://onlinecourses.nptel.ac.in/noc25_cs116/preview		

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Common to all Programs)							Semester: IV		
Course: Open Elective – II (Sustainability and Climate Change)							Code: 25ALOE402B		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Students should have knowledge about current environmental issues, various types of pollution and the concept of sustainable development.									
Course Objectives:									
1. To introduce the fundamental concepts and definitions of sustainability 2. To equip students with knowledge of sustainable construction solutions. 3. To develop an understanding of the Earth's climate system, assess the impacts of climate change, and evaluate the vulnerabilities of natural systems.									
Course Outcomes: After the completion of course, students will be able to									
CO1	Explain the principles, challenges, global agreements, and legislations related to sustainable development and environmental protection.								
CO2	Apply green materials, energy-water efficiency strategies, and green building rating systems to develop sustainable infrastructure solutions.								
CO3	Analyze the earth’s climate system, human influences, and observed trends to understand the fundamentals of climate change.								
CO4	Evaluate the causes, impacts, and physical evidence of climate change at global and regional scales.								
CO5	Assess the sectoral impacts of climate change on natural systems, infrastructure, and human health.								
CO6	Recommend mitigation strategies and policy measures through international frameworks and technological interventions to address climate change.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Sustainable Development: Definitions & Dimensions: sustainability, Brundtland Report, triple bottom line (economic, social, environmental), Global & Local Environmental Challenges: resource depletion, climate change, pollution, Agenda 21, CDM, Paris/Kyoto Protocols, Clean Development Mechanism, Environmental Legislation & Standards: ISO 14000 series, Indian Water & Air Acts.								05

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2.	Sustainable Solutions: Green Materials & Techniques: low-VOC paints, agro-waste bricks, bamboo, ferro-cement, stabilized soil blocks. Energy & Water Efficiency: passive design, renewable/solar/wind energy, rainwater harvesting, EIA in construction. Green Building Systems: LEED, GRIHA, ECBC, BREEAM rating frameworks for sustainable infrastructure.	05
3.	Climate & Climate Change Fundamentals: Earth's Climate System: Atmosphere structure, energy balance, greenhouse effect, climate zones, monsoons, El Niño/La Niña Human Influence: Greenhouse gas emissions, global warming trends, carbon cycle, RCP/SSP scenarios, Indian climate observations	04
4.	Climate Change Impact: Climate Change Impact: Temperature shifts, sea-level rise, extreme weather, glacier melt, urban heat islands, Natural vs. anthropogenic causes; Milankovitch cycles, anthropogenic emissions. Physical evidence: rising global temperatures, melting glaciers, sea-level rise, extreme weather trends in India and globally.	04
5.	Impacts on Natural System: Sectoral impacts: agriculture, water resources, infrastructure, coastal zones, urban systems including heat islands, flooding, human health	04
6.	Mitigation & Policy Measures: International policy processes: UNFCCC, IPCC, Kyoto/Montreal Protocols, CDM & carbon trading Technological and engineering mitigation: renewable energy, CCS, reflective surfaces (cool roofs), bioengineering (e.g., slope stabilization)	04
TOTAL		26

Text Books:

1. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science", Pearson Education.
2. D. N. Murty, "Sustainable Development", Himalaya Publishing House.
3. Peter P. Rogers, Kazi F. Jalal, and John A. Boyd, "An Introduction to Sustainable Development", Routledge, Earthscan Series.
4. N. H. Ravindranath and Jayant Sathaye, "Climate Change and Developing Countries", Springer.

Reference Books:

1. K. S. Jagadish et al., "Alternative Building Materials & Technologies", New Age International Publishers.
2. P. T. Anastas and J. B. Zimmerman, "Principles of Green Engineering", Oxford University Press.
3. David T. Allen and David R. Shonnard, "Sustainability Engineering: Concepts, Design & Case Studies", Pearson Education.
4. S. Kumar Dash, "Climate Change – An Indian Perspective", Cambridge University Press, 2007.



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5. John M. Wallace and Peter V. Hobbs, "Atmospheric Science: An Introductory Survey", Elsevier Academic Press, 2006.
6. IPCC Assessments, Intergovernmental Panel on Climate Change (IPCC), as referenced in Anna University syllabus.

E-Resources:

1. UNEP (United Nations Environment Programme)
<https://www.unep.org/resources>
2. IPCC (Intergovernmental Panel on Climate Change) Reports
<https://www.ipcc.ch/reports/>
3. edX - Sustainability Courses
<https://www.edx.org/learn/sustainability>
4. Coursera - Climate Change Courses
<https://www.coursera.org/courses?query=climate%20change>
5. NASA Global Climate Change: Vital Signs of the Planet
<https://climate.nasa.gov/>
6. World Bank Open Knowledge Repository
<https://openknowledge.worldbank.org/>
7. UC Berkeley Environmental Courses (Search for PDFs)
<https://nature.berkeley.edu/classes/>
8. MIT Open Courseware - Environmental Topics
<https://ocw.mit.edu/courses/find-by-topic/#cat=environment>

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Common to all Programs)							Semester: IV		
Course: Open Elective – II (Energy Audit and Electrical Safety)							Code: 25ALOE402C		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Concept of power & energy in three phase & single phase, Various electrical equipment & specifications									
Course Objectives:									
1. To Study the importance of energy security for sustainable development and the fundamentals of energy conservation. 2. To introduce performance evaluation criteria of various electrical and thermal installations to facilitate the energy management 3. To relate the data collected during performance evaluation of systems for identification of energy saving opportunities 4. Understand the key terms and definitions related to electrical safety. 5. Learn about preliminary preparations and preconditions necessary before starting installation work.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Illustrate present state of energy security and its importance.								
CO2	Identify and describe the basic principles and methodologies adopted in energy audit of utility.								
CO3	Illustrate and analyze the Financial Analysis Techniques.								
CO4	Evaluating the performance of some common thermal installations and list the energy saving opportunities.								
CO5	Demonstrate awareness of the scope and significance of electrical safety in reducing risk and ensuring safe practices in electrical systems.								
CO6	Identify and assess the potential risks and hazards associated with the installation process of electrical equipment.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Energy Scenario: Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, Energy Conservation Act-2001 and its features, Re-structuring of the energy supply sector, energy strategy for the future, air pollution, climate change, Electricity Act, 2003.								05
2.	Energy Management & Audit: Definition, need and types of energy audit. Energy management (audit) approach- understanding energy costs, bench marking, energy performance, matching energy								05

