POOJYA DODDAAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI

B.E. in Electronics &Instrumentation Engineering

Scheme of Teaching and Examination 2021-2022

Outcome Based Education (OBE) and Choice Based Credit System(CBCS)

(Effective from the academic year 2021-2022)

**III SEMESTER (ELECTRONICS AND INSTRUMENTATION ENGINEERING)**

| Sl. No | Course and Course Code | | Course Title | Teaching Department | Teaching Hours/Week | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory/ lecture | Tutorial | Practical / Drawing | Duration in Hours | SEE Marks | CIE Marks | Total Marks | |
| | | | | | L | T | P | | | | | |
| 1 | BS | 21MA31C | Numerical Methods and Integral Transform | Mathematics | 03 | --- | --- | **03** | **50** | **50** | **100** | **3** |
| 2 | PC | 21EI32 | Analog Electronics | E&IE | 03 | --- | --- | **03** | **50** | **50** | **100** | **3** |
| 3 | PC | 21EI33 | Digital System Design | E&IE | 03 | --- | --- | **03** | **50** | **50** | **100** | **3** |
| 4 | PC | 21EI34 | Transducers & Instrumentation | E&IE | 03 | --- | --- | **03** | **50** | **50** | **100** | **3** |
| 5 | HSMS | 21 HU35 | Constitution of India Professional Ethics and Cyber Law | Humanities | 02 | --- | --- | **02** | **50** | **50** | **100** | **1** |
| 6 | Internship | 21INT36 | Summer Internship-I | --- | --- | --- | --- | **---** | **---** | **50** | **50** | **2** |
| 7 | AEC | 21EIAE36A | Ability Enhancement Course (Electronic Circuits Lab using PSPICE) | E&IE | --- | --- | 03 | **03** | **50** | **50** | **100** | **1** |
| 8 | UHV | 21UHV36B | Universal Human Values-I | -- | 02 | --- | --- | **02** | **50** | **50** | **100** | **1** |
| 9 | PC | 21EIL31 | Analog Electronics Lab | E&IE | --- | --- | 02 | **03** | **50** | **50** | **100** | **1** |
| 10 | PC | 21EIL32 | Digital System Design Lab | E&IE | --- | --- | 02 | **03** | **50** | **50** | **100** | **1** |
| 11 | PC | 21EIL33 | Transducers Lab | E&IE | --- | --- | 02 | **03** | **50** | **50** | **100** | **1** |
| | | | Total | | | | | | **500** | **550** | **1050** | **20** |

| Course Title: Numerical Methods and Integral Transforms | | |
|---|---|---|
| Course Code | 21MA31C | CIE: 50 |
| Number of Lecture Hours/Week | 03 Hrs (Theory) | SEE: 50 |
| Total Number of Lecture Hours : 42 | Credits: 03 | SEE Hours: 03 |
| Prerequisite: | | |

**Course Learning Objectives**: To enable the students to obtain the knowledge of Engineering Mathematics in the following topics

1. Numerical methods to solve algebraic and Transcendental equations
2. Interpolation methods , Numerical differentiation and Numerical integration
3. Fourier Series, Fourier transforms and Z-transforms and its application in engineering fields

| Modules | Teaching Hours |
|---|---|
| **Module-I**<br>**Algebraic And Transcendental Equations**, Solution by Newton' Raphson and Regula falsi methods.<br>**Finite differences** (Forward and Backward differences), Interpolation, Newton's Forward and Backward formulae. Langrange's interpolation and inverse interpolation formulae **RBT Levels: L1, L2 & L3** | **09 Hrs** |
| **Module II**<br>**Numerical differentiation:** Numerical differentiation using Newton's forward and backward interpolation formulae and problems.<br>**Numerical integration**: Introduction, Trapezoidal rule, Simpson's $1/3^{rd}$ ,Simpson's $3/8^{th}$ rule and Weddle's rule. (all formulae and rules without proof).<br>**Numerical solutions of first order and first degree ordinary differential equations**: Taylors series method, Runge –Kutta method of fourth order, modified Euler's method and Milne's-Thomson's predictor and corrector methods and problems.(all formulae without proof) **RBT Levels: L1, L2 & L3** | **09 Hrs** |
| **Module III**<br>**Difference equations and Z-Transforms :**<br>Basic definitions, , standard Z-transforms, linearity property , damping rule, shifting rule , initial value theorem ,final value theorem and problems . Inverse Z-Transforms and application of Z-Transforms to solve difference equations.<br>**RBT Levels: L1, L2 & L3** | **08 Hrs** |
| **Module - IV**<br>**Fourier series:**<br>Periodic functions, Fourier series with periods $(0, 2\pi)$, $(-\pi, \pi)$, $(0, 2l)$ and $(-l, l)$. Half range Fourier series, Practical harmonic analysis and problems.<br>**RBT Levels: L1, L2 & L3** | **08 Hrs** |

