BE SCHEME & SYLLABUS

Second Year
(III and IV Semester)

With effect from 2022-23

Electrical and Electronics Engineering

ST JOSEPH ENGINEERING COLLEGE

AN AUTONOMOUS INSTITUTION

Vamanjoor, Mangaluru - 575028

MOTTO

Service & Excellence

VISION

To be a global premier Institution of professional education and research.

MISSION

- Provide opportunities to deserving students of all communities, the Christian students in particular for quality professional education.
- Design and deliver curricula to meet the national and global changing needs through student-centric learning methodologies.
- Attract, nurture and retain the best faculty and technical manpower.
- Consolidate the state-of-art infrastructure and equipment for teaching and research activities.
- Promote all round personality development of the students through interaction with alumni, academia and industry.
- Strengthen the Educational Social Responsibilities (ESR) of the institution.

ST JOSEPH ENGINEERING COLLEGE

An Autonomous Institution
Vamanjoor, Mangaluru - 575028

Affiliated to VTU – Belagavi & Recognized by AICTE New Delhi
NBA – Accredited: B.E. (CSE, ECE, EEE, ME and CIV) & MBA
NAAC – Accredited with A+

B.E. SCHEME & SYLLABUS
(With effect from 2022-23)

Electrical & Electronics Engineering

SECOND YEAR

(III and IV Semester)

AUTONOMY AND ACCREDITATION

St Joseph Engineering College (SJEC) is an Autonomous Institute under Visvesvaraya Technological University (VTU), Belagavi, Karnataka State, and is recognized by the All-India Council for Technical Education (AICTE), New Delhi. SJEC is registered under the trust "Diocese of Mangalore, Social Action Department".

The SJEC has been conferred Fresh Autonomous Status from the Academic Year 2021-22. The college was granted autonomy by the University Grants Commission (UGC) under the UGC Scheme for Autonomous Colleges 2018 and conferred by VTU. The UGC Expert Team had visited the college on 28-29 November 2021 and rigorously assessed the college on multiple parameters. The fact that only a handful of engineering colleges in the state have attained Autonomous Status adds to the college's credibility that has been on a constant upswing. Autonomy will make it convenient for the college to design curricula by recognizing the needs of the industry, offering elective courses of choice and conducting the continuous assessment of its students.

At SJEC, the Outcome-Based Education (OBE) system has been implemented since 2011. Owing to OBE practised at the college, SJEC has already been accredited by the National Board of Accreditation (NBA). Five of the UG programs, namely Computer Science & Engineering, Mechanical Engineering, Electronics and Communication Engineering, Electrical & Electronics Engineering and Civil Engineering and MBA programs, have accreditation from the NBA.

Also, SJEC has been awarded the prestigious A+ grade by the National Assessment and Accreditation Council (NAAC) for five years. With a Cumulative Grade Point Average (CGPA) of 3.39 on a 4-point scale, SJEC has joined the elite list of colleges accredited with an A+ grade by NAAC in its first cycle. The fact that only a small percentage of the Higher Education Institutions in India have bagged A+ or higher grades by NAAC adds to the college's credibility that has been on a constant upswing.

The college is committed to offering quality education to all its students, and the accreditation by NAAC and NBA reassures this fact. True to its motto of "Service and Excellence", the college's hard work has resulted in getting this recognition, which has endorsed the academic framework and policies that the college has been practicing since its inception. The college has been leveraging a flexible choice-based academic model that gives students the freedom to undergo learning in respective disciplines and a transparent and continuous evaluation process that helps in their holistic development.

CONTENTS

ABOUT THE DEPARTMENT

The Department of Electrical & Electronics Engineering (EEE) was established in the year 2002. The Department has a team of well qualified and dedicated faculty with wide range of specialization. The BE programme offers a unique mix of electrical, electronics and computer related courses enabling the students to take up a professional career/higher studies in any of these areas. Subjects on Electric Circuit Analysis, Control Systems, EV Technologies, Protection and Power Systems, Electric Power Generation, Transmission and Distribution give the basic exposure to electrical fundamentals, whereas Analog and Digital Electronics, Microcontrollers, Digital Signal Processing, Embedded Systems, Hardware Description Languages(HDL), Advanced CMOS VLSI Design, Advanced Programming Languages make attractive blend of Electrical & Electronics Engineering concepts thereby creating excellent placement opportunities in various fields such as Construction, Power Distribution, Automobile, Aeronautical, Information Technology, Healthcare sectors, Semiconductor Device Design and Fabrication. The students of EEE branch are placed in Electrical & Electronics Engineering related Organizations and Software Companies. With the objective of making graduates Industry ready, Computer labs with modern Software and Hardware labs on Transformers, Motors, Power System Protective Relays, Power Electronics and Drive Systems have been operational and have helped students to improve their Technical Knowledge and Skills. The Department of Electrical & Electronics Engineering at SJEC is one of the few Departments in the region to secure NBA Accreditation since 2013.

DEPARTMENT VISION

Excel in Electrical Engineering Education and Research

DEPARTMENT MISSION

- Provide and maintain an environment designed to ensure quality Electrical Engineering Education.
- Design and deliver add-on curricula to existing syllabus to ensure compatibility with National and Global needs.
- Provide Holistic Personality Development of the students through interaction with Industry, Academia and Alumni.
- Consolidate state-of-art laboratories for Teaching and Research Activities.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. To develop necessary skills in students for successful careers through rigorous education and appreciation for the life-long learning needed to maintain competency.

2. To provide students with the solid foundation in mathematical, scientific and electrical engineering to analyze data and extract relevant information for application to product design and pursue higher education.

3. To train students with good scientific and engineering breadth, including proficiency in software language and use of latest software tools so as to comprehend, analyze, design and create novel products and solutions to current problems.

4. To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations on complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and the synthesis of information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and a leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Electrical & Electronics Engineering Graduates will be able to:
PSO1: Make use of modern simulation software & hardware tools and techniques to analyze, present and solve Electrical Engineering problems.
PSO2: Develop entrepreneurial skills through Industry-Institute interactions by activities related to personality development and financial management.

III Semester (B.E. - EE Engineering)													
SI. No	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical/ Drawing**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	BSC	22EEE31	Mathematics for Electrical and Electronics Engineering -III	MAT	MAT	2	2	-	03	50	50	100	3
2	IPCC	22EEE32	Analog Electronic Circuits (Integrated)	EEE	EEE	2	2	2	03	50	50	100	4
3	IPCC	22EEE33	Electric Circuit Analysis (Integrated)	EEE	EEE	3	-	2	03	50	50	100	4
4	PCC	22EEE34	Transformers and Generators	EEE	EEE	3	-	-	03	50	50	100	3
5	ESC	22EEE35X	ESC/ETC/PLC	EEE	EEE	3	-	-	03	50	50	100	3
6	PCCL	22EEE36L	Transformers and Generators Laboratory	EEE	EEE	-	-	2	03	50	50	100	1
7	HSMC	22UHV37	Universal Human Values - II	COM	COM	2	-	-	02	50	50	100	2
		22BFE37	Biology for Engineers	COM	COM								
8	AEC/SDC	22IEP38	IoT Enabled Prototyping	COM	COM	-	-	2	02	50	50	100	1
9	MNCC	22ITB39A / 22ITC39B	Industry Oriented Training – Business Etiquettes/ Industry Oriented Training – Computing Skills	COM	COM	-	-	2	02	50	-	50	-
					Total	15	4	10	24	**450**	**400**	**850**	**21**

22EEE35X : Engineering Science Course/Emerging Technology Course/Programming Language Course			
22EEE351	Electric Power Generation and Economics	22EEE353	Semiconductor Devices
22EEE352	Electrical Measurement and Instrumentation	22EEE354	Object Oriented Programming using C++

IV Semester (B.E. - EE Engineering)													
SI. No	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical/ Drawing**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	PCC	22EEE41	Transmission and Distribution	EEE	EEE	2	2	-	03	50	50	100	3
2	IPCC	22EEE42	Digital Electronics (Integrated)	EEE	EEE	2	2	2	03	50	50	100	4
3	IPCC	22EEE43	Microcontrollers (Integrated)	EEE	EEE	3	-	2	03	50	50	100	4
4	PCC	22EEE44	Electric Motors	EEE	EEE	3	-	-	03	50	50	100	3
5	ESC	22EEE45X	ESC/ETC/PLC	EEE	EEE	3	-	-	03	50	50	100	3
6	PCCL	22EEE46L	Electric Motors Laboratory	EEE	EEE	-	-	2	03	50	50	100	1
7	HSMC	22UHV47	Universal Human Values – II	COM	COM	2	-	-	02	50	50	100	2
	HSMC	22BFE47	Biology for Engineers	COM	COM								
8	AEC/SDC	22CTE48	Computational Tools for Engineers	COM	COM	-	-	2	02	50	50	100	1
9	AEC/SDC	22ITB49A / 22ITC49B	Industry Oriented Training – Business Etiquettes/ Industry Oriented Training – Computing Skills	COM	COM	-	-	2	02	50	-	50	-
					Total	15	4	10	24	**450**	**400**	**850**	**21**

22EEE45X : Engineering Science Course/Emerging Technology Course/Programming Language Course			
22EEE451	Operational Amplifiers	22EEE453	Sensors and Transducers
22EEE452	Electromagnetic Field Theory	22EEE454	Electrical Safety Practices

III Semester

Mathematics for Electrical and Electronics Engineering -III			
Course Code	**22EEE31**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	2:2:0	SEE Hours	03
Total Hours	40 Hours	Credits	03

Course Learning Objectives: The objective of the course is to

- To acquaint the students with differential equations and their applications in electrical engineering
- To find the association between attributes and the correlation between two variables
- To use Fourier series to represent periodical physical phenomena in engineering analysis and to enable the student to express non periodic functions to periodic functionusing Fourier series and Fourier transforms.
- To apply the basic ideas of the theory of probability and random signals.

Module-1 : Ordinary Differential Equations of Higher Order **8 hours**

Importance of higher-order ordinary differential equations in Electrical & Electronics Engineering applications.

Higher-order linear ODEs with constant coefficients - Inverse differential operator, problems restricted to e^{ax}, $sinax/cosax$ and polynomial types. Linear differential equations with variable Coefficients-Cauchy's and Legendre's differential equations - Problems.

Application of linear differential equations to L-C circuit and L-C-R circuit.

Module-2: Curve fitting, Correlation and Regressions **8 hours**

Principles of least squares, Curve fitting by the method of least squares in the form $y = a + bx$, $y = a + bx + cx^2$, and $y = ax^b$. Correlation, Co-efficient of correlation, Lines of regression, Angle between regression lines, rank correlation

Module-3 Fourier Series **8 hours**

Periodic functions, Dirchlet's condition, conditions for a Fourier series expansion, Fourier seriesof functions with period 2π and with arbitrary period. Half rang Fourier series. Practical harmonic analysis.

Module-4 Fourier Transforms and Z –transforms **8 hours**

Infinite Fourier transforms: Definition, Fourier sine, and cosine transform. Inverse Fourier transforms Inverse Fourier cosine and sine transforms. Problems.

Z-transforms: Definition, Standard z-transforms, Damping, and shifting rules, Problems.Inverse z-transform by the method of partial fraction and applications to solve difference equations

Module-5 Probability Distributions **8 hours**

Review of basic probability theory, Random variables-discrete and continuous Probability distribution function, cumulative distribution function, mean and variance, Binomial, Poisson, Exponential and Normal distribution (without proofs for mean and SD) – Problems.

Course Outcomes: At the end of the course the student will be able to:	
22EEE31.1	Apply differential equations to Electrical Engineering.
22EEE31.2	Make use of correlation and regression analysis to fit a suitable mathematical model for statistical data.
22EEE31.3	Demonstrate the Fourier series to study the behavior of periodic functions.
22EEE31.4	To use Fourier transforms to analyze problems involving continuous-time signals and to apply Z-Transform techniques to solve difference equations.
22EEE31.5	Apply discrete and continuous probability distributions in analyzing the probability models arising in the engineering field.

22EEE31.6	Demonstrate the validity of testing the hypothesis.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Higher Engineering Mathematics	B. S. Grewal	Khanna Publishers	44th Ed., 2021
2	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10th Ed., 2018
Reference Books				
1	Higher Engineering Mathematics	V. Ramana	McGraw-Hill Education	11th Ed., 2017
2	Engineering Mathematics	Srimanta Pal & Subodh C. Bhunia	Oxford University Press	3rd Ed., 2016
3	A textbook of Engineering Mathematics	N.P Bali and Manish Goyal	Laxmi Publications	10th Ed., 2022
4	Advanced Engineering Mathematics	C. Ray Wylie, Louis C. Barrett	McGraw – Hill Book Co., New York	6th Ed., 2017

Web links and Video Lectures (e-Resources):

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU e-Shikshana ProgramVTU EDUSAT Program.

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22EEE31.1	2	0	1	0	0	0	0	0	0	0	0	0	0	0
22EEE31.2	0	2	1	0	0	0	0	0	0	0	0	0	0	0
22EEE31.3	2	0	1	0	0	0	0	0	0	0	0	0	0	0
22EEE31.4	0	3	0	0	0	0	0	0	0	0	0	0	0	0
22EEE31.5	3	0	0	0	0	0	0	0	0	0	0	0	0	0
22EEE31.6	0	2	1	0	0	0	0	0	0	0	0	0	0	0

1: Low 2: Medium 3: High

Analog Electronic Circuits			
Course Code	**22EEE32**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	2:2:2	SEE Hours	03
Total Hours	40 hours Theory + 10 Lab slots	Credits	04

Course Learning Objectives: The objective of the course is to

- Provide the knowledge for the analysis of diode and transistor circuits.
- Develop skills to design the electronic circuits like amplifiers and oscillators.
- Understand the importance of FET and MOSFET amplifiers.

Module-1 Diode Circuits & Transistor Biasing **8 hours**

Diode Circuits: Diode rectifier circuits, Diode clipping and clamping circuits.
Transistor biasing and stabilization: Operating point, analysis and design of fixed bias circuit, self-bias circuit, Emitter stabilized bias circuit, voltage divider bias circuit, stability factor of different biasing circuits (qualitative comparison only). Transistor switching circuits.

Module-2 Transistor at Low Frequencies **8 hours**

Hybrid model, h-parameters for CE, CC and CB modes, mid-band analysis of single stage amplifier, simplified hybrid model, analysis for CE, CB and CC(emitter voltage follower circuit) modes, Millers Theorem and its dual, analysis for collector to base bias circuit.
General frequency considerations, effect of various capacitors on frequency response, Miller effect capacitance, high frequency response, multistage frequency effects.

Module-3 Amplifiers **8 hours**

Multistage amplifiers: Cascade connection, CASCODE connection, Darlington connection (qualitative analysis only).
Feedback Amplifiers: Concept of feedback, feedback connection types, general characteristics of negative feedback amplifiers, Input and output resistance with feedback of various feedback amplifiers, practical feedback amplifier circuits.