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	use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments, Facility as an energy system, Energy analysis and the Sankey Diagram, Organizing - location of energy management, top management support, managerial function, roles and responsibilities of energy manager, force field analysis, Energy policies and its purpose.	
3.	Financial Management: Investment-need, appraisal and criteria, financial analysis techniques-simple payback period, return on investment, net present value, internal rate of return, cash flows, risk and sensitivity analysis; financing options, energy performance contracts and role of ESCOs, Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques -energy consumption, production, cumulative sum of difference (CUSUM).	04
4.	Energy Efficiency in Electrical Utilities: Electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors, energy conservation opportunities in Fans, Blower, Pumps, Lighting System.	04
5.	Introduction to Electrical Safety, Shocks And Their Prevention: Terms and definitions, objectives of safety and security measures, Hazards associated with electric current and voltage, principles of electrical safety, Primary and secondary electrical shocks, causes of electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns in residential buildings and shops.	04
6.	Safety During Installation of Plant and Equipment: Introduction, preliminary preparations, preconditions for start of installation work, risks during installation of electrical plant and equipment, safety aspects during installation, field quality and safety during erection, personal protective equipment for erection personnel, installation of a large oil immersed power transformer, installation of outdoor switchyard equipment, safety during installation of electrical rotating machines.	04
TOTAL		26
Text Books:		
1. Energy Audit and Management, Volume-I, IECC Press. 2. W.R. Murphy, G. McKay Butter worth, "Energy management", Elsevier/bsp Books Pvt. Ltd., 2003. 3. Gupta B. R.: Generation of Electrical Energy, Eurasia Publishing House Pvt. Ltd., New Delhi, 2001 4. Prasanna Chandra, "Financial management", Tata McGraw Hill, 10 th Edition, 2019.		



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5. Rao, S. and Saluja, H.L., “Electrical Safety, Fire Safety Engineering and Safety Management”, Khanna Publishers, 1988.
6. Pradeep Chaturvedi, “Energy Management Policy, Planning & Utilization”, Concept Publishing.

Reference Books:

1. Albert Thumann, P.E., C.E.M. William J. Younger, "Handbook of Energy Audits", River Publishers,
2. Paul O'Callaghan, "Energy management", McGraw-Hill Education, 1992.
3. CB Smith, “Energy Management Principles”, Pergamon Press, New York.
4. W. C. Turner, “Energy Management Hand Book”. John Wiley and sons.

E-Resources:

1. NPTEL course on Basic Principles of Energy Management & Energy Audit, By Dr. R. N. Patel & Dr. Akhilesh Kumar Tiwari, Chhattisgarh Swami Vivekanand Technical University, Bhilai.
[Basic Principles of Energy Management & Energy Audit - Course](#)
2. NPTEL course on Building Energy Systems and Auditing, By Prof. Shankha Pratim Bhattacharya, IIT Kharagpur.
[Building Energy Systems and Auditing - Course](#)

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DEPARTMENT OF ELECTRICAL ENGINEERING

Program: B. Tech. (Common to all Programs)							Semester: IV		
Course: Open Elective – II (Digital Marketing)							Code: 25ALOE402D		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Fundamentals of Business, Digital Tools									
Course Objectives:									
1. To understand digital marketing & process of website design. 2. To identify the keywords for a website & understand the SEO. 3. To Study the various Digital Marketing Tools. 4. To learn the use of social media websites for Digital Marketing. 5. To be Conversant with Linked In platform. 6. To know the recent trends in Digital Marketing.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Design websites using free tools like wordpress and explore it for digital marketing.								
CO2	Apply various keywords for a website & to perform SEO.								
CO3	Understand the various SEM Tools and implement the Digital Marketing Tools.								
CO4	Illustrate the use of Facebook, Instagram and YouTube for Digital Marketing in real life.								
CO5	Use Linked in platform for various campaigning.								
CO6	Understand the importance of recent trends in digital marketing.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Digital Marketing Planning and Structure: Importance of Digital Marketing, Digital Marketing Vs. Traditional Marketing, Inbound vs Outbound Marketing, Understanding Demographics. WWW, Buying a Domain, Core Objective of Website and Flow, One Page Website, Strategic Design of Products & Services Page, Strategic Design of Landing Page, Segmentation & Targeting and Positioning to Digital Marketing, Portfolio, Gallery and Contact Designing Wordpress Website.								04
2.	Search Engine Optimization (SEO): Fundamentals; Keywords and SEO Content Plan; SEO & Business Objectives; Writing SEO Content; On-site & off-site SEO; Optimize Organic Search Ranking, Website SEO Auditing. Introduction to Web Analytics								04

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3.	Search Engine Marketing: Importance of Adwords, Google Ad Types, PPC Cost Formula, Ad Page Rank, Billing and Payments, Adwords User Interface, Keyword Planner, Creating Ad Campaigns, Creating Text Ads, Creating Ad Groups, Search Engine Marketing (SEM) Tools, Bidding Strategy for CPC. Case Studies. Conversion Tracking Code, Designing Image Ads, Creating Video Ads, Youtube Video Promotion	05
4.	Social Media Marketing (SMM) Part 1: B to C Perspective, B to B Perspective: Introduction; Major Social Media Platforms for Marketing; Developing Data-driven Audience & Campaign Insights; Social Media for Business. Facebook & Instagram Marketing: Understanding of Facebook Marketing, Types of Facebook Advertising, Creating first ad on Facebook, Setting Campaign and optimization, Facebook Power Editor, Facebook Video Marketing, Facebook App & Shopping Marketing. YouTube Marketing: YouTube Account Setup (Create a business account with a personal account), YouTube Monetization, YouTube Ads, YouTube Analytics.	05
5.	Social Media Marketing (SMM) Part 2: LinkedIn Advertising: How to use LinkedIn Professionally, Types of LinkedIn Advertising, LinkedIn New feed Advertising, LinkedIn Message Pitching, Traffic and Leads Generation, Billing and Report. Email Marketing: Email Software and Tools, Importing Email Lists, Planning Email Campaign, Email Templates and Designs, Sending HTML Email Campaigns, Web Forms Lead Importing, Integrating Landing Page Forms, Campaign Reports and Insights, Segmentation Strategy, Responder Tracker.	04
6.	Upcoming Trends in Digital Marketing: Podcast, OTT Platforms, Mob-Ad, No Click Searches, Google Verified Listing, Voice Search, Visual Search, Online Reviews, Automated and Smart Bidding, Chatbots, Affiliate Marketing.	04
TOTAL		26
Text Books:		
1. Cory Rabazinsky, "Google-Ad words for Beginners: A Do-It-Yourself Guide to PPC Advertising". 2. Ian Brodie, "Email Persuasion: Captivate and Engage Your Audience, Build Authority and Generate More Sales With Email Marketing". 3. Jan Zimmerman and Deborah, "Social Media Marketing All-In-One for Dummies". 4. Dave Chaffey, Fiona Ellis-Chadwick, Kevin Johnston, Richard Mayer, "Internet Marketing", Pearson Education. 5. Oliver J Rich, "Digital Marketing". 6. Gerry T. Warner and Joe Wilson Schaefer "Online Marketing".		