| Module V | |
|---|---|
| **Fourier Transforms:**<br>Finite and Infinite Fourier transforms, Fourier sine and cosine transforms, properties, Inverse Fourier transforms and problems.<br>**RBT Levels: L1, L2 & L3** | **08 Hrs** |

**Question paper pattern:**
Total ten questions will be asked. Two from each module. The student has to answer five questions, selecting at least one from each module.

**Text boo**ks:
1 Higher Engineering Mathematics by B.S.Grewal, Khanna publishers; 40th Edition.2007
2 Engineering Mathematics by N. P. Bali and Manish Goyal. Laxmi publications, latest edition

**Reference books:**
1.Advanced Engineering Mathematics by E. Kreyszig, John Willey & sons 8th Edn.
2.A short course in differential equations – Rainvile E.D.9th Edition.
3.Advanced Engineering Mathematics by R.K.Jain & S.R.K Iyengar; Narosa publishing House.
4.Introductory methods of numerical analysis by S.S.Sastry

**E-Books and Online resources:**
- http://.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
  http://academicearth.org/

**Pedagogy (General Instructions):**
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution of some exercises (post-lecture activity).

| Course Code | CO # | Course Outcome (CO) |
|---|---|---|
| 21MA31C | **CO1** | Solve the numerical problems in algebraic, transcendental equations. Computation of interpolation polynomials |
| | **CO2** | Compute derivatives of the functions numerically using given data and Evaluate integrations numerically. |
| | **CO3** | Understanding the characteristics and properties of the Z-transform |

| | | |
|---|---|---|
| | **CO4** | Construction of Fourier series for periodic signals and Fourier series to analyze circuits. |
| | **CO5** | Determine Fourier transformation for continuous time signals and systems |

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

**Method of Examination:**

**Note:- The SEE question paper will be set for 100 marks and the marks scored by the student will be proportionately reduced to 50.**

- The question paper will have **ten** full questions carrying equal marks.
- Each full question carries **20**marks.
- There will be **two** full questions (with a **maximum** of **four** sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.

The students will have to answer **five** full questions, selecting **one** full question from each module.

| Course Title: Analog Electronics | | |
|---|---|---|
| Course Code | 21EI32 | CIE: 50 |
| Number of Lecture Hours/Week | 03 Hrs (Theory) | SEE: 50 |
| Total Number of Lecture Hours : 42 | Credits: 03 | SEE Hours: 03 |
| Prerequisite: Basic Electronics. | | |

**Course Objectives**

1. Become familiar with the construction and characteristics of JFETs and MOSFETs. & BJTS
2. Enable students to design the various biasing circuits of BJTs and FETs
3. Understand and analyze Power amplifier circuits.
4. Understand the concept of Feedback and its effect on amplifier circuits.
5. Enable students to understand and design of the various types Oscillator circuits.