Module-4 Power Amplifiers & Oscillators **8 hours**

Power Amplifiers: Classification of power amplifiers, Analysis of class A, Class B, class C and Class AB amplifiers, Distortion in power amplifiers, harmonic distortion in Class B amplifiers, cross over distortion and elimination of cross over distortion.
Oscillators: Concept of positive feedback, frequency of oscillation for RC phase oscillator, Wien Bridge oscillator, Tuned oscillator circuits, Hartley oscillator, Colpitt's oscillator, crystal oscillator and its types.

Module-5 FETs **8 hours**

Construction, working and characteristics of JFET and MOSFET (enhancement and Depletion type) Biasing of JFET and MOSFET. Fixed bias configuration, self-bias configuration, voltage divider biasing. Analysis and design of JFET (only common source configuration with fixed bias) and MOSFET amplifiers.

PRACTICAL MODULE

1. Simulation and verification of series, shunt and double ended clipper circuits.
2. Simulation and verification of clamper circuits.
3. Design, simulation and Testing of Full wave – centre tapped transformer type and Bridge type rectifier circuits with and without Capacitor filter. Determination of ripple factor, regulation and efficiency.
4. Determination of h parameters for CE, CB and CC modes using transistor static characteristics.
5. Frequency response of single stage BJT RC coupled amplifier and determination of half power points, bandwidth, input and output impedances.
6. Design and testing of BJT -RC phase shift oscillator for given frequency of oscillation.
7. Design, simulation and testing of Wien bridge oscillator for given frequency of oscillation.

8. Design and testing of Hartley and Colpitt's oscillator for given frequency of oscillation.
9. Determination of gain, input and output impedance of BJT Darlington emitter follower with and without bootstrapping.
10. Design and testing of Class A and Class B power amplifier and to determine conversion efficiency.

Course Outcomes: At the end of the course the student will be able to:	
22EEE32.1	Design and analyze the biasing circuits for transistor amplifiers, field effect transistors and MOSFET amplifiers.
22EEE32.2	Design and analyze the power amplifier circuits and oscillator circuits for different range of frequencies.
22EEE32.3	Demonstrate the knowledge of transistor amplifiers, feedback amplifier circuits for sustainable development of real time applications.
22EEE32.4	Communicate effectively to estimate the response of diode application circuits and transistor switching circuits.
22EEE32.5	Communicate effectively to estimate the response of transistor amplifiers, field effect transistors and MOSFET amplifiers.
22EEE32.6	Simulate electronic circuits based on amplifiers using modern software tools.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Electronic Devices and Circuit Theory	Robert L Boylestad, Louis Nashelsky	Pearson	11th Edition, 2015
2	Electronic Devices and Circuits	Millman and Halkias	Mc Graw Hill	4th Edition, 2015
3	Electronic Devices and Circuits	David A Bell	Oxford University Press	5th Edition, 2008
Reference Books				
1	Microelectronics Circuits Analysis and Design	Muhammad Rashid	Cengage Learning	2nd Edition, 2014
2	A Text Book of Electrical Technology, Electronic Devices and Circuits	B.L. Theraja,, A.K. Theraja	S. Chand	Reprint, 2013
3	Electronic Devices and Circuits	Anil K. Maini Vasha Agarval	Wiley	1st Edition, 2009
4	Electronic Devices and Circuits	S. Salivahanan N. Suresh 2013	Mc Graw Hill	3rd Edition

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/108106068 (Analog ICs, IIT Madras, NPTEL Course)
- https://nptel.ac.in/courses/108106084 (Analog Circuits, IIT Madras NPTEL Course)

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22EEE32.1	0	0	0	1	2	0	0	0	0	0	0	0	1	0
22EEE32.2	0	0	0	1	0	0	0	0	0	0	0	0	0	0
22EEE32.3	0	0	0	0	0	0	1	0	0	0	0	0	0	0
22EEE32.4	0	0	0	0	0	0	0	2	0	1	0	0	0	0
22EEE32.5	0	0	0	0	1	0	0	0	0	2	0	1	1	0
22EEE32.6	0	0	0	0	2	0	0	0	0	0	0	0	2	0

1: Low 2: Medium 3: High

Electric Circuit Analysis			
Course Code	**22EEE33**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:2	SEE Hours	03
Total Hours	40 hours Theory + 10 Lab slots	Credits	04

Course Learning Objectives: The objective of the course is to

- To apply the basic laws and network theorems to analyse electrical circuits.
- To analyse series and parallel resonance circuits.
- To understand the behaviour of switching transients in electric circuits.
- To impart basic knowledge on network analysis using Laplace transforms.
- To determine the parameters of two port networks.
- To simulate electric circuits and verify theoretical results.

Module-1 Basic Concepts of circuit analysis **8 hours**

Concept of ideal and practical sources. Concept of Super-Mesh and Super node analysis. Analysis of networks by (i) Network reduction method including star – delta transformation, (ii) Mesh and Node voltage methods for AC and DC circuits with independent and dependent sources.

Module-2 Network Theorems **8 hours**

Super Position theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem and Millman's theorem. Analysis of networks, with and without dependent AC and DC sources

Module-3 Resonant circuits & Transient Analysis **8 hours**

Analysis of simple series RLC and parallel RLC circuits under resonances. Problems on Resonant frequency, Bandwidth and Quality factor at resonance

Transient analysis of RL and RC circuits under DC excitations: Behavior of circuit elements under switching action, Evaluation of initial conditions

Module-4 Laplace Transformation **8 hours**

Introduction to Laplace transformation (LT), LT of Impulse, Step, Ramp, Sinusoidal signals and shifted functions. Waveform synthesis. Initial and Final value theorems. Transfer function and Pole-zero Diagram. Solutions of networks using LT.

Module-5 Two Port Networks **8 hours**

Definition, Open circuit impedance, Short circuit admittance, h-parameters and Transmission parameters and their evaluation for simple circuits, relationships between parameter sets.

PRACTICAL MODULE

1. Study of the effect of open and Short circuits in simple circuits.
2. Determination of resonant frequency, bandwidth, and Q of a series circuit.
3. Determination of resonant frequency, bandwidth, and Q of a parallel circuit.
4. Verification of Thevenin's theorem
5. Verification of Norton's theorem
6. Verification of Superposition theorem.
7. Verification of maximum Power transfer theorem.
8. Power factor correction.
9. Measurement of time constant of an RC circuit
10. Measurement of power in three phase Circuits using two watt meter method.

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

22EEE33.1	Solve complex electric circuits using basic concepts of network theory.
22EEE33.2	Solve complex electric circuits using network theorems.
22EEE33.3	Analyse the resonance and transient behaviour of electric circuit.

22EEE33.4	Analyze electric circuit using Laplace transformation.
22EEE33.5	Demonstrate the use of two port network parameters.
22EEE33.6	Simulate electric circuit using modern software tools.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Engineering Circuit Analysis	William H Hayt et al	McGraw Hill	8th Edition, 2014.
2	Network Analysis	M.E.Vanvalkenburg	Pearson	3rd Edition, 2014
3	Fundamentals of Electric Circuits	Charles K Alexander Matthew N O Sadiku	McGraw Hill	3rd Edition, 2013
Reference Books				
1	Engineering Circuit Analysis	J David Irwin et al	Wiley India	10th Edition, 2014
2	Electric Circuits	Mahmood Nahvi	McGrawHill	5th Edition, 2009
3	Introduction to Electric Circuits	A. Richard C Dorf and James A Svoboda	Wiley	9th Edition, 2015

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/108/105/108105159/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22EEE33.1	0	0	0	0	2	0	0	0	0	0	0	0	0	0
22EEE33.2	0	0	0	0	3	0	0	0	0	0	0	0	0	0
22EEE33.3	0	0	0	0	0	0	0	0	0	1	0	0	0	0
22EEE33.4	0	1	0	0	0	0	0	0	0	2	0	0	0	0
22EEE33.5	0	2	0	0	0	0	0	0	0	0	0	0	0	0
22EEE33.6	0	0	0	0	0	0	0	0	0	0	0	0	3	0

1: Low 2: Medium 3: High

Transformers and Generators			
Course Code	**22EEE34**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Hours	03
Total Hours	40 Hours	Credits	03

Course Learning Objectives: The objective of the course is to

- Understand the concepts of transformers and their analysis.
- Suggest a suitable three phase transformer connection for a particular operation.
- Understand the concepts of generator and to evaluate their performance.
- Explain the requirement for the parallel operation of transformers and synchronous generators.

Module-1 Single & Three Phase Transformers **8 hours**

Operation of practical transformer under no-load and on-load with phasor diagrams. Open circuit and Short circuit tests, calculation of equivalent circuit parameters and predetermination of efficiency-commercial and all-day efficiency. Voltage regulation and its significance.

Introduction of Three-phase Transformers**,** Constructional features of three-phase transformers. Choice betweensingle unit three-phase transformer and a bank of three single-phase transformers. Transformer connection for three phase operation– star/star, star/delta and V/V, comparative features. Phase conversion-Scott connection for three-phase to two-phase conversion. Labeling of three-phase transformer terminals

Self-Study: Three-Winding Transformers & Cooling of Transformers: Three-winding transformers. Cooling of transformers.

Module-2 Test on Transformers & Autotransformers **8 hours**

Polarity test, Sumpner's test, separation of hysteresis and eddy current losses, Necessity of Parallel operation, conditions for parallel operation– Singlephase and three phase. Load sharing in case of similar and dissimilar transformers.

Introduction to autotransformer-copper economy.

Self-Study: Tap changing transformers: On load tap changing transformers.

Module-3 DC & Synchronous Generators **8 hours**

Armature reaction, Commutation and associated problems related to DC generators.

Armature windings, winding factors, e.m.f equation. Harmonics–causes, reduction and elimination. Synchronous reactance, Equivalent circuit related to synchronous generators.

Module-4 Analysis of Synchronous Generators **8 hours**

Alternator on load. Excitation control for constant terminal voltage. Voltage regulation. Open circuit and short circuit characteristics, Assessment of reactance-short circuit ratio, synchronous reactance, Voltage regulation by EMF, MMF and ZPF.

Module-5 Performance of Synchronous Generators **8 hours**

Effects of saliency, Parallel operation of salient pole synchronous generators and load sharing. Methods of Synchronization, Synchronizing power, Determination of X_d & X_q – slip test

Power angle characteristic (power angle equation for salient and non-salient pole), Capability curve for large turbo generators. Hunting and damper windings.

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

22EEE34.1	Design a solution using transformers for distribution substations.
22EEE34.2	Design a solution to install a three phase Alternator for a low power hydel generating station.
22EEE34.3	Analyze the performance parameters of transformers to evaluate the safety and environmental constraints near distribution substations.
22EEE34.4	Analyze the performance parameters of generators to evaluate the safety and environmental constraints near low power hydel generating station.

22EEE34.5	Demonstrate knowledge of transformers and generator operation, working in a team for commissioning /maintenance of low power hydel generating station.
22EEE34.6	Develop entrepreneurial skills in commissioning/maintenance of transformers and generators in low power hydel generating station.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Electric Machines	D. P. Kothari, et al	McGraw Hill	4th Edition, 2011
2	Principals of Electrical Machines	V.K Mehta, Rohit Mehta	S Chand	2nd Edition, 2009
Reference Books				
1	Electric Machines	Ashfaq Hussain	Dhanpat Rai & Co	2nd Edition, 2005
2	Electrical Machinery	Dr. P.S. Bhimbra	Khanna Publications	7th Edition, 2007
3	Theory and Performance of Electrical Machines	J.B. Gupta	S.K. Kataria and sons-New Delhi	15th Edition 2015

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/108105017 (Electrical Machines -I, IIT Kharagpur)
- https://nptel.ac.in/courses/108106072 (Electrical Machines II, IIT Madras)

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22EEE34.1	0	0	2	0	0	0	0	0	0	0	0	0	0	0
22EEE34.2	0	0	1	0	0	0	0	0	0	0	0	0	0	0
22EEE34.3	0	0	0	0	0	2	0	0	0	0	0	0	0	0
22EEE34.4	0	0	0	0	0	1	0	0	0	0	0	0	0	0
22EEE34.5	0	0	0	0	0	0	0	0	0	0	2	0	0	0
22EEE34.6	0	0	0	0	0	0	0	0	0	0	0	0	0	2

1: Low 2: Medium 3: High

Electric Power Generation and Economics			
Course Code	**22EEE351**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Hours	03
Total Hours	40 Hours	Credits	03

Course Learning Objectives: The objective of the course is to

- Understand the basics of hydroelectric power plant, merits and demerits of hydroelectric power plants, site selection, arrangement and elements of hydroelectric plant.
- Understand the working, site selection and arrangement of Steam, Diesel and Gas Power Plants.
- Understand the working, site selection and arrangement of Nuclear Power Plants.
- Understand importance of different equipments in substation, Interconnection of power stations and different types of grounding.
- Understand the economics of power generation.

Module-1 Hydroelectric Power Plants **8 hours**

Hydrology, run off and stream flow, hydrograph, flow duration curve, Mass curve, reservoir capacity, dam storage. Hydrological cycle, merits and demerits of hydroelectric power plants, Selection of site. General arrangement of hydel plant, elements of the plant, Classification of the plants based on water flow regulation, water head and type of load the plant has to supply. Water turbines – Pelton wheel, Francis, Kaplan and propeller turbines. Characteristic of water turbines Governing of turbines, selection of water turbines. Underground, small hydro and pumped storage plants. Choice of size and number of units, plant layout and auxiliaries

Module-2 Steam, Diesel, Gas Turbine Power Plants **8 hours**

Introduction to Steam Power Plant, Efficiency of steam plants, Merits and demerits of plants, selection of site. Working of steam plant, Power plant equipment and layout, Steam turbines, Fuels and fuel handling, Fuel combustion and combustion equipment, Coal burners, Fluidized bed combustion, Combustion control, Ash handling, Dust collection, Draught systems, Feed water, Steam power plant controls, plant auxiliaries.

Introduction to Diesel Power Plant, Merits and demerits, selection of site, elements of diesel power plant, applications.

Introduction to Gas Turbine Power Plant, Merits and demerits, selection of site, Fuels for gas turbines, Elements of simple gas turbine power plant, Methods of improving thermal efficiency of a simple gas power plant, Closed cycle gas turbine power plants. Comparison of gas power plant with steam and diesel power plants.

Module-3 Nuclear Power Plants **8 hours**

Introduction, Economics of nuclear plants, Merits and demerits, selection of site, Nuclear reaction, Nuclear fission process, Nuclear chain reaction, Nuclear energy, Nuclear fuels, Nuclear plant and layout, Nuclear reactor and its control, Classification of reactors, power reactors in use, Effects of nuclear plants, Disposal of nuclear waste and effluent, shielding.

Module-4 Substations & Grounding **8 hours**

Introduction to Substation equipment; Transformers, High Voltage Fuses, High Voltage Circuit Breakers and Protective Relaying, High Voltage Disconnect Switches, Lightning Arresters, High Voltage Insulators and Conductors, Voltage Regulators, Storage Batteries, Reactors, Capacitors, Measuring Instruments, and power line carrier communication equipment. Classification of substations – indoor and outdoor, Selection of site for substation, Bus-bar arrangement schemes and single line diagrams of substations. Interconnection of power stations. Introduction to gas insulated substation, Advantages and economics of Gas insulated substation.