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Reference Books:
1. Prof. Seema Gupta, “Digital Marketing”, McGraw Hill Publications. 2. Judy Strauss, Adel Ansary, Raymond Frost, Prentice Hall, “E- Marketing”. 3. Dr. Andy Williams, “WordPress for Beginners 2020: A Visual Step-by-Step Guide to Mastering WordPress”. 4. Cecilia Figueroa, “Introduction To Digital Marketing 101”, BPB Publications. 5. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns by Ian Dodson, Wiley; 1st edition (2016). 6. Digital Marketing For Dummies by Ryan Deiss and Russ Henneberry, For Dummies
E-Resources:
1. Digital Tools Certification- By Google. Link of the Course: https://skillshop.exceedlms.com/student/catalog 2. Swayam Certification course on, “Digital Marketing”, by Dr. Tejindarpal Singh Panjab University Chandigarh. Link of the Course: https://swayam.gov.in/nd2_ugc19_hs26/preview

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DEPARTMENT OF ELECTRICAL ENGINEERING

Program: B. Tech. (Robotics & Automation Engineering)							Semester: IV		
Course: Open Elective – II (Entrepreneurship and Innovations)							Code: 25ALOE402E		
Teaching Scheme				Evaluation Scheme					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	50	-	100
Prerequisites:									
Professional Development, Quality Management System									
Course Objectives:									
1. To learn the students various aspects of innovation and methods of fostering Innovation 2. To appreciate the importance of embarking on self-employment and has developed the confidence and personal skills for the same. 3. To start a small business enterprise by liaising with different stake holders. 4. To effectively manage small business enterprise.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Understand the key concepts of innovation								
CO2	Identify and analyze opportunities for innovation								
CO3	Recognize the potential and value of self-employment								
CO4	Develop a viable business plan for a small enterprise								
CO5	Apply financial principles to plan and structure engineering and automation projects effectively								
CO6	Apply fundamental principles of management								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Innovation: Creativity, Invention and innovation, Types of Innovation, Relevance of Technology for Innovation, The Indian innovations and opportunities, Promoting and managing innovation, Innovators and Imitators, Patents, Trademarks, Intellectual Property, Exploring, Executing, Leveraging and renewing innovation, Enhancing Innovation Potential & Formulating strategies for Innovation								04
2.	Strategy for Commercializing Innovation: Innovation Process, Risks and barriers for introducing products and services, selecting a Strategy, setting up the Investment and establishing organisation, Evaluating the Costs and impact of the Project								04
3.	Entrepreneurship: Definition. Growth of industries in developing countries; role of industries in the national economy; characteristics; demand based and resources based ancillaries and sub-control types. Government policies, stages in starting an industry, types (family business/start-ups etc.), Sources of finance								04



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4.	Project Identification and Accountancy: Assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, Accountancy: Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, preparation of financial reports, accounts and stores studies.	04
5.	Project Planning and Control: The financial functions cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. Profit planning and programming, planning cash flow, capital expenditure and operations. Control of financial flows, control and communication.	05
6	Laws: Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.	05
TOTAL		26
Text Books:		
1. Rabindra N. Kanungo, "Entrepreneurship and Innovation", Sage Publications, New Delhi, 1998. 2. Donald F. Kuratko, "Entrepreneurship – Theory, Process and Practice", 9 th Edition, Cengage Learning, 2014. 3. Peter F. Drucker, "Innovation and Entrepreneurship", Butterworth-Heinemann.		
Reference Books:		
1. Robin Lowe and Sue Marriott, "Enterprise: Entrepreneurship and Innovation – Concepts, Contexts and Commercialization", Butterworth-Heinemann. 2. S. S. Khanka, "Entrepreneurial Development", S. Chand & Co. Ltd., Ram Nagar, New Delhi, 2013. 3. Joseph L. Massie, "Essentials of Management", Prentice Hall of India.		
E-Resources:		
1. https://ocw.mit.edu/collections/entrepreneurship/ 2. https://onlinecourses.nptel.ac.in/		

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech. (Electrical Engineering)							Semester: IV		
Course: Project Management System – I							Code: 25EEMC403		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Interactive mind-set for practical.									
Course Objectives:									
1. To acquire basic knowledge of Problem-solving techniques. 2. To understand the structured way of solving problems with the right tools.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Know the project and its importance.								
CO2	Understand the structured way of project execution process.								
CO3	Understand on how to project, goals and timeline.								
CO4	Know the key principles of project management.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Project & Management System: What is a project, What is Project Management, Types, Importance and its benefits								06
2.	Project Management Process: Planning, Execution, Monitoring & Control, Deliverables, Stakeholders.								06
3.	Principles: 12 Principles of Project Management.								16
TOTAL								28	
Text Books:									
1. K. Nagarajan, "Project Management", New Age International Publishers. 2. Joseph Heagney, "Fundamentals of Project Management", AMACOM. 3. Harold Kerzner, "Project Management: A Systems Approach to Planning, Scheduling, and Controlling", Wiley.									
Reference Books:									
1. “A Guide to the Project Management Body of Knowledge (PMBOK Guide)”, Project Management Institute. 2. B. B. Goel, “Project Management: Principles and Techniques”, Deep & Deep Publications Pvt. Ltd.									
E-Resources:									
1. Dr. Nimisha Singh, “Introduction to Project Management: Principles & Practices”, NPTEL Course - https://onlinecourses.swayam2.ac.in/imb25_mg167/preview 2. Prof. Raghu Nandan Sengupta, “Project Management”, NPTEL Course - https://onlinecourses.nptel.ac.in/noc25_mg78/preview									

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DEPARTMENT OF ELECTRICAL ENGINEERING

Program: B. Tech. (Electrical Engineering)							Semester: IV		
Course: Problem Solving Techniques II							Code: 25EEAE401		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Interactive mind-set for practical.									
Course Objectives:									
1. To acquire basic knowledge of Problem-solving planning.									
2. To understand the effectiveness check and sustenance.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Know how to plan and execute the problem solving.								
CO2	Understand the measure and monitoring of problem-solving plan and execution.								
CO3	Understand the effectiveness measures of problem solving.								
CO4	Understand the sustenance working plan and execution.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Planning & Execution: What is planning? PDCA way of thinking and planning, Inputs requirement mapping.								08
2.	Measure of Planning & Execution: Key measures, How to measure and monitor? Reviews & Reporting with documentation.								08
3.	Effectiveness measures & Sustenance: Define effectiveness measures, How to measure and monitor? Importance of Sustenance, How to plan and execute sustenance activities.								12
TOTAL								28	
Text Books:									
1. B. Mahadevan, “Operations Management: Theory and Practice”, Pearson Education India.									
2. L.M. Prasad, “Principles and Practices of Management”, Sultan Chand & Sons.									
Reference Books:									
1. The PDCA Cycle for Industrial Improvement: Applied Case Studies (Synthesis Lectures on Engineering, Science, and Technology), Springer.									
E-Resources:									
1. Coursera, “Initiating and Planning Projects” - https://www.coursera.org/learn/project-planning									