| Modules | Teaching Hours |
|---|---|
| **Module-I**<br>**Transistor Introduction:** Types of transistor, working of a transistor, transistor connections, common base connection and characteristics common emitter connection and its characteristics, common collector connection and its characteristics, relation between $\alpha$, $\beta$ and $\gamma$, comparison of transistor connections,<br>**Field Effect Transistors:** Introduction, Construction and Characteristics of JFETs, MOSFET and their types, Depletion type MOSFET**:** Basic construction, operation and characteristics of P-channel depletion type MOSFETs ,<br>Enhancement type MOSFET: Basic construction, operation and characteristics, of P-channel enhancement type MOSFETs. | **09 Hrs** |
| **Module II**<br>**Transistor Biasing :** Conditions of biasing, DC load line and operating point, stability factor, fixed bias circuits, Self bias or emitter bias circuits, voltage divider biasing circuits and their relevant problems<br>**FET Biasing:** Introduction for biasing of FETs, Fixed-Bias Configuration, Self-Bias Configuration, Voltage Divider Biasing. Relevant numerical problems. Comparison of FETs with BJTs. | **09 Hrs** |
| **Module III**<br>**Multistage Amplifiers:** Introduction to Multistage transistor amplifier, frequency consideration and their important terms, frequency response of an amplifier, RC coupled amplifier, frequency response of RC coupled amplifier, transformer coupled amplifier and its frequency response, Darlington emitter follower | **08 Hrs** |
| **Module - IV**<br>**Power Amplifiers :** Concept and features of power amplifiers, classification of large signal amplifiers, comparison of amplifier classes, series fed class A amplifier, Transformer coupled class A amplifiers, push pull class B amplifier, complimentary | **08 Hrs** |

| | |
|---|---|
| symmetry class B amplifier. | |
| **Module V**<br>**Feedback and Oscillator Circuits: F**eedback concepts, Feedback connection types, effects of negative feedback, particle feedback circuits: BJT based current series and voltage shunt feedback.<br>Oscillator operation, Barkhaunsen's criteria, RC phase oscillator using BJT, Tuned oscillator Circuits: BJT based Hartley oscillator, Transistor Crystal oscillator. | **08 Hrs** |

**Question paper pattern:**
Total ten questions will be asked. Two from each module. The student has to answer five questions, selecting at least one from each module.

**Text Books:**
1. Electronic Circuits: A.P Godse, U.A Bakshi. Technical Publication Pune.
2. Electronic Devices and Circuits Theory: Robert Boylestad and Louis Nashelsky. PHI 9th Edn

**Reference Books :**
1. Integrated Electronic: Jacob Millman and Chritos Halkies, TMH.

**Course outcomes:**
**On completion of the course, the student will have the ability to:**

| Course Code | CO # | Course Outcome (CO) |
|---|---|---|
| **21EI32** | **CO1** | Describe the structure operation of BJT, FET and MOSFET. |
| | **CO2** | Design and implement a biasing circuits for BJT and FET. |
| | **CO3** | Design various transistor amplifier circuits and their frequency response |
| | **CO4** | Acquire the knowledge of classifications , operations of various power amplifiers |
| | **CO5** | Understand the feedback concepts and designing of oscillator circuits. |

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

| Course Title: **Digital System Design** | | |
|---|---|---|
| Course Code | 21EI33 | CIE: 50 |
| Number of Lecture Hours/Week | 03 Hrs (Theory) | SEE: 50 |
| Total Number of Lecture Hours- 42 | Credits: 03 | SEE Hours: 03 |
| Prerequisite: Basic Electronics. | | |

**Course Objectives:** This course will enable the students to

1.To impart the concepts of simplifying Boolean expression using K-map techniques and Quin-Mc-Cluskey minimization techniques.
2. To impart the concepts of designing and analyzing combinational logic circuits.
3. To impart design methods and analysis of sequential logic circuits.
4. To impart the concepts of HDL-Verilog data flow and behavioral models for the design of digital systems.