Introduction to Grounding, Difference between grounded and ungrounded system. System grounding – ungrounded, solid grounding, resistance grounding, reactance grounding, resonant grounding. Earthing transformer. Neutral grounding and neutral grounding transformer.

Module-5 Economics of power generation	**8 hours**
Introduction, Effect of variable load on power system, classification of costs, Cost analysis. Interest and Depreciation, Methods of determination of depreciation, Economics of Power generation, different terms considered for power plants and their significance, load sharing. Choice of size and number of generating plants. Tariffs, objective, factors affecting the tariff, types. Types of consumers and their tariff. Power factor, disadvantages, causes, methods of improving power factor, Advantages of improved power factor, economics of power factor improvement and comparison of methods of improving the power factor. Choice of equipment.	

Course Outcomes: At the end of the course the student will be able to:	
22EEE351.1	Explain the basics of hydroelectric power plant, merits and demerits of hydroelectric power plants, site selection, arrangement and elements of hydroelectric plant.
22EEE351.2	Explain the working, site selection and arrangement of Steam, Diesel and Gas Power Plants.
22EEE351.3	Explain the working, site selection and arrangement of Nuclear Power Plants.
22EEE351.4	Explain the importance of different equipment's in substation, Interconnection of power stations
22EEE351.5	Explain the importance of different types of grounding.
22EEE351.6	Explain the economics of power generation

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Power Plant Engineering	P.K. Nag	Mc Graw Hill,	4th Edition, 2014
2	Generation of Electrical Energy	B. R. Gupta	S. Chand	2015
3	Electrical power Generation, Transmission and Distribution	S.N. Singh	Prentice Hall India	2nd Edition, 2009
Reference Books				
1	A Course in Power Systems	J.B. Gupta	Katson	2008
2	Electrical Power Distribution Systems	V. Kamaraju	McGrawHill	1st Edition, 2009
3	Electrical Distribution Engineering	Anthony J. Pansini	CRC Press	3rd Edition, 2006

Web links and Video Lectures (e-Resources):

- https://archive.nptel.ac.in/courses/108/102/108102047/
- https://onlinecourses.nptel.ac.in/noc23_ee128/preview

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22EEE351.1	3	2	0	0	0	0	0	0	0	0	0	0	0	0
22EEE351.2	3	2	0	0	0	0	0	0	0	0	0	0	0	0
22EEE351.3	2	3	0	0	0	0	0	0	0	0	0	0	0	0
22EEE351.4	1	1	0	0	0	0	0	0	0	0	0	0	0	0
22EEE351.5	3	2	0	0	0	0	0	0	0	0	0	0	0	0
22EEE351.6	0	3	0	0	0	0	0	0	0	0	0	0	0	0

1: Low 2: Medium 3: High

Electrical Measurement and Instrumentation			
Course Code	**22EEE352**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Hours	03
Total Hours	40 Hours	Credits	03

Course Learning Objectives: The objective of the course is

- To measure resistance, inductance and capacitance using different bridges and determine earth resistance.
- To study the construction and working of various meters used for measurement.
- To study the adjustments, calibration & errors in energy meters and methods of extending the range of instruments.

Module-1 Measurement of Resistance, Inductance & Capacitance	**8 hours**
Wheatstone's bridge, sensitivity, limitations. Kelvin's double bridge. Earth resistance measurement by fall of potential method and by using Megger. Sources and detectors, Maxwell's inductance and capacitance bridge, Hay's bridge, Schering bridge.	
Module-2 Measurement of Power, Energy, Frequency	**8 hours**
Introduction to Measurement of Power, Energy, Power Factor and Frequency, Errors and minimization, UPF and LPF wattmeters. Measurement of real and reactive power in 3 phase circuits. Errors, adjustments and calibration of single phase energy meter. Construction and operation of single-phase dynamometer type power factor meter. Weston frequency meter and phase sequence indicator.	
Module-3 Extension of Instrument ranges and Magnetic Instruments	**8 hours**
Desirable features of ammeters and voltmeters. Shunts and multipliers. Instrument transformers, Desirable characterises, Errors of CT and PT, Turns compensation. Introduction to Magnetic measurements, measurement of flux, flux density, magnetizing force and leakage factor.	
Module-4 Electronic & Digital Instruments	**8 hours**
Essentials of electronic instruments, Advantages of electronic instruments, True rms reading voltmeter, Electronic multimeters, Digital voltmeters (DVM) – Ramp type DVM, Integrating type DVM and Successive - approximation DVM, Q meter. Principle of working of electronic energy meter (with block diagram).	
Module-5 Display & Recording Devices	**8 hours**
Character formats, segment displays, Cathode ray tubes, Light emitting diodes, Liquid crystal displays, Incandescent, Fluorescent, Liquid vapour and Visual displays. Strip chart recorders, Galvanometer recorders, Bridge type recorders, LVDT type recorders, Digital tape recording, Ultraviolet recorders, Electro Cardio Graph (ECG)	

Course Outcomes: At the end of the course the student will be able to:	
22EEE352.1	Apply the knowledge of physics and mathematics to discuss methods on measuring resistance inductance and capacitance
22EEE352.2	Apply the knowledge of basic concepts of electric circuits to discuss methods of measuring power and energy
22EEE352.3	Analyze the operations of CTs and PTs adhering to the norms of engineering practice set by IEEE and BIS
22EEE352.4	Demonstrate the use of measuring instruments to manage multidisciplinary projects.
22EEE352.5	Demonstrate the knowledge of recording instruments and display devices to manage multidisciplinary projects

22EEE352.6	Interpret the knowledge on meters and indicators to develop entrepreneurial skills in the domain of industrial instrumentation

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Electrical and electronic Measurements and Instrumentation	A.K. Sawhney	Dhanpat Rai and Co	10th Edition 2015
2	A Course in Electronics and Electrical Measurements and Instrumentation,	J. B. Gupta	Katson Books	14th Edition 2014
Reference Books				
1	Electrical and electronic Measurements and Instrumentation,	R.K. Rajput	S Chand	5th Edition, 2012
2	Electrical Measuring Instruments and Measurements	S.C. Bhargava	BS Publications	2nd Edition 2013
3	3 Modern Electronic Instrumentation and Measuring Techniques	Cooper D and A.D. Heifrick	Pearson	First Edition, 2015

Web links and Video Lectures (e-Resources):

- https://archive.nptel.ac.in/courses/108/105/108105153/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22EEE352.1	2	0	0	0	1	0	0	0	0	0	0	0	0	0
22EEE352.2	0	1	0	0	0	0	0	0	0	0	0	3	0	0
22EEE352.3	0	0	0	0	0	0	0	2	0	0	0	0	0	0
22EEE352.4	0	0	0	0	0	0	0	0	0	0	2	0	1	0
22EEE352.5	0	0	0	2	0	0	0	0	0	0	2	0	0	0
22EEE352.6	0	0	0	0	0	0	0	0	0	1	0	0	0	2

1: Low 2: Medium 3: High

Semiconductor Devices			
Course Code	**22EEE353**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Hours	03
Total Hours	40 Hours	Credits	03

Course Learning Objectives: The objective of the course is to

- Understand the basics of semiconductor device physics.
- Understand the construction and working principle of BJT,JFET and MOSFETs
- Understand the structure and features of special semiconductor devices.
- Understand the fabrication process of semiconductor devices.

Module-1 Fabrication of PN junctions	**8 hours**
Thermal oxidation, diffusion, rapid thermal processing, ion implantation, chemical vapor deposition, photolithography, etching, metallization.	
Module-2 Semiconductor diode	**8 hours**
Formation of PN junction, depletion region, barrier potential, reverse breakdowns, PN junction as diode, symbol, biasing modes, V-I characteristics, reverse saturation current, diode current equation, effect of temperature on diode current, ideal diode, basic diode ratings.	
Module-3 Bipolar Junction Transistors	**8 hours**
Definition, types of BJT, symbols, BJT structure and operation, Modes of operation, BJT Biasing-DC Load line and Bias point, comparison of CB, CE and CC modes, Applications, thermal runaway, role of heat sinks.	
Module-4 Field Effect Transistor	**8 hours**
Junction Field Effect Transistor, JFET operation & Characteristics, MOSFETs, Basic MOSFET operation & structure, types of MOSFET, current-voltage characteristics.	
Module-5 Special semiconductor devices	**8 hours**
Physical structure, Working principle, characteristic curves, symbol and Applications of UJT, SCR, DIAC , TRIAC and IGBT, Features of varactor diode, tunnel diode, Gunn diode, PIN diode, and Schottky diode.	

Course Outcomes: At the end of the course the student will be able to:	
22EEE353.1	Understand the fabrication process of semiconductor devices
22EEE353.2	Explain the structure and operation of a Semiconductor Diode
22EEE353.3	Explain the structure and operation of BJTs
22EEE353.4	Explain the structure and operation of JFETs and MOSFETs
22EEE353.5	Understand the principles and features of special semiconductor devices
22EEE353.6	Write effective report after conducting experiments on characteristics of semiconductor diode and BJT

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Semiconductor Devices	Kanaan Kano	Prentice Hall India	2009
2	Semiconductor Physics & Devices	Donald A Neamen, Dhrubes Biswas	Mc Graw Hill Education	4th Edition, 2012

3	Solid State Electronic Devices	Ben. G. Streetman, Sanjay Kumar Banergee	Pearson Education	7th Edition 2016
Reference Books				
1	Microelectronic Circuits	A.S. Sedra, K.C. Smith	Oxford University Press	6th Edition, 2004
2	Fundamentals of Microelectronics	Behzad Razavi	Prentice Hall India	1999
3	Physics of Semiconductor Devices	S.M.Sze, Kwok K. Ng	Wiley	3rd Edition, 2018
4	Introduction to Semiconductor Devices – For Computing and Telecommunications Applications	Kevin F. Brernnan	Cambridge University Press	First South Asian Edition, 2005

Web links and Video Lectures (e-Resources):

- https://archive.nptel.ac.in/courses/108/106/108106181/
- https://nptel.ac.in/courses/122106025/2
- https://nptel.ac.in/courses/117106091/
- https://www.mooc-list.com/tags/electronic-devices
- https://www.edx.org/course/electronic-materials-and-devices-2

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22EEE353.1	2	0	0	0	0	0	0	0	0	2	0	0	1	0
22EEE353.2	2	2	1	0	2	0	0	0	1	2	0	0	1	0
22EEE353.3	2	2	1	0	2	0	0	0	1	0	0	0	1	0
22EEE353.4	2	2	1	0	2	0	0	0	1	0	0	0	1	0
22EEE353.5	2	0	0	0	0	0	0	0	0	2	0	1	0	0
22EEE353.6	0	0	0	1	1	0	0	0	0	0	0	0	1	0

1: Low 2: Medium 3: High

Object Oriented Programming using C++			
Course Code	**22EEE354**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Hours	03
Total Hours	40 Hours	Credits	03

Course Learning Objectives: The objective of the course is to

- Define Encapsulation, Inheritance and Polymorphism.
- Solve the problem with object oriented approach.
- Analyze the problem statement and build object oriented system model.
- Describe the characters and behavior of the objects that comprise a system.
- Explain function overloading, operator overloading and virtual functions.
- Discuss the advantages of object oriented programming over procedure oriented programming.

Module-1 Beginning with C++	**8 hours**
What is C++?, Applications and structure of C++ program, Different Data types, Variables, Different Operators, expressions, operator overloading and control structures in C++ .	
Module-2 Functions, Classes and Objects	**8 hours**
Functions, Inline function, function overloading, friend and virtual functions, Specifying a class, C++ program with a class, arrays within a class, memory allocation to objects, array of objects, members, pointers to members and member functions.	
Module-3 Constructors, Destructors and Operator Overloading	**8 hours**
Constructors, Multiple constructors in a class, Copy constructor, Dynamic constructor, Destructors, Defining operator overloading, Overloading Unary and binary operators, Manipulation of strings using operators.	
Module-4 Inheritance, Pointers, Virtual Functions, Polymorphism	**8 hours**
Derived Classes, Single, multilevel, multiple inheritance, Pointers to objects and derived classes, this pointer, Virtual and pure virtual functions	
Module-5 Streams and Working with Files	**8 hours**
C++ streams and stream classes, formatted and unformatted I/O operations, Output with manipulators, Classes for file stream operations, opening and closing a file, EOF	

Course Outcomes: At the end of the course the student will be able to:	
22EEE354.1	Explain the basics of Object-Oriented Programming concepts.
22EEE354.2	Apply the object initialization and destroy concept using constructors and destructors.
22EEE354.3	Apply the concept of polymorphism to implement compile time polymorphism in programs by using overloading methods and operators.
22EEE354.4	Utilize the concept of inheritance to reduce the length of code and evaluate the usefulness.
22EEE354.5	Apply the concept of run time polymorphism by using virtual functions, overriding functions and abstract class in programs.
22EEE354.6	Utilize I/O operations and file streams in programs.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Object Oriented Programming with C++	E.Balaguruswamy	Tata McGraw Hill India	6th Edition, 2013

Reference Books				
1	Object Oriented Programming with C++	Robert Lafore	Galgotia publication	2010
2	Object Oriented Programming with C++	Sourav Sahay	Oxford University	2006

Web links and Video Lectures (e-Resources):

- NPTELHRD video 27 - OOAD – I (https://youtu.be/qiyMyyYqZVY)
- NPTELHRD video 28 - OOAD – II (https://youtu.be/YpOE5VNEJ6c)
- NPTELHRD video Lecture - 36 Object Oriented Databases (https://youtu.be/meWQLWq7QSE)
- NPTELHRD video Lecture -37 Object Oriented Databases II (https://youtu.be/ZY2-YGjJ2ZE)

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22EEE354.1	3	1	1	1	1	0	0	0	0	0	0	0	1	0
22EEE354.2	3	2	1	1	1	0	0	0	0	0	0	0	1	0
22EEE354.3	3	2	1	1	1	0	0	0	0	0	0	0	1	0
22EEE354.4	3	2	1	1	1	0	0	0	0	0	0	0	1	0
22EEE354.5	3	2	1	1	1	0	0	0	0	0	0	0	1	0
22EEE354.6	3	2	1	1	1	0	0	0	0	0	0	0	1	0

1: Low 2: Medium 3: High

Transformers and Generators Laboratory			
Course Code	**22EEE36L**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Practical	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	0:0:2	SEE Hours	03
Total Hours		Credits	01

Course Learning Objectives: The objective of the course is to

- Conducting of different tests on transformers and synchronous machines and evaluation of their performance.
- Verify the parallel operation of two single phase transformers.
- Study the connection of single phase transformers for three phase operation and phase conversion.
- Study of synchronous generator connected to infinite bus.