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B-Tech. (Electrical Engineering)							Semester: IV		
Course: Electrical Workshop							Code: 25EEVS405		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic Electrical Engineering, Electrical Measurements and Instruments, Fundamentals of Electronics									
Course Objectives:									
1. To develop foundational skills in electrical wiring. 2. To provide hands-on experience in motor control and protection circuits. 3. To impart practical knowledge of modern electrical distribution systems. 4. To familiarize students with various lighting technologies. 5. To introduce students to basic electronic circuit design and prototyping. 6. To enable students to interface and control electronic devices using Arduino. 7. To cultivate problem-solving and troubleshooting skills.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Apply electrical wiring techniques in residential and industrial setups.								
CO2	Design, assemble, and test electronic circuits using breadboards for analog and power applications.								
CO3	Interpret datasheets and manuals to select appropriate components in electrical/electronic circuit design.								
CO4	Develop and implement embedded system applications using Arduino for real-time control and automation tasks.								
CO5	Demonstrate practical skills on electrical/electronic/Arduino-based circuits.								
CO6	Develop circuits in the form of structured technical reports.								
Course Contents:									
Unit	Description								
1.	Group A - Electrical (Minimum 2 exercises from this group) 1. Wiring of simple light circuit for controlling light/ fan point (PVC conduit wiring) 2. Wiring of light/fan circuit using two way switches. (Staircase wiring) 3. Design and fabrication of single phase Induction/three phase motor stator. 4. Start delta starter wiring for automatic and manual operation. 5. Wiring of distribution box with MCB, ELCB, RCCB and MCCB. 6. Wiring of 40 W tube, T-5, LED, Metal Halide lamps and available latest luminaries. 7. Assembly of various types of contactors with wiring. 8. Assembly of DOL and 3-point starter with NVC connections and overload operation. 9. Study the various types of earthing for electrical appliances/systems, Practice of earthing and Measurement of Earth resistance of Campus premises. 10. Measurement of Dielectric Absorption Ratio and Polarization Index of insulation.								
	Group B - Electronics (Minimum 2 Exercise from this group)								

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	1. This group consists of electronic circuits which must be assembled and tested on general purpose PCB or bread boards. 2. Design and development of combined $\pm 12\text{ V}$, $\pm 5\text{ V}$ regulated power supply. 3. Design and development of SCR based half controlled converter using RC triggering. 4. Design and development of first order/ second order low pass/high pass filters with an application. 5. Peak detector using op-amplifiers. 6. Zero crossing detector using op-amplifiers. 7. D.C. step down chopper. 8. Traffic light controller using time delay circuits. 9. Buck/boost converter using LM2596S.
3.	Group C (All interfacing circuits for Arduino boards must be assembled on general purpose PCB and tested.) 1. Arduino based D.C. Motor speed control. 2. Arduino based temperature measurement and display. 3. Arduino based ramp, saw tooth waveform generation. 4. Arduino based stepper motor control.

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Liberal Learning - IV

**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)							Semester: IV		
Course: Liberal Learning – IV (Guitar)							Code: 25EECC406A		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music and Guitar musical instrument.									
Course Objectives:									
1. To develop advanced technical proficiency, musical interpretation, and performance skills through complex repertoire. 2. To enhance creativity, improvisation, composition, and theoretical understanding across multiple musical genres. 3. To strengthen ensemble leadership, stage performance, and professional musicianship for advanced musical pursuits.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Perform advanced guitar repertoire with technical accuracy, musical expression, and stylistic interpretation.								
CO2	Apply advanced harmony, rhythm, improvisation, composition, and performance techniques across different musical genres.								
CO3	Demonstrate ensemble leadership, collaboration, stage etiquette, and professional musicianship.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Revision of Semester III Concepts								2
2.	Advanced Chord Voicings & Inversions								2
3.	Modal Scales & Advanced Scale Applications								2
4.	Improvisation over Chord Progressions								2
5.	Advanced Fingerstyle & Hybrid Picking								2
6.	Guitar Solo Techniques – Bends, Vibrato, Legato								2
7.	Song Arrangement & Musical Interpretation								2
8.	Introduction to Composition & Melody Writing								2
9.	Ensemble Rehearsal & Musical Communication								2
10.	Genre-based Performance (Jazz, Rock, Blues, Contemporary)								2
11.	Stage Performance Techniques & Performance Psychology								2
12.	Mock Recital & Individual Feedback								2
13.	Final Rehearsal & Performance Preparation								2
TOTAL								26	
Text Books:									
1. Hal Leonard Corporation, "Hal Leonard Guitar Method – Complete Edition", Hal Leonard Publications.									

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2. Mel Bay, "Modern Guitar Method – Grade 1, 2 & 3", Mel Bay Publications.
3. Leavitt, W., "A Modern Method for Guitar (Books 1–3)", Berklee Press.
4. Stetina, T., "Fretboard Mastery", Hal Leonard Publications.
5. Kolb, T., "Music Theory for Guitarists", Hal Leonard Publications.

Reference Books:

1. Chapman, R., "The Complete Guitar Manual", DK Publishing.
2. Latarski, D., "Practical Theory for Guitar", Alfred Music.
3. Denyer, R., "The Guitar Handbook", Knopf Publishing.
4. Buckingham, B., "Scales and Modes for Guitar", Hal Leonard Publications.