Sl. No	Experiments
1	Open Circuit and Short circuit tests on single phase step up or step down transformer and pre determination of (i) Efficiency and regulation (ii) Calculation of parameters of equivalent circuit.
2	Sumpner's test on similar transformers and determination of combined and individual transformer efficiency.
3	Parallel operation of two dissimilar single-phase transformers of different kVA and determination of load
4	Polarity test and connection of 3 single-phase transformers in star – delta and determination of efficiency and regulation under balanced resistive load.
5	Connection of 3 single-phase transformers in delta – delta and V – V (open delta) connection under load and determination of efficiency and regulation under balanced resistive load.
6	Scott connection with balanced and unbalanced loads.
7	Separation of hysteresis and eddy current losses in single phase transformer.
8	Voltage regulation of an alternator by EMF, MMF and ZPF methods
9	a. Load test on DC Generators. b. Open circuit test on DC generator to calculate the load characteristics.
10	Power angle curve of synchronous generator or Direct load test on three phase synchronous generator to determine efficiency and regulation

Course Outcomes: At the end of the course the student will be able to:	
22EEE36L.1	Design an experimental solution to test the performance parameters of transformers used in distribution substations.
22EEE36L.2	Design an experimental solution to test the performance parameters of three phase Alternator used in low power hydel generating station.
22EEE36L.3	Analyze the performance parameters of transformers from test data to evaluate the safety and environmental constraints near distribution substations.
22EEE36L.4	Analyze the performance parameters of Alternator from test data to evaluate the safety and environmental constraints near low power hydel generating station.
22EEE36L.5	Function effectively as a member of diverse team to demonstrate the knowledge on testing of power transformers and DC Generators.
22EEE36L.6	Function effectively as a member of diverse team to demonstrate the knowledge on testing of Alternators.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Electric Machines	D. P. Kothari, et al	McGraw Hill	4th Edition, 2011
2	Principals of Electrical Machines	V.K Mehta, Rohit Mehta	S Chand	2nd Edition, 2009
Reference Books				
1	Electric Machines	Ashfaq Hussain	Dhanpat Rai & Co	2nd Edition 2005
2	Electrical Machinery	Dr. P.S. Bhimbra	Khanna Publications	7th Edition, 2007.
3	Theory and Performance of Electrical Machines	J.B. Gupta	S.K. Kataria and sons-New Delhi	15th Edition 2015

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/108105017 (Electrical Machines -I, IIT Kharagpur)
- https://nptel.ac.in/courses/108106072 (Electrical Machines II, IIT Madras)

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22EEE36L.1	0	0	3	0	0	0	0	0	0	0	0	0	0	0
22EEE36L.2	0	0	2	0	0	0	0	0	0	0	0	0	0	0
22EEE36L.3	0	0	0	0	0	3	0	0	0	0	0	0	0	0
22EEE36L.4	0	0	0	0	0	2	0	0	0	0	0	0	0	0
22EEE36L.5	0	0	0	0	0	0	0	0	3	0	0	0	0	0
22EEE36L.6	0	0	0	0	0	0	0	0	1	0	0	0	0	0

1: Low 2: Medium 3: High

Universal Human Values- II			
Course Code	**22UHV37**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:0:0)	SEE Marks	50
Credits	**02**	Exam Hours	02

Course Learning Objectives: This introductory course input is intended:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement toward value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Module-1 Introduction to Value Education

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations.

Activities: Sharing about Oneself, Exploring Human Consciousness and Exploring Natural Acceptance. **5 Hours**

Module-2 – Harmony in the Human Being

Understanding Human beings as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

Activities: Exploring Sources of Imagination in the Self, Exploring Harmony of Self with the Body and Exploring the difference of Needs of Self and Body. **5 hours**

Module 3 – Harmony in the Family and Society

Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

Activities: Exploring the Feeling of Trust, Exploring the Feeling of Respect and Exploring the Feeling systems to fulfil Human Goal. **5 hours**

Module-4 – Harmony in the Nature/Existence

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.

Activities: Exploring the Four Orders of Nature and Co-existence in Existence. **5 hours**

Module-5 – Implications of the Holistic Understanding – a Look at Professional Ethics

Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession

Activities: Exploring Ethical Human Conduct**,** Humanistic Models in Education and steps of Transition towards Universal Human Order. **5 hours**

Course Outcomes: At the end of the course the student will be able to:	
22UHV37.1	Practice the method of self-exploration to understand the basic human aspiration.
22UHV37.2	Distinguish between needs of self and body.
22UHV37.3	Evolve a program for self-regulation and health.
22UHV37.4	Differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them.
22UHV37.5	Realize sustainable solutions to the problems in society and nature.
22UHV37.6	Develop competence in professional ethics and strategies for the transition towards a value-based life/profession.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	Excel Books, New Delhi	2nd Revised Edition, 2019
2	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	Excel Books New Delhi	2nd Revised Edition, 2019
Reference Books				
1	Jeevan Vidya: Ek Parichaya	A Nagaraj	Jeevan Vidya Prakashan Amarkantak	1999
2	Human Values	A.N. Tripathi	New Age Intl. Publishers, New Delhi	2004

Additional Resources/Web links/Video Lectures

1. The Story of Stuff (Book).
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
3. Small is Beautiful - E. F Schumacher.
4. Slow is Beautiful - Cecile Andrews
4. Economy of Permanence - J C Kumarappa
5. Bharat Mein Angreji Raj – Pandit Sunderlal
6. Rediscovering India - by Dharampal
7. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
8. India Wins Freedom - Maulana Abdul Kalam Azad
9. Vivekananda - Romain Rolland (English)
10. Gandhi - Romain Rolland (English)
11. UHV-I Teaching material (Presentations, Pre & Post Surveys etc.)
https://fdp-si.aicte-india.org/AicteSipUHV_download.php
12. Details of UHV-II: Universal Human Values – Understanding Harmony and Ethical Human Conduct
https://drive.google.com/file/d/1cznDaqDwKy__EKWmqJLWF94MeY4AXcsU/view?usp=sharing
13. Recorded FDP (Refresher 1 Part 1: Preparing to teach UHV-I in SIP)
https://www.youtube.com/watch?v=kejuD4faDDE&list=PLWDeKF97v9SOjS4RanhaYj4YLiImqm5pj&index=1

14. Resources, including the class notes and presentations
https://drive.google.com/drive/folders/1nh9m5ibEtvMyqekeiexAJtfbdNtmtt6-?usp=sharing

15. Hindi Recording of 5-day UHV FDP
https://www.youtube.com/playlist?list=PLWDeKF97v9SMRfe5PK1HPYnEcrrJOL6K7

16. English Recording of 5-day UHV FDP
https://www.youtube.com/playlist?list=PLWDeKF97v9SP7wSlapZcQRrT7OH0ZlGC4

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22UHV37.1						3		2						
22UHV37.2						2			3					
22UHV37.3						2		3						
22UHV37.4							3							
22UHV37.5			3				2							
22UHV37.6								3				2		

1: Low 2: Medium 3: High

Biology for Engineers			
Course Code	**22BFE37**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:0:0)	SEE Marks	50
Credits	**02**	Exam Hours	02

Course Learning Objectives:

1. To bring awareness of biological concepts to engineering students
2. To introduce the building blocks of life and their complexity
3. To encourage interdisciplinary studies and projects
4. To appreciate the discoveries that mimic nature and its working
5. To inculcate nature-inspired design and operational principles

Module-1 **5 Hours**

Basic Cell Biology: Introduction to Biology, The cell: the basic unit of life, Expression of genetic information-protein structure and function, Cell metabolism; Cells respond to their external environments, Cells grow and reproduce, Cellular differentiation.

Module-2 **5 Hours**

Biochemistry and Molecular Aspects of Life: Biodiversity-Chemical bonds in Biochemistry; Biochemistry and Human biology, Protein synthesis -DNA; RNA, Transcription and translation factors play key roles in protein synthesis, Differences between eukaryotic and prokaryotic protein synthesis, Stem cells and their applications.

Module-3 **5 Hours**

Bioinspired Engineering based on human physiology: Circulatory system (artificial heart, pacemaker, stents), Nervous system (Artificial neural network), Respiratory system, sensory system (electronic nose, electronic tongue), Visual and auditory prosthesis (Bionic eye and cochlear implant).

Module-4 **5 Hours**

Relevance of Biology as an interdisciplinary approach: Biological observation that led to major discoveries, Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf), Bird flying (aircraft), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro).

Module-5 **5 Hours**

Bioinspired Algorithms and Applications: Genetic algorithm, Gene expression modelling, Parallel Genetic Programming: Methodology, History, and Application to Real-Life Problems, Dynamic Updating DNA Computing Algorithms, Bee-Hive: New Ideas for Developing Routing Algorithms Inspired by Honey Bee Behaviour.

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

22BFE37.1	Discuss how the cell forms the basic building block of life
22BFE37.2	Distinguish between transcription and translation
22BFE37.3	Describe the role played by proteins within the cell
22BFE37.4	Analyze the role of bioinspired design in novel applications
22BFE37.5	Apply bioinspired design principles to other domains
22BFE37.6	Implement a simple genetic algorithm

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Text Books				
1	Biology for Engineers	Thyagarajan.S., Selvamurugan. N., Rajesh.MP, Nazeer RA, Richard W. Thilagaraj, Barathi.S., and Jaganthan.M.K	Tata McGraw Hill	2012
2	Molecular Biology	Robert Weaver	McGraw-Hill	5th Edition, 2012
Reference books				
1	Lewin's Genes XII	Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick	Jones and Bartlett Learning	2017
2	Bioinspired Engineering	Jenkins, C.H.	Momentum Press	2012
3	Bio mimetics: Nature-Based Innovation	Yoseph Bar-Cohen	CRC Press	1st Edition, 2016
4	A Practical Guide to Bio-inspired Design	Hashemi Farzaneh, Helena, Lindemann, Udo	Springer	2019

Web links/Video Lectures/MOOCs

1. https://books.google.co.in/books?id=-2LNBQAAQBAJ&printsec=frontcover#v=onepage&q&f=false
2. https://www.aminotes.com/2017/02/biology-for-engineers-module-1-cocepts.html

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22BFE37.1	2					1								
22BFE37.2		1				1								
22BFE37.3	2					2								
22BFE37.4		2										2		
22BFE37.5	2											2		
22BFE37.6		2										2		

1: Low 2: Medium 3: High

IOT ENABLED PROTOTYPING			
Course Code:	**22IEP38**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Credits	**01**	Exam Hours	02

Course Learning Objectives:

1. Understand the IoT concepts such as sensing, actuation, and communication.
2. Development of Internet of Things (IoT) prototypes—including devices for sensing, actuation, processing, and communication and Protocols
3. Understand the significance of Project Management and the different techniques of planning
4. To introduce fundamental aspects of intellectual property rights, Govt. policies on IPR, and patentability search techniques.

Module 1

Internet of Things – Hardware / System Design

Introduction to IoT fundamentals, Introduction to sensors, Difference between analog and Digital sensors, Interfacing Temperature, Light and Humidity sensor with Arduino, Interfacing Motors with Arduino, A simple program to control actuator based on the analog sensor.

6 Hours

Module 2

Internet of Things

Networking in IoT:

Introduction to wireless communication, Wifi Module ESP8266 interface with Arduino, Machine to Machine (M2M) communication using WiFi module. A simple demonstration of sensing temperature from one device and control actuator on a second device (M2M)

IoT in Web/ Cloud Platform:

Introduction to a web server - XAMPP(windows), A simple interactive web page using HTML5, Bootstrap (or CSS), and Javascript. Interfacing ESP8266 with webserver, ThingSpeak API, and MQTT protocol, A simple project to demonstrate the status of two IoT devices communicating with a Web Server. **6 Hours**

Module 3

Project Planning and Management

Project initiation, Project charter, Project planning, and implementation, Scheduling and costing, Project monitoring and control, Project closure and reports.

6 Hours

Module 4

Intellectual Property Rights

Introduction and the need for intellectual property right (IPR) – Kinds of Intellectual Property Rights, Elements of Patentability: Novelty, Non-Obviousness (Inventive Steps), Industrial Application, Non - Patentable Subject Matter, Registration Procedure, Patentability search methods, Patent landscape, Freedom-to-market, National IPR Policy, Govt. initiatives and scheme in promoting IPR. **6 Hours**

Course Project

Develop IoT-based prototypes (solutions) to solve any industrial or societal problems. The prototype building is teamwork of 3-5 students. The goals should be clearly defined and should use robust technologies and rigorous testing. **6 Hours**

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

22IEP38.1	Analyze the basics of IoT and protocols.
22IEP38.2	Develop IoT-based prototypes to solve industrial and societal problems.
22IEP38.3	Apply appropriate approaches to plan a new project and develop a project schedule.

22IEP38.4	Discuss the ethical aspects in IPR, Govt. policies on IPR, and conducting patentability searches.
22IEP38.5	Inculcate the teamwork and communication skills.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books				
1	Internet of Things (A Hands-on-Approach)	Vijay Madisetti and Arshdeep Bahga	Orient Blackswan Private Limited	1st Edition, 2015
2	Fundamentals of Intellectual Property	Dr. Kalyan C. Kankanala	Asia Law House	1st Edition, 2012
3	Project Management Absolute Beginner's Guide	Greg Horine	Pearson Education (US)	4th Edition, 2017

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22IEP38.1			**2**		**2**				**2**	**2**				
22IEP38.2			**2**								**3**			
22IEP38.3					**2**						**2**			
22IEP38.4								**1**		**2**				
22IEP38.5								**1**	**2**	**2**				

1: Low 2: Medium 3: High

Industry Oriented Training - Business Etiquettes			
Course Code	**22ITB39A**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	-
Credits	-	Exam Hours	02

Course Learning Objectives:

6. Know the components of self-introduction
7. Develop a resume with the inclusion of core competencies
8. Involve and contribute to group discussions
9. Develop effective communication to succeed in the professional career
10. Know the etiquettes of digital communication

Module-1

Self-Introduction &Essentials of grooming

Self-Introduction: Learn the secret to introducing Yourself, Things to avoid when introducing yourself. Activity: Video record the self-introduction. **Essentials of grooming:** Creating the first impression, what does the well-dressed man wear? What does the well-dressed woman wear? Personal hygiene and habits. **4 Hours**

Module-2

Resume Writing

Purpose, Identifying Relevant Competencies, Understanding Applicant Tracking Systems, Lists of Competencies, Writing Accomplishment/ Objective Statements, Finding the Right Words- Action verbs, The Most Popular Resume Format, Other Popular Resume Formats, Do's and Don'ts. Activity: Students have to submit a copy of their resume. **4 Hours**

Module-3

Group Discussion

Types, process, Evaluation criteria, Do's and Don'ts Activity: Group discussions have to be held during the training sessions. **4 Hours**

Module-4

Communicate effectively

Build a Story, Just a Minute, Group Activities, Team building activities, Role Play, Presentation Skills. **4 Hours**

Module-5

Digital right and wrong

Virtual Communication: Agenda, being prepared, Dressing appropriately, background, Use Microphone and camera the right way, restraining from off tasks during virtual meetings, protecting confidential data during online presentations, time management. **4 Hours**