E-Resources:

1. Berklee Online – Guitar lessons, music theory, ear training, and performance resources.
<https://online.berklee.edu>
2. JustinGuitar – Structured guitar lessons from beginner to advanced.
<https://www.justinguitar.com>
3. Fender Play – Interactive lessons on chords, scales, techniques, and songs.
<https://www.fender.com/play>
4. TrueFire – Professional online guitar courses covering multiple genres and techniques.
<https://truefire.com>
5. Ultimate Guitar – Tabs, chord charts, scales, and community resources.
<https://www.ultimate-guitar.com>
6. MuseScore – Free music notation software and sheet music library.
<https://musescore.org>
7. MusicTheory.net – Interactive music theory lessons and exercises.
<https://www.musictheory.net>
8. Yamaha Music India – Educational resources on guitar fundamentals and musicianship.
<https://in.yamaha.com>

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)							Semester: IV		
Course: Liberal Learning – IV (Singing)							Code: 25EECC406B		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music in singing.									
Course Objectives:									
1. To develop voice modulation, singing, and expression techniques across different musical genres.									
2. To familiarize students with microphone handling, studio setup, microphone placement, and recording practices.									
3. To enhance students’ recording and stage performance skills through practical application of raga, tala, rasa, and presentation techniques.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Apply voice modulation, pitch control, and singing techniques in various styles.								
CO2	Perform Khayal, Semi-Classical, and Folk compositions with musical expression.								
CO3	Demonstrate microphone handling, recording skills, and stage presentation.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Voice range development and voice modulation, Pitch control and tonal accuracy								4
2.	Voice culture for studio singing								4
3.	Singing techniques in different genres: Light Music, Film Songs, Ghazals, Lavani etc., Expression according to song style								4
4.	Vilambit Khayal, Drut Khayal								4
5.	Semi-Classical Music, Folk Music								2
6.	Performance practice, Stage presentation skills								2
7.	Knowledge of Raga and Tala, Rasa and Musical Expression								2
8.	Studio setup, Microphone handling techniques, Microphone placement, Recording techniques, Recording practice								4
TOTAL								26	
Text Books:									
1. Bhatkhande, V. N., "Kramik Pustak Malika (Vol. III & IV)", Hindustani Music Publications.									
2. Paluskar, V. D., "Sangeet Bal Prakash", Gandharva Mahavidyalaya Mandal.									
Reference Books:									
1. Bhatkhande, V. N., "Hindustani Sangeet Paddhati (Vol. I–IV)", Sangeet Karyalaya.									
2. Ranade, A. D., "Hindustani Music: Tradition in Transition", Promilla & Co. Publishers.									
3. Ratanjankar, S. N., "Abhinav Geet Manjari", Sangeet Karyalaya.									



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E-Resources:

1. [Sangeet Natak Akademi](#)
2. [All India Radio \(Akashvani\)](#)
3. [SwarGanga Music Foundation](#)
4. [YouTube – Sangeet Natak Akademi Channel](#)
5. [Digital Tanpura and Tabla Applications \(e.g., iTanpura, Riyaz, NaadSadhana\)](#)

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)							Semester: IV		
Course: Liberal Learning – IV (Cinematography)							Code: 25EECC406C		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
A basic understanding of film theory, Camera operation, Lighting techniques and visual storytelling is essential for cinematography.									
Course Objectives:									
1. To develop proficiency in camera operation, exposure settings, and photographic composition.									
2. To apply lighting techniques and visual storytelling principles across different photography genres.									
3. To develop basic image editing and post-processing skills using appropriate software.									
4. To enhance creative, technical, and professional skills for effective photography practice.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Operate cameras confidently and use various camera settings effectively.								
CO2	Apply exposure principles by controlling aperture, shutter speed, and ISO to capture quality images.								
CO3	Compose visually appealing photographs using principles of composition and design.								
CO4	Utilize natural and artificial lighting techniques to enhance photographic results.								
CO5	Capture photographs in different genres such as portrait, landscape, product, event, and wildlife photography.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Revision Session of Sem III								2
2.	Storyboarding and planning								2
3.	Short film Screening								2
4.	Short Film Project (Camera-Phone)								2
5.	Short Film Project								2
6.	Short Film Project								2
7.	Short Film Project								2
8.	Short Film Project								2
9.	Short Film Project								2
10.	Short Film Project Submission								2
11.	Introduction Video Editing								2
12.	Basic Knowledge of Editing Tools								2
13.	Basics Timeline, Color Correction, Transition, Effects								2
TOTAL								26	
Text Books:									



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| <ol style="list-style-type: none">1. Peterson, B., "Understanding Exposure – Theory + Fundamentals", Amphoto Books.2. Kelby, S., "The Digital Photography Book – Practical + Shooting", Rocky Nook. |
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Reference Books:

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| <ol style="list-style-type: none">1. Langford, M., "Langford's Basic Photography – Technical Concepts", Focal Press.2. Freeman, M., "The Photographer's Eye – Composition, Visual Balance, Framing, Perspective", Ilex Press. |
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E-Resources:

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| <ol style="list-style-type: none">1. https://youtu.be/V7z7BAZdt2M?si=to4yQ46zEKRbxK0m2. https://youtu.be/WXdAX0No2hM?si=GZu_mJsmyJ7NGnAU |
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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)							Semester: IV		
Course: Liberal Learning – IV (Dance)							Code: 25EECC406D		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Good stamina, flexibility and familiarity with simple rhythmic patterns and beats.									
Course Objectives:									
1. To develop advanced dance techniques with precision, coordination, balance, flexibility, and rhythmic control.									
2. To enhance expressive skills, musicality, stage presence, and overall performance quality.									
3. To develop creativity and choreography skills through individual and group dance compositions.									
4. To integrate technique, rhythm, expression, synchronization, and stagecraft in complete performances.									
5. To develop leadership, teamwork, discipline, confidence, and professional performance skills through rehearsals, competitions, and cultural events.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate advanced dance techniques with precision, coordination, flexibility, balance, and rhythmic control.								
CO2	Apply musicality, expression, synchronization, creativity, and stage presence in individual and group performances.								
CO3	Create and present dance compositions using advanced choreography, formations, transitions, and stagecraft.								
CO4	Plan, rehearse, and perform polished dance presentations for cultural events, competitions, and advanced training.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Revision of prior semester & Warm-up								2
2.	Introduction formatted story telling through dance								2
3.	Learning the First Half of the Composition,								2
4.	Completion of Composition with Rhythm and introduction to live music dancing format								2
5.	Theme-Based Choreography – Planning and Concept Development								2
6.	Production introduction and choreography completion								2
7.	Lights and stage formative knowledge								2
TOTAL								26	
Text Books:									
1. Bharata Muni, "Natya Shastra", translated by Manomohan Ghosh, Asiatic Society, Kolkata.									
2. Nandikeshvara, "Abhinaya Darpana", translated by Manomohan Ghosh.									