Course Outcomes: At the end of the course the student will be able to:	
22ITB39A.1	Articulate the essential components required for self-introduction in any business or a networking event and also recognize the need to dress appropriately for a successful career in the corporate
22ITB39A.2	Develop a resume inclusive of core competencies, and action verbs which are compatible with Applicant Tracking Systems
22ITB39A.3	Demonstrate the types, process and evaluation process of Group Discussion and carry out effective group discussions
22ITB39A.4	Develop skills required for effective communication
22ITB39A.5	Associate and be accustomed to the etiquette to be followed during online meetings

Sources

1. English for Common Interactions in the Workplace: Basic Level: Coursera: https://www.coursera.org/learn/english-common-interactions-workplace-basic-level
2. Personal Communication-Introduce Yourself With Confidence: https://www.udemy.com/course/how-to-introduce-yourself/
3. Professionalism, Grooming and Etiquette: https://www.edx.org/course/professionalism-grooming-and-etiquette
4. How to Write a Resume: https://www.coursera.org/learn/how-to-write-a-resume#syllabus
5. Group Discussion Strategies: https://www.udemy.com/course/group-discussion-strategies/
6. Communication Strategies for a Virtual Age: https://www.coursera.org/learn/communication-strategies-virtual-age#syllabus

References

1. https://simplifytraining.com/course/personal-hygiene-and-good-grooming/
2. https://www.udemy.com/course/group-discussion-strategies/
3. https://www.educba.com/course/group-discussion/
4. https://getrafiki.ai/meetings/rules-of-virtual-meeting-etiquette-every-sales-professional-should-follow/
5. https://thedigitalworkplace.com/articles/online-meeting-etiquette-for-attendees/
6. https://rigorousthemes.com/blog/virtual-meeting-etiquette-guidelines-ground-rules/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22ITB39A.1									2	3		1		
22ITB39A.2										3		1		
22ITB39A.3									2	3	1	1		
22ITB39A.4									2	3	1	1		
22ITB39A.5									2	3	1	1		

1: Low 2: Medium 3: High

Industry Oriented Training - Computing Skills			
Course Code	**22ITC39B**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	-
Credits	-	Exam Hours	02

Course Learning Objectives:

1. Use logical conditions for problem-solving and also introduce the concepts of arrays
2. Know functions, function calls, and parameter passing
3. Introduce algorithms and appreciate their importance in problem-solving
4. Introduce the core concepts of OOP's
5. Differentiate between front-end & back-end development and recognize the use of database management

Module-1

Introduction to computing constructs

Logical conditions: For Loops, Nested For Loops, While Loops, Do-While Loops, Nesting and Boxes, and combine/negate several logical conditions using logic operations AND, OR, and NOT.

Arrays & strings: Create arrays of characters (strings), use the null terminator, and manipulate strings. **4 Hours**

Module-2

Functions & Pointers

Introduction to Functions, Returning Data From a Function, Passing Data Into a Function, Getting Valid User Input, Changing Parameter Values, Pointer Basics, Changing the Pointed to Value, Walking an Array with Pointers, Dynamic Memory Allocation, Getting More Memory, Pointers to Structure. **4 Hours**

Module-3

Algorithm analysis

Introduction to Algorithm Analysis, Big-O, Big-O Examples, Dynamic Array Operations, Bubble Sort, Selection Sort, Insertion Sort, Recursion, Recursive Binary Search, Merge Sort. **4 Hours**

Module-4

Object-oriented programming

Designing for Object-Oriented Programming, Core Concepts of OO Programming: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, procedural and object-oriented programming paradigm. **4 Hours**

Module-5

Frontend and backend development

UI, Database management: DBMS overview, Relational Data Model and the CREATE TABLE Statement, Basic Query Formulation with SQL. **4 Hours**

Course Outcomes: At the end of the course the student will be able to:	
22ITC39B.1	Illustrate the use of logical conditions, declare and manipulate data into arrays
22ITC39B.2	Implement functions, function calls, and parameter passing
22ITC39B.3	Design, implement, and evaluate an algorithm to meet desired needs
22ITC39B.4	Describe the core concepts of OOP's
22ITC39B.5	Recognize the concepts of front-end development and database management

Sources
1. Computational Thinking with Beginning C Programming Specialization: https://www.coursera.org/learn/simulation-algorithm-analysis-pointers?specialization=computational-thinking-c-programming#syllabus 2. Simulation, Algorithm Analysis, and Pointers: https://www.coursera.org/lecture/simulation-algorithm-analysis-pointers/big-o-examples-pdCan 3. Programming Fundamentals: https://www.coursera.org/learn/programming-fundamentals?specialization=c-programming#syllabus 4. Object-Oriented Programming Concepts: https://www.coursera.org/learn/concepts-of-object-oriented-programming#syllabus 5. Introduction to Back-End Development: https://www.coursera.org/learn/introduction-to-back-end-development

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22ITC39B.1	2	1	1											
22ITC39B.2	2	1	1											
22ITC39B.3	1	1	2											
22ITC39B.4	2		1											
22ITC39B.5	2	1	1											

1: Low 2: Medium 3: High

IV Semester

Transmission and Distribution			
Course Code	**22EEE41**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	2:2:0	SEE Hours	03
Total Hours	40 Hours	Credits	03

Course Learning Objectives: The objective of the course is to

- Articulate the importance of HVAC, EHVAC, UHVAC and HVDC transmission.
- Design insulators for a given voltage level.
- Calculate the parameters of the transmission line for different configurations and assess the performance of the line.
- Study underground cables for power transmission.
- Evaluate different types of distribution systems.
- Identify the distribution systems based on quality and reliability.

Module-1 : Power System and Transmission Lines **8 hours**

Generation, transmission and distribution. Advantages of higher voltage transmission: HVAC, EHVAC, UHVAC and HVDC. Interconnection. Feeders, distributors and service mains.

A brief introduction to types of supporting structures and line conductors- Conventional conductors; Aluminium Conductor steel reinforced (ACSR), All – aluminium alloy conductor (AAAC) and All –aluminium conductor (AAC). High temperature conductors.

Bundle conductor and its advantages. Importance of sag, Sag calculation – supports at same and different levels, effect of wind and ice. Line vibration and vibration dampers. Overhead line protection against lightening; ground wires.

A brief introduction on types of insulators, material used- porcelain, toughened glass and polymer (composite). Potential distribution over a string of suspension insulators. String efficiency, Methods of increasing string efficiency. Arcing horns

Module-2: Transmission Line Parameters **8 hours**

Introduction to line parameters- resistance, inductance and capacitance. Inductance of composite – conductors, geometric mean radius (GMR) and geometric mean distance (GMD). Advantages of single circuit and double circuit lines. Capacitance of composite – conductor, geometric mean radius (GMR) and geometric mean distance (GMD). Advantages of single circuit and double circuit lines.

Module-3 Performance of Transmission Lines **8 hours**

Classification of lines – short, medium and long. Current and voltage relations, line regulation and Ferranti effect in short length lines, medium length lines considering Nominal T and nominal circuits, and long lines considering hyperbolic form equations. Equivalent circuit of a long line. ABCD constants in all cases.

Module-4 Corona and Underground Cables **8 hours**

Corona phenomena, disruptive and visual critical voltages, corona loss. Advantages and disadvantages of corona. Methods of reducing corona.

Types of underground cables, constructional features, insulation resistance, thermal rating, charging current, grading of cables – capacitance and inter-sheath. Dielectric loss. Comparison between AC and DC cables. Limitations of cables. Specification of power cables

Module-5 Distribution Systems **8 hours**

Primary AC distribution systems–Radial feeders, parallel feeders, loop feeders and interconnected network system. Secondary AC distribution systems – Three phase 4 wire system and single phase 2 wire distribution, AC distributors with concentrated loads. Effect of disconnection of neutral in a 3 phase four wire system.

Introduction to reliability, definition of reliability, failure, probability concepts, limitation of distribution systems, power quality, Reliability aids.

Course Outcomes: At the end of the course the student will be able to:	
22EEE41.1	Identify the importance of different transmission systems and types of insulators.
22EEE41.2	Assess the performance of overhead lines and interpret corona.
22EEE41.3	Classify types of distribution systems and explain the purpose of underground cables.
22EEE41.4	Analyze the parameters of the transmission line for different configurations.
22EEE41.5	Classify different types of distribution systems.
22EEE41.6	Examine the distribution systems quality and reliability.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	A Course in Electrical Power	J B Gupta	S K Kataria & Sons	2008
2	Principles of Power System	V.K. Mehta Rohit Mehta	S Chand	1st Edition 2013
Reference Books				
1	Electrical Power Generation, Transmission Distribution	S.N. Singh	Prentice Hall India	2nd Edition 2009
2	Electric Power Distribution	A.S. Pabla	McGraw-Hill	6th Edition 2012

Web links and Video Lectures (e-Resources):

- https://youtu.be/uy9lZCdkQIM
- https://youtu.be/NEXWcOgqZOI
- https://youtu.be/WPmOB31UTkI

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22EEE41.1	3	0	0	0	0	0	2	0	0	0	0	0	1	0
22EEE41.2	0	3	0	0	0	0	1	0	0	0	0	0	2	0
22EEE41.3	3	0	0	0	0	0	2	0	0	0	0	0	1	0
22EEE41.4	0	1	0	0	0	0	3	0	0	0	0	0	0	2
22EEE41.5	0	2	0	0	0	0	3	0	0	0	0	0	0	2
22EEE41.6	3	0	0	0	0	0	0	0	0	0	0	0	0	1

1: Low 2: Medium 3: High

Digital Electronics			
Course Code	**22EEE42**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	2:2:2	SEE Hours	03
Total Hours	40 hours Theory + 10 Lab slots	Credits	04

Course Learning Objectives: The objective of the course is to

- Apply Karnaugh Maps for the simplification of Boolean Algebraic equations
- Analyze and apply the Combinational logic design approach to construct Decoders, Encoders, andDigital Multiplexers etc.
- Construct Latches/ Flip-flops and their application in the design of Registers and Counters.
- Examine Mealy and Moore Models to the sequential circuit application.

Module-1 Principles of Combinational Logic	**8 hours**
Number System **,**Logic families, logic gates, combinational logic, canonical forms,Karnaugh maps- 3,4,5 varaiable, Simplifying Max and Min term equations, prime implicants	
Module-2 Analysis and Design of Combinational logic	**8 hours**
Decoders, BCD decoders, Encoders, Digital multiplexers, multiplexers as Boolean function generators, De-multiplexer**,** Adders and subtractors, Binary comparators	
Module-3 Flip-Flops	**8 hours**
Basic Bistable elements, Latches, The master-slave flip-flops: SR , D, JK, T flip-flops, pulse & Edge triggered flip- flops, Characteristic equations	
Module-4 Flip-Flops Applications	**8 hours**
Registers, binary ripple counters, synchronous binary counters, Counters based on shift registers, Design of a synchronous counter, Design of a synchronous mod-n counter using clocked T, JK, D and SR flip-flops.	
Module-5 Sequential Circuit Design	**8 hours**
Mealy and Moore models, State machine notation, Synchronous Sequential circuit analysis, Construction of state diagrams, counter design. Memories: Read only and Read/Write Memories, Programmable ROM, EPROM, Flash memory	

PRACTICAL MODULE

1. Simplification, and realization of Boolean expressions using logic gates/Universal gates.
2. Realization of half/Full adder and Half/Full Subtractor using logic gates
3. Design and testing of Multiplexers and decoders
4. Design and testing of code conversion circuits
5. Design and testing of RS & JK flip-flop circuits
6. Design and testing of Ring counter/Johnson counter.
7. Design and testing of shift registers
8. Design of MOD – N counters using IC

Course Outcomes: At the end of the course the student will be able to:	
22EEE42.1	Apply the first principles of digital electronics to develop a simplified switching equation using Karnaugh Maps techniques for a given Boolean expression.
22EEE42.2	Apply the knowledge of digital electronics engineering principles to design Multiplexer,Encoder, Decoder, Adder, Subtractors, and Comparator
22EEE42.3	Understand the engineering practices for analyzing flip flop circuits
22EEE42.4	Apply the principles of flip-flops to design sequential circuits such as registers and counters

22EEE42.5	Demonstrate the knowledge of mealy and moore state diagrams to solve the sequential design problems
22EEE42.6	Recognize the need for application of flip flop in memories.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Logic and computerdesign Fundamentals	M. Morries Mano andCharles Kime	Pearson Learning	2014
2	Digital Principles and Design	Donald D Givone	Tata McGraw Hill. J. F. Wakerly	2012
Reference Books				
1	Digital Systems Principles and Applications	Charles H Roth	Prentice Hall	5th Edition 2011

Web links and Video Lectures (e-Resources):

- http://nptel.vtu.ac.in/econtent/courses/CSE/15CS32/index.php
- https://nptel.ac.in/courses/108/105/108105113/

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22EEE42.1	0	2	0	0	0	0	0	0	0	0	0	0	0	0
22EEE42.2	0	1	0	0	0	0	0	0	0	0	0	0	0	0
22EEE42.3	0	0	0	0	0	0	0	2	0	0	0	0	0	0
22EEE42.4	0	0	0	0	0	0	0	0	0	0	2	0	0	0
22EEE42.5	0	0	0	0	0	0	0	0	0	0	1	0	0	0
22EEE42.6	0	0	0	0	0	0	0	0	0	0	0	3	3	0

1: Low 2: Medium 3: High

Microcontrollers			
Course Code	**22EEE43**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:2	SEE Hours	03
Total Hours	40 hours Theory + 10 Lab slots	Credits	04

Course Learning Objectives: The objective of the course is to

- Explain the internal organization and working of Computers, microcontrollers and embedded processors.
- Compare and contrast the various members of the microcontroller family.
- Explain the registers of the 8051 microcontroller, manipulation of data using registers and MOV instructions.
- Explain in detail the execution of 8051 Assembly language instructions and data types.
- Explain loop, conditional and unconditional jump and call, handling and manipulation of I/O instructions.
- Explain different addressing modes of 8051, arithmetic, logic instructions, and programs.
- Explain and develop 8051 C programs for time delay, I/O operations, I/O bit manipulation, logic, and arithmetic operations and data conversion.

Module-1 8051 Microcontroller Basics **8 hours**

Inside the Computer, Microcontrollers and Embedded Processors, Block Diagram of 8051, PSW and Flag Bits, 8051 Register Banks and Stack, Internal Memory Organization of 8051, IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051, Pins Of 8051. Memory Address Decoding, 8031/51 Interfacing with External ROM And RAM, 8051 Addressing Modes.

Module-2 Assembly Programming and Programming in C **8 hours**

Introduction to 8051 assembly programming, Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming.

Data types and time delay in 8051C, I/O programming in 8051C, Logic operations in 8051 C, Data conversion program in 8051 C, Accessing code ROM space in 8051C, Data serialization using 8051C.

Module-3 Timer and Serial Port Programming **8 hours**

Programming 8051 timers in assembly language, Counter programming, Programming timers 0 and 1 in 8051 C.

Basics of serial communication, 8051 connections to RS232, 8051 serial port programming in assembly language, serial port programming in C for 8051.

Module-4 Interrupts Programming and Interfacing 8051 **8 hours**

8051 interrupts, Programming timer, external hardware, serial communication interrupt, Interrupt priority in 8051/52, Interrupt programming in C.

LCD interfacing, Keyboard interfacing. ADC 0808 interfacing to 8051, Serial ADC Max1112 ADC interfacing to 8051, DAC interfacing, Sensor interfacing and signal conditioning.

Self-learning topics: ADC, DAC Interfacing

Module-5 Motor Interfacing and 8255 Interfacing **8 hours**

Relays and optocoupler isolators, stepper motor interfacing, DC motor interfacing and PWM.

Programming the 8255, 8255 interfacing, C programming for 8255.

Self-learning topics: motor interfacing.

PRACTICAL MODULE

1. Assembly language programs on data transfer, arithmetic and logic operations.
2. Assembly language programs for Conditional call and return instructions.
3. Code conversion programs in Assembly language – BCD to ASCII, ASCII to BCD, ASCII to decimal, Decimal to ASCII, Hexa decimal to decimal
4. Assembly language Programs using serial port and on-chip timer/counters.

5. 8051 C program for Stepper motor interface.
6. 8051 C program for DC motor interface for speed control using PWM.
7. 8051 C program to generate different waveforms: Sine, Square, Triangular, Ramp using DAC interface.
8. 8051 C program to interface External ADC

Course Outcomes: At the end of the course the student will be able to:	
22EEE43.1	Outline the 8051 architecture, registers, internal memory organization, addressing modes.
22EEE43.2	Discuss 8051 addressing modes, instruction set of 8051, accessing data and I/O port programming.
22EEE43.3	Develop 8051C programs for time delay, I/O operations, I/O bit manipulation, logic and arithmetic operations, data conversion and timer/counterprogramming.
22EEE43.4	Summarize the basics of serial communication and interrupts, also develop 8051 programs for serial data communication and interrupt programming.
22EEE43.5	Program 8051 to work with external devices for ADC, DAC, Stepper motor control, DC motor control, Elevator control.
22EEE43.6	Use modern software to analyze and implement microcontroller programs.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	The 8051 Microcontroller and Embedded Systems Using Assembly and C.	Muhammad Ali Mazadi	Pearson	2nd Edition, 2008.
2	The 8051 Microcontroller	Kenneth Ayala	Cengage Learning	3rd Edition, 2005
3	PIC microcontroller and Embedded Systems	Muhammad Ali Mazadi, Rolin D McKinlay	Pearson	2008
Reference Books				
1	The 8051 Microcontroller and Embedded Systems	Manish K Patel	McGraw Hill	2014
2	Microcontrollers: Architecture, Programming, Interfacing and System Design	Raj Kamal	Pearson	1st Edition, 2012

Web links and Video Lectures (e-Resources):

- Video lectures on Microprocessors and Microcontrollers by Prof. Ajit Pal, Dept of Computer Science Engg., IIT Kharagpur. https://archive.nptel.ac.in/courses/108/105/108105102/#

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22EEE43.1	2	0	0	0	0	0	1	0	0	0	0	0	0	0
22EEE43.2	1	0	0	0	0	0	2	0	0	0	0	0	0	0
22EEE43.3	0	0	0	0	0	0	3	0	0	0	0	2	0	0
22EEE43.4	0	0	0	0	0	0	0	0	0	0	0	3	1	0
22EEE43.5	0	0	0	0	0	0	0	0	0	0	0	3	2	0
22EEE43.6	0	0	0	0	0	0	1	0	0	0	0	0	3	0

1: Low 2: Medium 3: High

Electric Motors			
Course Code	**22EEE44**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Hours	03
Total Hours	40 Hours	Credits	03

Course Learning Objectives: The objective of the course is to

- Study the constructional features, operational features of electric motors.
- Study different tests to be performed for the assessment of performance characteristics of motors.
- Study the different speed control methods for motors
- Select a suitable drive for specific application.
- Explain the construction and operation of synchronous motor and special motors.

Module-1 DC Motors **8 hours**

Classification, Back emf and its significance, Torque equation, Characteristics of shunt, series and compound motors, Speed control of shunt, series and motors, DC Motor starters- 3 point and 4 point.

Losses in DC Motors, efficiency and condition for maximum efficiency.

Self-Study: Application of DC Motors.

Module-2 Testing of DC Motors **8 hours**

Direct and Indirect method of testing, – Brake Test, Swinburne's test, Retardation test, Hopkinson's test, merits and demerits of tests.

Three Phase Induction Motors: Construction, classification and types. Slip, torque equation, slip-torque characteristic covering motoring generating and braking regions of operation. Maximum torque, significance of slip.

Self-Study: Generation of rotating magnetic field. Principal of operation.

Module- 3 Performance of Three Phase Induction Motor **8 hours**

Phasor diagram on no load and on load, equivalent circuit, losses, efficiency, No-load and blocked rotor test, Performance evaluation from circle diagram and equivalent circuit. Cogging and Crawling. High torque rotors- double cage and deep rotor bars, equivalent circuit and performance evaluation of double cage induction motor. Induction motor working as induction generator.

Self-Study: Application of Induction Generators to renewable energy sources.

Module-4 Speed Control of Three Phase Induction Motors **8 hours**

Direct on line, star delta and auto transformer starting of three phase induction motors. Rotor resistance starting. Speed control of three phase induction motor by voltage, frequency and rotor resistance methods.

Single Phase Induction Motor: Double revolving field theory and principle of operation. Construction and operation of split phase, capacitor start, capacitor run and shaded pole motors.

Self-Study: Application of three phase and single phase induction motors.

Module-5 Synchronous Motors **8 hours**

Principle of operation, phasor diagram, torque and torque angle. Blondel diagram, effect of change in load, effect of change in excitation. V and inverted V curves. Synchronous condenser. Hunting and damping. Methods of starting of Synchronous Motors.

Special Motors: Construction and operation of Universal Motor, PMDC, Stepper Motor and AC Servo motor.

Self-Study: Application of special motors

Course Outcomes: At the end of the course the student will be able to:	
22EEE44.1	Analyze the performance characteristics of DC Motors and select a suitable motor to provide solutions to the current industrial problems.
22EEE44.2	Outline the constructional features and analyze characteristics of Three Phase Induction Motors and select a suitable motor for the industrial application.

22EEE44.3	Describe the constructional features of Single Phase Induction Motors; select a suitable motor for the industrial application.
22EEE44.4	Analyze the operation of Synchronous Motors and applications of the same to address the current industrial issues.
22EEE44.5	Explore various available techniques to test the DC Motors, evaluate the performance and speed control techniques of Three Phase Induction Motors.
22EEE44.6	Describe the constructional features and operation of special purpose motors such as Universal Motors, AC Servomotor and Stepper Motor, application of theses motors to manage multidisciplinary projects.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Electric Machines	D. P. Kothari, I. J. Nagrath	McGraw Hill	4th Edition, 2011
2	Theory of Alternating Current Machines	Alexander Langsdorf	McGraw Hill	2nd Edition, 2001
Reference Books				
1	Electric Machines	Ashfaq Hussain	Dhanpat Rai & Co	2nd Edition, 2013
2	Electrical Machines, Drives and Power systems	Theodore Wildi	Pearson	6th Edition, 2014

Web links and Video Lectures (e-Resources):

- https://archive.nptel.ac.in/courses/108/102/108102146/

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22EEE44.1	3	3	0	0	0	0	0	0	2	1	0	0	0	1
22EEE44.2	3	3	0	0	0	0	0	0	2	1	0	0	0	1
22EEE44.3	3	3	0	0	0	0	0	0	2	1	0	0	0	1
22EEE44.4	3	3	0	0	0	0	0	0	2	1	0	0	0	1
22EEE44.5	3	3	0	0	0	0	0	0	2	1	0	0	0	1
22EEE44.6	3	3	0	0	0	0	0	0	2	1	0	0	0	1

1: Low 2: Medium 3: High

Operational Amplifiers			
Course Code	**22EEE451**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Hours	03
Total Hours	40 Hours	Credits	03

Course Learning Objectives: The objective of the course is to

- Understand the basics of Linear ICs such as Op-amp, Regulator, Timer & PLL.
- Learn the designing of various circuits using linear ICs.
- Use these linear ICs for specific applications
- Understand the concept and various types of converters
- Use these ICs, in Hardware projects

Module-1 Operational amplifiers **8 hours**

Introduction, Block diagram representation of a typical Op-amp, schematic symbol, characteristics of an Op-amp, ideal op-amp, equivalent circuit, ideal voltage transfer curve, open loop configuration, differential amplifier, inverting & non –inverting amplifier, Op-amp with negative feedback, voltage series feedback amplifier, voltage shunt feedback amplifier(excluding derivations).

General Linear Applications: A.C. amplifier, summing, scaling & averaging amplifier, inverting and non-inverting configuration, Instrumentation amplifier.

Module-2 Filters and DC Voltage regulators **8 hours**

First & Second order high pass & low pass Butterworth filters. Band pass filters, all pass filters.

Voltage regulator basics, voltage follower regulator, adjustable output regulator, LM317 & LM337 Integrated circuits regulators.

Module-3 Signal Generators, Comparators & Converters **8 hours**

Triangular / rectangular wave generator, phase shift oscillator, saw tooth oscillator.

Basic comparator, zero crossing detector, inverting & non-inverting Schmitt trigger circuit, voltage to current converter with grounded load, current to voltage converter and basics of voltage to frequency and frequency to voltage converters.

Module-4 Converters **8 hours**

Precision half wave & full wave rectifiers.

R–2R D/A Converter, Integrated circuit 8-bit D/A, successive approximation ADC, linear ramp ADC

Module-5 PLL & Timers **8 hours**

Basic PLL, components, performance factors.

Internal architecture of 555 timer, Mono stable multivibrator and applications

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

22EEE451.1	Analyze the basic architecture and block diagram representation of operational amplifiers using linear applications of IC 741.
22EEE451.2	Analyze the operation of active filter circuits and DC voltage regulators using the principles of operational amplifiers.
22EEE451.3	Apply the standards of electronic laboratory practices for the usage of signal generators, comparators and converters based on data sheets.
22EEE451.4	Apply the standards of electronic laboratory practices for the usage of signal processing circuits, ADC and DAC based on data sheets.
22EEE451.5	Recognize the need for usage of Phase Locked Loops, 555 timers and their applications in open ended projects.
22EEE451.6	Simulate linear integrated circuits based on operational amplifiers using modern software tools like Multisim®.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Op-Amps and Linear Integrated Circuits	Ramakant A Gayakwad	Pearson	4th Edition, 2015
2	Operational Amplifiers and Linear ICs	David A. Bell	Oxford	3rd Edition 2011
Reference Books				
1	Linear Integrated Circuits; Analysis, Design and Applications	B. Somanthan Nair	Wiley India	2013
2	Linear Integrated Circuits, S.	Salivahanan, et al	McGraw Hill	2nd Edition, 2014
3	Operational Amplifiers and Linear Integrated Circuits	K. Lal Kishore	Pearson	1st Edition, 2012

Web links and Video Lectures (e-Resources):

- https://www.digimat.in/nptel/courses/video/108108114/L01.html

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22EEE451.1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
22EEE451.2	0	2	0	0	0	0	0	0	0	0	0	0	0	0
22EEE451.3	0	0	0	0	0	0	0	2	0	0	0	0	0	0
22EEE451.4	0	0	0	0	0	0	0	1	0	0	0	0	0	0
22EEE451.5	0	0	0	0	0	0	0	0	0	0	0	2	0	0
22EEE451.6	0	0	0	0	0	0	0	0	0	0	0	0	3	0

1: Low 2: Medium 3: High

Electromagnetic Field Theory			
Course Code	**22EEE452**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Hours	03
Total Hours	40 Hours	Credits	03

Course Learning Objectives: The objective of the course is to

- To study different coordinate systems for understanding the concept of gradient, divergence and curl of a vector.
- To study the application of Coulomb's Law and Gauss Law for electric fields produced by different charge configurations.
- To evaluate the energy and potential due to a system of charges.
- To study the behavior of electric field across a boundary between a conductor and dielectric and between two different dielectrics.
- To study the magnetic fields and magnetic materials.
- To study the time varying fields and propagation of waves in different media.

Module-1 Vector Analysis **8 hours**

Scalars and Vectors, Vector algebra, Cartesian co-ordinate system, Vector Components and unit vectors. Scalar field and Vector field. Dot product and Cross product, Gradient of a scalar field. Divergence and Curl of a vector field. Co – ordinate systems: cylindrical and spherical, relation between different coordinate systems. Expression for gradient, divergence and curl in rectangular, cylindrical and spherical co-ordinate systems, Numericals.

Coulomb's law, Electric field intensity and its evaluation for (i) point charge (ii) line charge (iii) surface charge (iv) volume charge distributions. Electric flux density, Gauss law and its applications. Maxwell's first equation (Electrostatics). Divergence theorem, Numericals.

Module-2 Energy and Potential **8 hours**

Energy expended in moving a point charge in an electric field. The line integral. Definition of potential difference and potential. The potential field of a point charge and of a system of charges. Potential gradient. The dipole. Energy density in the electrostatic field. Numericals.

Current and current density. Continuity of current. Metallic conductors, conductor's properties and boundary conditions. Perfect dielectric materials, capacitance calculations. Parallel plate capacitor with two dielectrics with dielectric interface parallel to the conducting plates. Numericals.

Module-3 Poisson's and Laplace Equations **8 hours**

Derivations and problems, Uniqueness theorem.

Biot - Savart's law, Ampere's circuital law. The Curl. Stokes theorem. Magnetic flux and flux density. Scalar and vector magnetic potentials. Numericals.

Module-4 Magnetic forces **8 hours**

Force on a moving charge and differential current element. Force between differential current elements. Force and torque on a closed circuit. Numericals.

Nature of magnetic materials, magnetisation and permeability. Magnetic boundary conditions. Magnetic circuit, inductance and mutual inductance. Numericals.

Module-5 Time Varying Fields **8 hours**

Faraday's law for time varying fields, Displacement current. Maxwell's equations in point form and integral form. Numericals.

Wave propagation in free space and in dielectrics. Pointing vector and power considerations. Propagation in good conductors, skin effect. Numericals.

Course Outcomes: At the end of the course the student will be able to:	
22EEE452.1	Use different coordinate systems, Coulomb's Law and Gauss Law for the evaluation of electric fields produced by different charge configurations.
22EEE452.2	Calculate the energy and potential due to a system of charges & Explain the behavior of electric field across boundary conditions.