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| <ol style="list-style-type: none">3. Balasaraswati, T., "Dance", Madras Music Academy.4. Krishna Iyer, E., "Dance", Ganesh & Co., Chennai. |
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Reference Books:

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| <ol style="list-style-type: none">1. Kothari, Sunil, "Dance", Marg Publications, Mumbai.2. Vatsyayan, Kapila, "Dance: Indian Dance in Literature and the Arts", Sangeet Natak Akademi.3. Payne, Helen, "Creative Dance and Movement in Groupwork", Routledge, 2021. |
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E-Resources:

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| <ol style="list-style-type: none">1. https://youtu.be/VTrGVHvWfPA?si=AvKTenB7bpx302R62. https://youtu.be/pG0NmQDKspc?si=AEfhhbRAEs9OjNErp3. https://youtu.be/eg-3ybiL6UI?si=AOj0NuGXDupxD2Mt |
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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)							Semester: IV		
Course: Liberal Learning – IV (Synthesizer/Keyboard)							Code: 25EECC204E		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music and Keyboard musical instrument.									
Course Objectives:									
1. To strengthen understanding of fundamental keyboard concepts and techniques.									
2. To develop proficiency in major and minor scales and arpeggios through practical exercises.									
3. To enhance accompaniment, improvisation, and jamming skills through practical performance.									
4. To develop listening skills, musical creativity, and ensemble performance techniques.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate improved technical proficiency through advanced practice of Major and Minor Scales.								
CO2	Perform musical pieces based on Minor Scales with proper fingering, expression and dynamics.								
CO3	Apply arpeggio patterns effectively in chord progressions and keyboard performance.								
CO4	Demonstrate accompaniment, improvisation and jamming skills in solo and group performances.								
CO5	Develop listening ability, rhythmic accuracy and musical confidence through ear training and ensemble practice.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Revision of all Major Scales								2
2.	Revision of all Minor Scales (Natural, Harmonic & Melodic)								2
3.	Revision of Major and Minor Chords,								2
4.	Revision of Chord Progression, Family chords, Chords Inversion								2
5.	Playing Simple Songs with Indian Notation								2
6.	Introduction to Staff Notation								2
7.	Understanding the Difference between Indian and Western Staff								2
8.	Reading and Playing Simple Melodies from Staff Notation								2
9.	Playing Songs using Both Indian and Staff Notation								2
10.	Fundamentals of Keyboard Accompaniment								2
11.	Accompaniment using Major and Minor Chords								2
12.	Accompaniment with Scales and Simple Songs								2
13.	Group Performance								2
TOTAL								26	



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Text Books:
1. Aaron, M., "Michael Aaron Piano Course – Grade 2", Alfred Music. 2. Thompson, J., "John Thompson's Modern Course for the Piano – Second Grade", Willis Music. 3. Hanon, C. L., "The Virtuoso Pianist in Sixty Exercises", G. Schirmer. 4. Agay, D., "Learning to Play Piano – Book 2", Yorktown Press.
Reference Books:
1. Thompson, J., "Modern Course for the Piano", Willis Music. 2. Aaron, M., "Piano Course", Alfred Music. 3. Harrison, M., "Contemporary Music Theory", Hal Leonard. 4. Hanon, C. L., "The Virtuoso Pianist", G. Schirmer. 5. ABRSM, "Music Theory in Practice (Grades 1–5)", Associated Board of the Royal Schools of Music.
E-Resources:
1. https://youtu.be/2mPS-2guHVo?si=8X_4KKezIdrMejLH 2. https://youtu.be/tEtukfFv3Wk?si=2iJ8wdD0dfjWauPb

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Program: B. Tech (Electrical Engineering)							Semester: IV		
Course: Liberal Learning – IV (Basketball)							Code: 25EECC406F		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop fundamental basketball skills, physical fitness, teamwork, and understanding of rules and strategies to enable effective participation and performance in the game.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate fundamental basketball skills including passing, dribbling, shooting, and rebounding.								
CO2	Apply proper footwork, body control, and individual defensive techniques during play.								
CO3	Integrate fundamental skills effectively through drills, small-sided games, and practice matches.								
CO4	Demonstrate teamwork, coordination, confidence, and consistency in basketball performance.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Complete Skill Revision: Review all basketball fundamentals. Recall and perform all basic skills.								2
2.	Passing & Receiving Practice: Improve passing speed and accuracy. Demonstrate efficient passing skills.								2
3.	Dribbling: Enhance control and confidence. Maintain effective dribbling during movement.								2
4.	Shooting: Continue improving shooting technique. Achieve better shooting consistency.								2
5.	Rebounding: Reinforce rebounding fundamentals. Secure rebounds confidently.								2
6.	Individual Defense: Improve defensive positioning. Apply correct defensive techniques.								2
7.	Assessment – VII								2
8.	Body Technique and Footwork: Reinforce movement and balance. Demonstrate efficient basketball footwork.								2
9.	Skill Integration: Combine all fundamental skills. Execute basketball movements smoothly.								2
10.	Partner Skill: Develop teamwork through drills. Improve coordination with teammates.								2
11.	Small Sided Games: Apply skills in simple match situations. Use basketball fundamentals during gameplay.								2



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12.	Practice Match: Reinforce practical learning. Participate confidently in basketball games.	2
13.	Assessment - VIII	2
TOTAL		26
Text Books:		
1. FIBA, "Official Basketball Rules", International Basketball Federation (FIBA) 2. Dr. James Naismith, "Basketball: Its Origin & Development" 3. John R. Wooden, "Practical Modern Basketball", Allyn & Bacon		
Reference Books:		
1. James Naismith – Basketball: Its Origin and Development – University of Nebraska Press. 2. Jerry V. Krause & Don Meyer – Basketball Skills & Drills – Human Kinetics		
E-Resources:		
1. Rules of Basketball : How to Play Basketball : Basketball Rules for Beginners 2. How To Dribble A Basketball For Beginners! Basketball Basics for Kids Basketball Training 3. How To Shoot A Basketball For Beginners! Basketball Basics [SECRETS] 4. Basketball: Rebounding		

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)						Semester: II			
Course: Liberal Learning – II (Cricket)						Code: 25EECC204G			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop basic cricket skills. Fitness, teamwork, and knowledge of rules and strategies for effective game performance.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate basic batting, bowling, and fielding skills with consistency.								
CO2	Apply learned cricket skills, coordination, and decision-making during match situations.								
CO3	Demonstrate basic umpiring knowledge, fair play, teamwork, and sportsmanship.								
CO4	Demonstrate overall cricket proficiency through practice and competitive matches.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Revision of Batting Skills: Strengthen all basic batting techniques.								2
2.	Revision of Bowling: Improve consistency and control in bowling.								2
3.	Revision of Fielding Skills: Enhance catching, throwing, and ground fielding.								2
4.	Combined Skill Practice: Practice batting, bowling, and fielding together.								2
5.	Net Practice: Improve performance through focused practice.								2
6.	Team Coordination: Develop communication during play.								2
7.	Assessment - VII								2
8.	Match Awareness Practice Match I: Understand basic match situations / Apply all learned skills in a game.								2
9.	Practice Match II: Improve decision-making during play.								2
10.	Practice Match III: Build confidence through match experience.								2
11.	Basic Umpiring: Learn simple umpiring signals and decisions.								2
12.	Fair Play & Sportsmanship: Understand discipline and ethics in cricket.								2
13.	Assessment - VIII								2
TOTAL								26	
Text Books:									
1. Sridhar, R., "Coaching Beyond", Rupa Publications India.									



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Reference Books:
1. Eastaway, R., "Cricket Explained: From Grubbers to Googlies", St. Martin's Griffin.
E-Resources:
1. How to Play Cricket
2. Cricket rules explained in 2 minutes
3. Every Cricket Shot Explained in 21 Minutes

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)						Semester: IV			
Course: Liberal Learning – IV (Rifle and Pistol Shooting)						Code: 25EECC406H			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop safe shooting skills, accuracy, concentration, and proper shooting techniques in students.									
2. To build discipline, confidence and prepare shooters for competitive events.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Explain safe rifle handling, range discipline, equipment, and match procedures.								
CO2	Demonstrate proper shooting techniques, coordination, and posture.								
CO3	Apply mental focus and scientific principles to improve shooting performance.								
CO4	Demonstrate discipline, sportsmanship, and overall shooting proficiency.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Shot calling: Shot calling is the ability to mentally identify the exact location of the shot.								2
2.	Maintain training diary: To maintain notes given by coach								2
3.	Pressure handling: To handle pressure during match, shooters get tensed during match due to crowd or pressure about the performance								2
4.	Full qualification matches: Qualifying test match								2
5.	Final match: Final match between the qualified shooters								2
6.	Dry firing test: To do the whole process of firing the shot but the gun is not loaded								2
7.	Assessment –VII								2
8.	Advanced Accuracy Drills: It is a structured training exercise designed to improve precision, consistency, shot execution and mental control.								2
9.	Mock Competition I: It is a simulated shooting match conducted under actual competition conditions –match no.- 1								2
10.	Mock Competition II: It is a simulated shooting match conducted under actual competition conditions –match no.- 2								2
11.	Equipment Inspection and Adjustment: Learn to adjust the weapon according to the shooter								2
12.	Ethics and sportsmanship: It refers to the moral principles ,values, and respectful behavior that guide shooters during training and competition								2
13.	Assessment – VIII								2
TOTAL								26	



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Text Books:

1. International Shooting Sport Federation (ISSF), "ISSF Official Statutes, Rules and Regulations", International Shooting Sport Federation (ISSF)
2. National Rifle Association (NRA), "The NRA Guide to the Basics of Pistol Shooting", National Rifle Association of America
3. National Rifle Association (NRA), "The NRA Guide to the Basics of Rifle Shooting", National Rifle Association of America

Reference Books:

1. National Rifle Association (NRA), "The Fundamentals of Rifle Marksmanship", National Rifle Association of America
2. International Shooting Sport Federation (ISSF), "ISSF Official Statutes, Rules and Regulations", International Shooting Sport Federation (ISSF)
3. National Rifle Association (NRA), "The NRA Guide to the Basics of Pistol Shooting", National Rifle Association of America
4. National Rifle Association (NRA), "The NRA Guide to the Basics of Rifle Shooting", National Rifle Association of America

E-Resources:

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras,
<https://nptel.ac.in/courses/109106406>
2. [Open Sight Air Rifle Shooting Sports For Beginners. @TheGunzoneNetwork - YouTube](#)
3. [Basics of the Standing Position | Sauer Academy](#)
4. [The Ideal Air Rifle Shooter with Abhinav Bindra \[IND\]](#)

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DEPARTMENT OF ELECTRICAL ENGINEERING

Program: B. Tech (Electrical Engineering)							Semester: IV		
Course: Liberal Learning – IV (Volleyball)							Code: 25EECC406I		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To equip participants with the essential skills and knowledge of volleyball, enabling them to perform fundamental techniques, understand basic rules, and participate in basic gameplay scenarios confidently.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Explain the official rules, referee signals, and scoring procedures of volleyball.								
CO2	Demonstrate advanced volleyball skills, fitness components, and position-specific techniques.								
CO3	Apply offensive, defensive, and tactical strategies effectively during competitive play.								
CO4	Demonstrate proficiency in officiating, teamwork, sportsmanship, and overall match performance.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Official Volleyball Rules: History and development of volleyball rules, Court dimensions and equipment specifications, Team composition and player positions, Rotation and substitution rules, Scoring system (Rally Point System), Faults, violations, and penalties, Service order and match regulations.								2
2.	Referee Signals: Duties of the first and second referee, Official hand signals for all game situations, Line judge signals, Communication between officials, Practical demonstration of referee signals.								2
3.	Score Sheet And Match Procedures: Components of the official score sheet, Recording player line-ups and substitutions, Recording time-outs, sanctions, and scores, Match protocol before, during, and after play, Practical score sheet filling								2
4.	Physical Conditioning: Volleyball-specific warm-up exercises, Strength development for upper and lower body, Core stability exercises, Endurance training, Cool-down and recovery methods.								2
5.	Speed And Agility And Plyometric: Sprint drills , Agility ladder exercises, Cone drills , Jump training (plyometrics) , Explosive movement drills for volleyball								2
6.	Flexibility And Injury Prevention: Dynamic and static stretching, Mobility exercises, Common volleyball injuries, Injury prevention techniques, Recovery and rehabilitation basics								2
7.	Assessment - VII								2

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8.	Position-Specific Training: Setter responsibilities and drills, Outside hitter techniques, Middle blocker skills, Opposite hitter training, Libero defensive techniques, Position-based game practice.	2
9.	Complex Offensive System: 5–1 offensive system, 6–2 offensive system, Quick attack combinations, Setter-hitter coordination, Transition offense, Team offensive strategies.	2
10.	Complex Defensive System: Block defence system, Perimeter defense, Rotation defense, Backcourt positioning, Defensive communication, Transition from defense to attack.	2
11.	Tournament Practice: League and knockout match formats, Tournament scheduling, Team strategy under competition conditions, Match officiating practice, Sportsmanship and fair play.	2
12.	Comprehensive Skill Revision: Revision of all technical skills, Tactical system review, Fitness drills, Match-based practice, Error correction and performance improvement	2
13.	Assessment - VIII	2
TOTAL		26
Text Books:		
1. Fédération Internationale de Volleyball (FIVB), "Official Volleyball Rules", FIVB Publications 2. Bonnie Kenny & Cindy Gregory, "Volleyball: Steps to Success", Human Kinetics 3. Anita Bean, "The Complete Guide to Sports Nutrition", Bloomsbury Sport 4. Ian Jeffreys, "The Warm-Up", Human Kinetics		
Reference Books:		
1. Pete Waite, "Aggressive Volleyball", Human Kinetics 2. Bob Bertucci, "Volleyball Drill Book", Human Kinetics		
E-Resources:		
1. Volleyball Rules : How to Play Volleyball : The Rules of Volleyball EXPLAINED! 2. 6 Basic Skills in Volleyball - YouTube 3. Everything You Need to Know About the Game of Volleyball - YouTube		