22EEE452.3	Explain the Poisson's, Laplace equations and behavior of steady magnetic fields.
22EEE452.4	Explain the behavior of magnetic fields and magnetic materials.
22EEE452.5	Asses time varying fields and propagation of waves in different media.
22EEE452.6	Generalize the concepts of guided structures like transmission line, means of transporting energy or information, commonly used in power distribution and communication.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Engineering Electromagnetics	William H Hayt et al	McGraw Hill	8th Edition, 2014.
2	Principles of Electromagnetics	Matthew N. O. Sadiku	Oxford	6th Edition, 2015.
Reference Books				
1	Fundamentals of Engineering Electromagnetics	David K. Cheng	Pearson	2014
2	Electromagnetic Field Theory Fundamentals	Bhag Guru et al	Cambridge	2005
3	Electromagnetic Field Theory	Rohit Khurana	Vikas Publishing	1st Edition, 2014
4	Electromagnetics	J. A. Edminister	McGraw Hill	3rd Edition, 2010

Web links and Video Lectures (e-Resources):

- NPTELHRD video Lecture-1-Introduction to Vector **(https://youtu.be/pGdr9WLto4A)**
- NPTELHRD video Lecture-5-Electro Static Potential **(https://youtu.be/MjtmrTH1TsY)**
- NPTELHRD video Lecture-7-Gauss's Law **(https://youtu.be/whv_d-fBCg0)**
- NPTELHRD video Lecture-8-Poisson's Equation **(https://youtu.be/OiLhX_OBhm8)**

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22EEE452.1	3	2	1	0	0	0	0	0	0	0	0	0	0	0
22EEE452.2	3	2	1	0	0	0	0	0	0	0	0	0	0	0
22EEE452.3	3	2	1	0	0	0	0	0	0	0	0	0	0	0
22EEE452.4	3	2	1	0	0	0	0	0	0	0	0	0	0	0
22EEE452.5	3	2	1	1	0	0	0	0	0	0	0	0	0	0
22EEE452.6	3	2	0	0	1	0	0	0	0	0	0	0	0	0

1: Low 2: Medium 3: High

Sensors and Transducers			
Course Code	**22EEE453**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Hours	03
Total Hours	40 Hours	Credits	03

Course Learning Objectives: The objective of the course is to

- To discuss need of transducers, their classification and working of different types of transducers and sensors.
- To discuss recent trends in sensor technology and their selection.
- To explain the applications of audio electrical transducers used for the measurement of sound and working of different temperature sensing devices.
- To discuss basics of signal conditioning and signal conditioning equipment.
- To discuss configuration of Data Acquisition System, data conversion and Data transmission.
- To explain measurement of various non-electrical quantities

Module-1 Sensors and Transducers **8 hours**

Introduction, Classification of Transducers, advantages and disadvantages, Strain Gages, Load Cells, Proximity Sensors, Pneumatic Sensors, Light Sensors, Fiber Optic Transducers, Resistance Transducers, Variable Inductance Transducers, Capacitive Transducers, Piezoelectric Transducers, Hall Effect Transducers, Photoelectric Transducers.

Module-2 Sensors and Transducers **8 hours**

Solid-state transducers, Liquid crystal displays (LCD), Image transducers. Digital Transducers, Recent Trends – Smart Pressure Transmitters, Selection of Sensors, Rotary – Variable Differential Transformer, Synchros and Resolvers, Induction Potentiometers,

Module-3 Sound and Temperature Sensors **8 hours**

Sound, infrasound and ultrasound: Principles, Audio electrical sensors and transducers, Electrical to audio transducers.

Temperature sensors and thermal transducers: Heat and temperature, The bimetallic strip, Thermocouples, Metal – resistance sensors, Thermistors, Thermal transducers, Thermal to electrical transducers.

Module-4 Data Acquisition Systems **8 hours**

Introduction to signal conditioning, Functions of Signal Conditioning Equipment, Amplification, Types of Amplifiers, Mechanical Amplifiers Fluid Amplifiers, Optical Amplifiers, Electrical and electronic Amplifiers.

Introduction to data acquisition systems, Objectives and Configuration of Data Acquisition System, Data Acquisition Systems, Data Conversion**,** Data/Signal Transmission

Module-5 Measurement of Non – Electrical Quantities **8 hours**

Pressure gauges, low gas pressures, Ionization gauges, Measurement of Displacement, Measurement of Velocity/ Speed, Measurement of Acceleration, Measurement of Liquid Level

Course Outcomes: At the end of the course the student will be able to:	
22EEE453.1	Discuss need of transducers, their classification and working of various transducers and sensors
22EEE453.2	Discuss recent trends in sensor technology and their selection.
22EEE453.3	Discuss basics of signal conditioning and signal conditioning equipment.
22EEE453.4	Discuss configuration of Data Acquisition System, data conversion and data transmission.
22EEE453.5	Explain measurement of non-electrical quantities

22EEE453.6	Write effective report after conducting experiments on characteristics of transducers

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Electrical and Electronic Measurements and instrumentation	R.K Rajput	S. Chand	3rd Edition, 2013
Reference Books				
1	A Course in Electronics and Electrical Measurements and Instruments	J.B. Gupta	Katson Books	13th Edition, 2008
2	A Course in Electrical and Electronic Measurements and Instrumentation	A. K. Sawheny	Dhanpat Rai	2015

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc21_ee32/preview
- https://www.youtube.com/playlist?list=PLWbMIWDTOauBvP0ZxvoIshg55WPMF37UI

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22EEE453.1	1	0	0	1	1	0	0	0	0	0	0	1	1	0
22EEE453.2	0	0	0	0	0	0	0	0	0	1	0	0	0	0
22EEE453.3	0	0	0	1	1	0	0	0	0	0	0	0	1	0
22EEE453.4	0	0	0	0	0	0	0	0	0	1	0	0	0	0
22EEE453.5	0	0	0	0	0	0	0	0	0	1	0	0	0	0
22EEE453.6	0	0	0	1	1	0	0	0	0	0	0	0	1	0

1: Low 2: Medium 3: High

Electrical Safety Practices			
Course Code	**22EEE454**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Hours	03
Total Hours	40 Hours	Credits	03

Course Learning Objectives: The objective of the course is to

- To discuss the objectives of safety and security measures, hazards associated with electric current and voltage.
- To discuss the electrical safety measures in residential, commercial and agricultural installations.
- Understand the preliminary preparations, safe sequence and risk of plant and equipment.
- To analyze the hazardous zones and electrical safety in the hazardous areas
- Understand the application of fire extinguishers.

Module-1 Electrical Safety, Shocks and Their Prevention **8 hours**

Terms and definitions, objectives of safety and security measures, Hazards associated with electric current and voltage, who is exposed, principles of electrical safety, Approaches to prevent Accidents, scope of subject electrical safety. Primary and secondary electrical shocks, possibilities of getting 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, residential buildings and shop.

Module-2 Electrical Safety in Residential, Commercial and Agricultural Installations 8 hours

Wiring and fitting –Domestic appliances –water tap giving shock –shock from wet wall –fan firing shock –multi-storied building –Temporary installations – Agricultural pump installation –Do's and Don'ts for safety in the use of domestic electrical appliances.

Module-3 Electrical Safety during Installation **8 hours**

Preliminary preparations –safe sequence –risk of plant and equipment –safety documentation –field quality and safety -personal protective equipment –safety clearance notice –safety precautions – safeguards for operators –safety.

Module-4 Electrical Safety in Hazardous Areas **8 hours**

Hazardous zones –class 0, 1 and 2 – spark, flashovers and corona discharge and functional requirements – Specifications of electrical plants, equipment's for hazardous locations – Classification of equipment enclosure for various hazardous gases and vapours – classification of equipment/enclosure for hazardous locations.

Module-5 Fire Extinguishers **8 hours**

Fundamentals of fire-initiation of fires, types; extinguishing techniques, prevention of fire, types of fire extinguishers, fire detection and alarm system; CO2and Halogen gas schemes; foam schemes.

Course Outcomes: At the end of the course the student will be able to:	
22EEE454.1	Understand the Indian power sector organization and Electricity rules
22EEE454.2	Outline the electrical safety during installation, testing and commissioning procedure.
22EEE454.3	Make use of specification of electrical plants and classification of safety equipment for various hazardous locations.
22EEE454.4	Distinguish various fire extinguishers and their classification.
22EEE454.5	Analyze electrical safety measures in residential, commercial, agriculture, hazardous areas
22EEE454.6	Understand in detail the application fire extinguisher and their types.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Electrical Safety, Fire Safety Engineering and Safety Management	Rao, S. and Saluja, H.L	Khanna Publishers	1988
Reference Books				
1	Electrical safety Engineering	Cooper.W.F	Newnes-Butterworth Company	1978
2	Electrical safety hand book	John Codick,	McGraw Hill Inc., New Delhi	2000

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=GeKBDv2lSfM
- https://www.youtube.com/watch?v=jFDWlKayrTc&list=PLbRMhDVUMngdXebaRB59KdKwstzuAovua
- https://www.youtube.com/watch?v=-XRu7BSouvY

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22EEE454.1	1	0	0	0	0	3	0	0	0	0	0	3	0	0
22EEE454.2	1	0	0	0	0	3	3	0	0	0	0	0	0	0
22EEE454.3	1	0	0	0	0	3	0	0	0	0	0	3	0	0
22EEE454.4	1	0	0	0	0	3	3	0	0	0	0	3	0	0
22EEE454.5	1	0	0	0	0	3	2	0	0	0	0	0	0	0
22EEE454.6	1	0	0	0	0	3	2	0	0	0	0	3	0	1

1: Low 2: Medium 3: High

Electric Motors Laboratory			
Course Code	**22EEE46L**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Practical	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	0:0:2	SEE Hours	03
Total Hours		Credits	01

Course Learning Objectives: The objective of the course is to

- To perform test on DC Motors to determine their characteristics
- To study speed control methods of dc motor.
- To conduct test on DC Motors for pre determination of performance characteristics of DC Machines.
- To perform load test on single phase and three phase induction motors
- To conduct test on three phase induction motor to determine performance characteristics.
- To conduct test on synchronous motor to draw the performance characteristics.

Sl. No	Experiments
1	Load test on DC shunt motor to draw speed–torque and horse power–efficiency characteristics.
2	Field Test on DC series machines.
3	Speed control of DC shunt motor by armature and field control.
4	Swinburne's Test on DC motor.
5	Load test on three phase induction motor.
6	Regenerative test on DC shunt motor
7	No-load and Blocked rotor test on three phase induction motor to draw (i) equivalent circuit and (ii) circle diagram. Determination of performance parameters at different load conditions.
8	Load test on induction generator.
9	Load test on single phase induction motor to draw output versus torque, current, power and efficiency characteristics.
10	Conduct an experiment to draw v and Inverted V curves of synchronous motor at no load and load conditions.

Course Outcomes: At the end of the course the student will be able to:	
22EEE46L.1	Test DC machines to determine their characteristics and also to control the speed of DC motor.
22EEE46L.2	Pre-determine the performance characteristics of DC machines by conducting suitable tests
22EEE46L.3	Perform load test on single phase and three phase induction motor to assess its performance
22EEE46L.4	Conduct test on induction motor to pre-determine the performance characteristics.
22EEE46L.5	Conduct test on synchronous motor to draw the performance curves
22EEE46L.6	Function effectively as a member of diverse team to demonstrate the knowledge on testing of motors.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Electric Machines	D. P. Kothari, I. J. Nagrath	McGraw Hill	4th Edition, 2011
2	Theory of Alternating Current Machines	Alexander Langsdorf	McGraw Hill	2nd Edition, 2001

Reference Books				
1	Electric Machines	Ashfaq Hussain	Dhanpat Rai & Co	2nd Edition, 2013
2	Electrical Machines, Drives and Power systems	Theodore Wildi	Pearson	6th Edition, 2014

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/108105017
- https://nptel.ac.in/courses/108106072

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22EEE46L.1	0	0	2	0	0	0	0	0	0	0	0	0	0	0
22EEE46L.2	0	0	1	0	0	0	0	0	0	0	0	0	0	0
22EEE46L.3	0	0	0	0	0	2	0	0	0	0	0	0	0	0
22EEE46L.4	0	0	0	0	0	1	0	0	0	0	0	0	0	0
22EEE46L.5	0	0	0	0	0	0	0	0	2	0	0	0	0	0
22EEE46L.6	0	0	0	0	0	0	0	0	3	0	0	0	0	0

1: Low 2: Medium 3: High

Universal Human Values- II			
Course Code	**22UHV47**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:0:0)	SEE Marks	50
Credits	**02**	Exam Hours	02

Course Learning Objectives:

This introductory course input is intended:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement toward value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Module-1 Introduction to Value Education

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations.

Activities: Sharing about Oneself, Exploring Human Consciousness and Exploring Natural Acceptance. **5 Hours**

Module-2 – Harmony in the Human Being

Understanding Human beings as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

Activities: Exploring Sources of Imagination in the Self, Exploring Harmony of Self with the Body and Exploring the difference of Needs of Self and Body. **5 hours**

Module 3 – Harmony in the Family and Society

Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

Activities: Exploring the Feeling of Trust, Exploring the Feeling of Respect and Exploring the Feeling systems to fulfil Human Goal. **5 hours**

Module-4 – Harmony in the Nature/Existence

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.

Activities: Exploring the Four Orders of Nature and Co-existence in Existence. **5 hours**

Module-5 – Implications of the Holistic Understanding – a Look at Professional Ethics

Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession

Activities: Exploring Ethical Human Conduct**,** Humanistic Models in Education and steps of Transition towards Universal Human Order. **5 hours**

Course Outcomes: At the end of the course the student will be able to:	
22UHV47.1	Practice the method of self-exploration to understand the basic human aspiration.
22UHV47.2	Distinguish between needs of self and body.
22UHV47.3	Evolve a program for self-regulation and health.
22UHV47.4	Differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them.
22UHV47.5	Realize sustainable solutions to the problems in society and nature.
22UHV47.6	Develop competence in professional ethics and strategies for the transition towards a value-based life/profession.

Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	Excel Books, New Delhi	2nd Revised Edition, 2019
2	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	Excel Books New Delhi	2nd Revised Edition, 2019
Reference Books				
1	Jeevan Vidya: Ek Parichaya	A Nagaraj	Jeevan Vidya Prakashan Amarkantak	1999
2	Human Values	A.N. Tripathi	New Age Intl. Publishers, New Delhi	2004

Additional Resources/Web links/Video Lectures

1. The Story of Stuff (Book).
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
3. Small is Beautiful - E. F Schumacher.
4. Slow is Beautiful - Cecile Andrews
4. Economy of Permanence - J C Kumarappa
5. Bharat Mein Angreji Raj – Pandit Sunderlal
6. Rediscovering India - by Dharampal
7. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
8. India Wins Freedom - Maulana Abdul Kalam Azad
9. Vivekananda - Romain Rolland (English)
10. Gandhi - Romain Rolland (English)
11. UHV-I Teaching material (Presentations, Pre & Post Surveys etc.)
https://fdp-si.aicte-india.org/AicteSipUHV_download.php
12. Details of UHV-II: Universal Human Values – Understanding Harmony and Ethical Human Conduct
https://drive.google.com/file/d/1cznDaqDwKy__EKWmqJLWF94MeY4AXcsU/view?usp=sharing

13. Recorded FDP (Refresher 1 Part 1: Preparing to teach UHV-I in SIP)
https://www.youtube.com/watch?v=kejuD4faDDE&list=PLWDeKF97v9SOjS4RanhaYj4YLiImqm5pj&index=1

14. Resources, including the class notes and presentations
https://drive.google.com/drive/folders/1nh9m5ibEtvMyqekeiexAJtfbdNtmtt6-?usp=sharing

15. Hindi Recording of 5-day UHV FDP
https://www.youtube.com/playlist?list=PLWDeKF97v9SMRfe5PK1HPYnEcrrJOL6K7

16. English Recording of 5-day UHV FDP
https://www.youtube.com/playlist?list=PLWDeKF97v9SP7wSlapZcQRrT7OH0ZlGC4

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22UHV47.1						3		2						
22UHV47.2						2			3					
22UHV47.3						2		3						
22UHV47.4							3							
22UHV47.5			3				2							
22UHV47.6								3				2		

1: Low 2: Medium 3: High

Biology for Engineers			
Course Code	**22BFE47**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:0:0)	SEE Marks	50
Credits	**02**	Exam Hours	02

Course Learning Objectives:

1. To bring awareness of biological concepts to engineering students
2. To introduce the building blocks of life and their complexity
3. To encourage interdisciplinary studies and projects
4. To appreciate the discoveries that mimic nature and its working
5. To inculcate nature-inspired design and operational principles

Module-1 **5 Hours**

Basic Cell Biology: Introduction to Biology, The cell: the basic unit of life, Expression of genetic information-protein structure and function, Cell metabolism; Cells respond to their external environments, Cells grow and reproduce, Cellular differentiation.