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**DEPARTMENT OF ELECTRICAL ENGINEERING**

Program: B. Tech (Electrical Engineering)							Semester: IV		
Course: Liberal Learning – IV (Football)							Code: 25EECC406J		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To enhance football players’ technical skills, tactical understanding, physical fitness, teamwork, and sportsmanship, fostering a comprehensive understanding and appreciation of the game.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate advanced football skills, position-specific techniques, and physical conditioning.								
CO2	Apply leadership, coaching, refereeing, and talent identification skills in football.								
CO3	Analyze match statistics, player performance, and team effectiveness using appropriate methods.								
CO4	Demonstrate teamwork, fair play, ethics, and overall football proficiency in competitive matches.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Advanced Technical Drills: Develop advanced football techniques through challenging drills that improve skill execution, speed, accuracy, and game adaptability.								2
2.	Position-Specific Training: Understand and apply position-specific skills, roles, and responsibilities to enhance individual performance within the team structure.								2
3.	Leadership & Captaincy: Develop leadership qualities, communication skills, and decision-making abilities to effectively guide and motivate teammates.								2
4.	Football Coaching Methods: Understand and apply effective coaching methods, session planning, and teaching approaches to improve player development.								2
5.	Talent Identification: Understand the principles of talent identification by evaluating technical, physical, tactical, and psychological attributes of players.								2
6.	Strength & Conditioning: Develop football-specific strength, endurance, speed, agility, and conditioning to improve athletic performance and reduce injury risk.								2
7.	Assessment-VII								2
8.	Refereeing & Match Officiating: Understand the laws of the game and develop basic refereeing skills for fair and effective match officiating.								2
9.	Match Statistics & Performance Analysis: Analyze match statistics and performance data to evaluate player contributions, team effectiveness, and areas for improvement.								2
10.	Fair Play & Professional Ethics: Understand the importance of fair play, respect, discipline, teamwork, and ethical behavior in football.								2



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11.	Tournament Practical: Apply technical, tactical, physical, and teamwork skills in a competitive tournament environment.	2
12.	Final Competitive Match: Demonstrate overall football development by applying skills, tactics, teamwork, and sportsmanship in a competitive match setting.	2
13.	Assessment-VIII	2
TOTAL		26
Text Books:		
1. Fédération Internationale de Football Association (FIFA), "Laws of the Game", FIFA. 2. International Football Association Board (IFAB), "Laws of the Game", IFAB.		
Reference Books:		
1. Hughes, C., "The Winning Formula in Soccer", Meyer & Meyer Sport. 2. Fédération Internationale de Football Association (FIFA), "Laws of the Game", FIFA. 3. International Football Association Board (IFAB), "Laws of the Game", IFAB		
E-Resources:		
1. Beginner's guide to football Football for dummies 2. Every position in soccer explained 3. Rules Of Soccer : How to play Soccer : Soccer Rules for Beginners		

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DEPARTMENT OF ELECTRICAL ENGINEERING

Program: B. Tech. (Electrical Engineering)							Semester: IV		
Course: Internship – II*							Code: 25EEIN402		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	-	-	02	-	-	25	-	-	25
Preamble:									
Internships serve as vital educational and career development experiences, offering practical exposure in a specific field. Employers seek individuals who possess the necessary skills and an understanding of industry environments, practices, and cultures. This internship is designed as a structured, short-term, supervised training program, often centered on specific tasks or projects with clear timelines. The primary goal is to immerse technical students in an industrial setting, providing experiences that cannot be replicated in the classroom. This exposure aims to develop competent professionals who understand the social, economic, and administrative factors influencing the operations of industrial organizations.									
Course Objectives:									
1. Exposure to students to the industrial environment, which cannot be provided in the classroom and hence creating deployable professionals for the industry. 2. Learn to implement the technical knowledge in real industrial situations.									
Course Outcomes: After completion of this course, students will able to -									
CO1	Gain exposure to industry practices and understand how academic concepts are applied in professional settings.								
CO2	Develop and demonstrate effective communication and teamwork skills within a work environment.								
CO3	Improve your problem-solving and time management skills by working in real-world industry settings.								
Internship Requirements									
1. Internship Duration: It is mandatory for all students to undergo an internship after every semester during vacations for the duration of 3 to 5 weeks. Internships completed during this period will be considered for the assessment of Term Work (TW). 2. Internship Opportunities: Students can explore various opportunities for internships at: a) Industries b) Research labs or organizations c) Collegiate clubs d) In-house research projects e) Online internships 3. Support and Assistance: Students can seek assistance for securing internships from: a) The Training and Placement cell, along with departmental coordinators b) Department or institute faculty members c) Personal contacts d) Directly connecting with industries or organizations 4. Request Letter: Once an industry, research organization, or collegiate club is identified, students must obtain a request letter from the concerned department or placement office. This letter, in the standard format must be duly signed by the authority, should be addressed to the HR manager or relevant authority.									



DEPARTMENT OF ELECTRICAL ENGINEERING

5. **Confirmation Letter:** Students must submit the confirmation letter from the industry, research organization, or collegiate club to the Internship Coordinator and the Head of Department (HOD) office.
6. **Joining Report:** Upon commencing the internship, students must submit the joining report, joining letter, or a copy of the confirmation email to the Internship Coordinator and the HOD office.
7. **Faculty Mentor:** A faculty member will be assigned as a mentor to a group of students. The mentor will be responsible for monitoring, evaluating, and assessing student internship activities. The faculty mentor is also required to visit the internship location and submit formal feedback to the Internship Coordinator.
8. **Faculty Visits:** Faculty members are advised to visit the internship site once or twice during the internship period to monitor progress.
9. **Progress Report:** Students must submit progress report fortnightly to their faculty guide and the final internship report to the Internship Coordinator and department office.
10. **Evaluation Report:** After the completion of the internship, the mentor, along with the assessment panel members, should submit the evaluation report of the students to the department office and the Internship Coordinator.
11. **Internship Certificate:** Students must receive the Internship Certificate from the industry and submit it to the Internship Coordinator and department office.
12. **Presentation and Assessment:** Students are required to give a presentation on their internship work as part of the term work. The internship diary and report will also be verified and assessed.

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