Module-2 **5 Hours**

Biochemistry and Molecular Aspects of Life: Biodiversity-Chemical bonds in Biochemistry; Biochemistry and Human biology, Protein synthesis -DNA; RNA, Transcription and translation factors play key roles in protein synthesis, Differences between eukaryotic and prokaryotic protein synthesis, Stem cells and their applications.

Module-3 **5 Hours**

Bioinspired Engineering based on human physiology: Circulatory system (artificial heart, pacemaker, stents), Nervous system (Artificial neural network), Respiratory system, sensory system (electronic nose, electronic tongue), Visual and auditory prosthesis (Bionic eye and cochlear implant).

Module-4 **5 Hours**

Relevance of Biology as an interdisciplinary approach: Biological observation that led to major discoveries, Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf), Bird flying (aircraft), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro).

Module-5 **5 Hours**

Bioinspired Algorithms and Applications: Genetic algorithm, Gene expression modelling, Parallel Genetic Programming: Methodology, History, and Application to Real-Life Problems, Dynamic Updating DNA Computing Algorithms, Bee-Hive: New Ideas for Developing Routing Algorithms Inspired by Honey Bee Behaviour.

Course Outcomes: At the end of the course the student will be able to:	
22BFE47.1	Discuss how the cell forms the basic building block of life
22BFE47.2	Distinguish between transcription and translation
22BFE47.3	Describe the role played by proteins within the cell
22BFE47.4	Analyze the role of bioinspired design in novel applications
22BFE47.5	Apply bioinspired design principles to other domains
22BFE47.6	Implement a simple genetic algorithm

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Text Books				
1	Biology for Engineers	Thyagarajan.S., Selvamurugan. N., Rajesh.MP, Nazeer RA, Richard W. Thilagaraj, Barathi.S., and Jaganthan.M.K	Tata McGraw Hill	2012
2	Molecular Biology	Robert Weaver	McGraw-Hill	5th Edition, 2012
Reference books				
1	Lewin's Genes XII	Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick	Jones and Bartlett Learning	2017
2	Bioinspired Engineering	Jenkins, C.H.	Momentum Press	2012
3	Bio mimetics: Nature-Based Innovation	Yoseph Bar-Cohen	CRC Press	1st Edition, 2016
4	A Practical Guide to Bio-inspired Design	Hashemi Farzaneh, Helena, Lindemann, Udo	Springer	2019

Web links/Video Lectures/MOOCs

1. https://books.google.co.in/books?id=-2LNBQAAQBAJ&printsec=frontcover#v=onepage&q&f=false
2. https://www.aminotes.com/2017/02/biology-for-engineers-module-1-cocepts.html

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22BFE47.1	2					1								
22BFE47.2		1				1								
22BFE47.3	2					2								
22BFE47.4		2										2		
22BFE47.5	2											2		
22BFE47.6		2										2		

1: Low 2: Medium 3: High

COMPUTATIONAL TOOLS FOR ENGINEERS			
Course Code:	**22CTE48**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Credits	**01**	Exam Hours	02

Course Learning Objectives:

1. Apply modeling and simulation tools for a wide range of engineering problems.
2. Understand the analysis of data in Excel with statistics.
3. Use MATLAB and Simulink to perform engineering system analysis.

The engineering design process heavily relies on modeling and simulation. Modern simulation techniques enable the development of multi-physical, holistic system models that account for all system interactions. These digital models speed up the design and testing processes, saving time and money.

Module 1

Engineering Design Analysis

Need for engineering design analysis. Product and system design. Introduction to analysis parameters – stress, deformation, acceleration, internal force and stability. Static structural analysis of engineering design using finite element method (case studies). Heat transfer and fluid dynamics modeling and simulation using CFD software (case studies).

10 Hours

Module 2

Data Analysis with EXCEL

Calculate Mean, Median, Mode, Minimum, Maximum, Quartiles, Variance and Standard Deviation from some numbers. Analyze a population using data samples. Group data, build XY charts, apply Logarithmic Scale and Trend Line on a chart, forecast from some data, and calculate running averages. Normal Distribution, Exponential Distribution, Uniform Probabilities, Binomial Distribution, and Poisson Distribution.

4 Hours

Module 3

MATLAB and Simulink for Engineers

Applications of MATLAB and Simulink in electrical engineering, electrical machines and power system projects, simulation of rectifiers, inverters, choppers, and cycloconverters.

10 Hours

Course Project

Solve complex engineering problems via modeling and simulation. The project work is teamwork of 3-5 students. The goals should be clearly defined, use any software tool, and rigorous validation of the mathematical model should be done (experimental or theoretical).

Course Outcomes: At the end of the course, the student will be able to:	
22CTE48.1	Apply the Finite Element Method to solve engineering problems
22CTE48.2	Solve statistical problems using Excel
22CTE48.3	Perform system-level analysis using MATLAB and Simulink
22CTE48.4	Build mathematical models for any given engineering problem.
22CTE48.5	Demonstrate teamwork and communication skills

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books				
1	**MATLAB and Simulink for Engineers**	Agam Kumar Tyagi	Oxford University Press	2012
2	**Practical Finite Element Analysis**	Nitin S.Gokhale	Finite to Infinite	2020
3	**Excel Crash Course for Engineers**	Eklas Hossain	Springer	2021

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22CTE48.1	1				1	1								
22CTE48.2		1			2				2					
22CTE48.3		1			2									
22CTE48.4					2	2								
22CTE48.5	1								2					

1: Low 2: Medium 3: High

Industry Oriented Training - Business Etiquettes			
Course Code	**22ITB49A**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	-
Credits	-	Exam Hours	02

Course Learning Objectives:

11. Know the components of self-introduction
12. Develop a resume with the inclusion of core competencies
13. Involve and contribute to group discussions
14. Develop effective communication to succeed in the professional career
15. Know the etiquettes of digital communication

Module-1

Self-Introduction &Essentials of grooming

Self-Introduction: Learn the secret to introducing Yourself, Things to avoid when introducing yourself. Activity: Video record the self-introduction. **Essentials of grooming:** Creating the first impression, what does the well-dressed man wear? What does the well-dressed woman wear? Personal hygiene and habits. **4 Hours**

Module-2

Resume Writing

Purpose, Identifying Relevant Competencies, Understanding Applicant Tracking Systems, Lists of Competencies, Writing Accomplishment/ Objective Statements, Finding the Right Words- Action verbs, The Most Popular Resume Format, Other Popular Resume Formats, Do's and Don'ts. Activity: Students have to submit a copy of their resume. **4 Hours**

Module-3

Group Discussion

Types, process, Evaluation criteria, Do's and Don'ts Activity: Group discussions have to be held during the training sessions. **4 Hours**

Module-4

Communicate effectively

Build a Story, Just a Minute, Group Activities, Team building activities, Role Play, Presentation Skills. **4 Hours**

Module-5

Digital right and wrong

Virtual Communication: Agenda, being prepared, Dressing appropriately, background, Use Microphone and camera the right way, restraining from off tasks during virtual meetings, protecting confidential data during online presentations, time management. **4 Hours**

Course Outcomes: At the end of the course the student will be able to:	
22ITB49A.1	Articulate the essential components required for self-introduction in any business or a networking event and also recognize the need to dress appropriately for a successful career in the corporate
22ITB49A.2	Develop a resume inclusive of core competencies, and action verbs which are compatible with Applicant Tracking Systems
22ITB49A.3	Demonstrate the types, process and evaluation process of Group Discussion and carry out effective group discussions
22ITB49A.4	Develop skills required for effective communication
22ITB49A.5	Associate and be accustomed to the etiquette to be followed during online meetings

Sources

1. English for Common Interactions in the Workplace: Basic Level: Coursera: https://www.coursera.org/learn/english-common-interactions-workplace-basic-level
2. Personal Communication-Introduce Yourself With Confidence: https://www.udemy.com/course/how-to-introduce-yourself/
3. Professionalism, Grooming and Etiquette: https://www.edx.org/course/professionalism-grooming-and-etiquette
4. How to Write a Resume: https://www.coursera.org/learn/how-to-write-a-resume#syllabus
5. Group Discussion Strategies: https://www.udemy.com/course/group-discussion-strategies/
6. Communication Strategies for a Virtual Age: https://www.coursera.org/learn/communication-strategies-virtual-age#syllabus

References

1. https://simplifytraining.com/course/personal-hygiene-and-good-grooming/
2. https://www.udemy.com/course/group-discussion-strategies/
3. https://www.educba.com/course/group-discussion/
4. https://getrafiki.ai/meetings/rules-of-virtual-meeting-etiquette-every-sales-professional-should-follow/
5. https://thedigitalworkplace.com/articles/online-meeting-etiquette-for-attendees/
6. https://rigorousthemes.com/blog/virtual-meeting-etiquette-guidelines-ground-rules/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22ITB49A.1									2	3		1		
22ITB49A.2										3		1		
22ITB49A.3									2	3	1	1		
22ITB49A.4									2	3	1	1		
22ITB49A.5									2	3	1	1		

1: Low 2: Medium 3: High

Industry Oriented Training - Computing Skills			
Course Code	**22ITC49B**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	-
Credits	-	Exam Hours	02

Course Learning Objectives:

6. Use logical conditions for problem-solving and also introduce the concepts of arrays
7. Know functions, function calls, and parameter passing
8. Introduce algorithms and appreciate their importance in problem-solving
9. Introduce the core concepts of OOP's
10. Differentiate between front-end & back-end development and recognize the use of database management

Module-1

Introduction to computing constructs

Logical conditions: For Loops, Nested For Loops, While Loops, Do-While Loops, Nesting and Boxes, and combine/negate several logical conditions using logic operations AND, OR, and NOT.

Arrays & strings: Create arrays of characters (strings), use the null terminator, and manipulate strings. **4 Hours**

Module-2

Functions & Pointers

Introduction to Functions, Returning Data From a Function, Passing Data Into a Function, Getting Valid User Input, Changing Parameter Values, Pointer Basics, Changing the Pointed to Value, Walking an Array with Pointers, Dynamic Memory Allocation, Getting More Memory, Pointers to Structure. **4 Hours**

Module-3

Algorithm analysis

Introduction to Algorithm Analysis, Big-O, Big-O Examples, Dynamic Array Operations, Bubble Sort, Selection Sort, Insertion Sort, Recursion, Recursive Binary Search, Merge Sort. **4 Hours**

Module-4

Object-oriented programming

Designing for Object-Oriented Programming, Core Concepts of OO Programming: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, procedural and object-oriented programming paradigm. **4 Hours**

Module-5

Frontend and backend development

UI, Database management: DBMS overview, Relational Data Model and the CREATE TABLE Statement, Basic Query Formulation with SQL. **4 Hours**

Course Outcomes: At the end of the course the student will be able to:	
22ITC49B.1	Illustrate the use of logical conditions, declare and manipulate data into arrays
22ITC49B.2	Implement functions, function calls, and parameter passing
22ITC49B.3	Design, implement, and evaluate an algorithm to meet desired needs
22ITC49B.4	Describe the core concepts of OOP's
22ITC49B.5	Recognize the concepts of front-end development and database management

Sources
1. Computational Thinking with Beginning C Programming Specialization: https://www.coursera.org/learn/simulation-algorithm-analysis-pointers?specialization=computational-thinking-c-programming#syllabus 2. Simulation, Algorithm Analysis, and Pointers: https://www.coursera.org/lecture/simulation-algorithm-analysis-pointers/big-o-examples-pdCan 3. Programming Fundamentals: https://www.coursera.org/learn/programming-fundamentals?specialization=c-programming#syllabus 4. Object-Oriented Programming Concepts: https://www.coursera.org/learn/concepts-of-object-oriented-programming#syllabus 5. Introduction to Back-End Development: https://www.coursera.org/learn/introduction-to-back-end-development

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22ITC49B.1	2	1	1											
22ITC49B.2	2	1	1											
22ITC49B.3	1	1	2											
22ITC49B.4	2		1											
22ITC49B.5	2	1	1											

1: Low 2: Medium 3: High

Core Values of the Institution

SERVICE

A Josephite will keep service as the prime goal in everything that is undertaken. Meeting the needs of the stakeholders will be the prime focus of all our endeavors.

EXCELLENCE

A Josephite will not only endeavor to serve, but serve with excellence. Preparing rigorously to excel in whatever we do will be our hallmark.

ACCOUNTABILITY

Every member of the SJEC Family will be guided to deliver on assurances given within the constraints set. A Josephite will always keep budgets and deadlines in mind when delivering a service.

CONTINUOUS ADAPTATION

Every member of the SJEC Family will strive to provide reliable and continuous service by adapting to the changing environment.

COLLABORATION

A Josephite will always seek to collaborate with others and be a team-player in the service of the stakeholders.

Objectives

- Provide Quality Technical Education facilities to every student admitted to the College and facilitate the development of all round personality of the students.
- Provide most competent staff and excellent support facilities like laboratory, library and internet required for good education on a continuous basis.
- Encourage organizing and participation of staff and students in in-house and outside Training programmes, seminars, conferences and workshops on continuous basis.
- Provide incentives and encouragement to motivate staff and students to actively involve in research-innovative projects in collaboration with industry and R &D centres on continuous basis
- Invite more and more number of persons from industry from India and abroad for collaboration and promote Industry-Institute Partnership.
- Encourage consultancy and testing and respond to the needs of the immediate neighbourhood.

St Joseph Engineering College

AN AUTONOMOUS INSTITUTION

Affiliated to VTU, Belagavi | Recognised by AICTE, New Delhi

Accredited by NAAC with A+ Grade

B.E. (CSE, ECE, EEE, ME, CIV), MBA & MCA Accredited by NBA, New Delhi

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