| **Modules** | **Teaching Hours** |
|---|---|
| **Module I**<br>**Principles of Combination Logic:** Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps- up to 4 variables, Quine- McCluskey Minimization Technique. Quine-McCluskey using Don't Care Terms.(Text 2, Chapter5) | **08 Hrs** |
| **Module II**<br>**Logic Design with MSI Components and Programmable Logic Devices:** Binary Adders and Subtractors, Comparators, Decoders, Encoders, Multiplexers, Programmable Logic Devices ( PLDs), Programmable Read only Memories (PROMS). (Text2, Chapter5) | **08 Hrs** |
| **Module III**<br>**Flip-Flops:** Basic Bistable Elements, Latches, TIMING Considerations, The Master-Slave Flip-flops (Pulse-Triggered flip-flops): SR flip-flops, JK flip-flops, Edge Triggered Flip-flops, Characteristic equations. (Text2, Chapter6) | **08 Hrs** |
| **Module IV**<br>**Simple Flip-Flops Applications:** Registers, Binary Ripple Counters, Synchronous Binary Counters, Counters based on Shift Registers, Design of Synchronous mod-n Counter using clocked T, JK, D and SR flip-flops. (Text2, Chapter6) | **08 Hrs** |
| **Module V**<br>**Introduction to Verilog:** Structure of Verilog module, Operators, Data Types, Styles of Description-Data flow description, Behavioral description.<br>Implementation of half adder and full adder using Verilog data flow description.<br>**Verilog Behavioral description:** Structure, Variable Assignment Statement, Sequential Statements, Loop Statements, Verilog Behavioral Description of Multiplexers (2:1, 4:1, 8:1) (Text 3, Chapters:1,2,3) | **10 Hrs** |

**Text books:**

1. Digital Logic Applications and Design by John M Yarbrough, Thomson Learning, 2001.
2. Digital Principles and Design by Donald D. Givone, McGraw Hill, 2002.
3. HDL Programming VHDL and Verilog By Nazeih M. Botros, 2009 reprint, Dreamtech press.

**Reference Books:**

1. Fundamentals of Logic Design, by Charles H Roth Jr., Cengage Learning.
2. Digital Principles and Design- Donald Givone, 12th reprint, TMH, 2008.
3. Logic Design Sudhakar Samuel, Pearson/ Sanguine, 2007.
4. Fundamentals of HDL-Cyril P R Pearson/ Sanguine 2010.

**Course outcomes:**

On completion of the course, the student will have the ability to:

| Course Code | CO # | Course Outcome (CO) |
|---|---|---|
| **21EI33** | CO1 | Simplify Boolean functions using K-map and Quene-McCluskey minimization technique. |
| | CO2 | Analyze and design for combinational logic circuits. |
| | CO3 | Analyze the concepts of Latches and Flip Flops.(SR, D T and JK). |
| | CO4 | Analyze and design the synchronous sequential circuits. |
| | CO5 | Implement Combinational circuits (adders, subtractors, multiplexers) using Verilog descriptions. |

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

| Course Title: Transducers and Instrumentation | | |
|---|---|---|
| Course Code | 21EI34 | CIE: 50 |
| Number of Lecture Hours/Week | 03 Hrs (Theory) | SEE: 50 |
| Total Number of Lecture Hours : 42 | Credits: 03 | SEE Hours:03 |
| Prerequisite: Basic Electrical Engineering. | | |

**Course Objectives**

1. To import the basic measuring technique.
2. To understand the dynamic behavior of measuring instruments.
3. To import the knowledge of classification of measuring instruments.
4. To understand the measuring principles using transducers.

| Modules | Teaching Hours |
|---|---|
| **Module I**<br>**General measurements and measurement systems:** Introduction, significance of measurements, methods of measurement, primary, secondary and terrestrial measurements, Instruments and Measurement systems, Classification of instruments, Deflection and null type instruments, functions of instruments and Measurement systems, Application of measurement systems, information and signal processing, elements of generalized measurement system.<br>**Static characteristics of instruments and measurement systems:** Measurement system performance, static calibration, static characteristics, errors in measurements, true value, static error, static correction, scale range and scale span, scale readability, reproducibility and repeatability, drift, noise, accuracy and precision, static sensitivity, linearity, hysteresis, threshold, dead time, dead zone, resolution or discrimination.<br>**Errors in measurement:** Types of errors, gross errors, systematic errors, random errors. | **09 Hrs** |
| **Module II**<br>**Dynamic characteristics of instruments:** Dynamic response, dynamic characteristic of measurement system, mathematical models of measurement systems, linear and nonlinear Systems, modeling: of electrical networks, mechanical systems, thermal systems, pneumatic systems, transfer function, block diagram representation, impulse response of linear system, sinusoidal transfer function.<br>**Primary sensing elements and transducers:** Introduction, mechanical devices as primary detectors, mechanical spring devices, pressure sensitive primary devices, electrical transducer, classification of transducers, characteristics and choice of transducers, summary of factor influencing the choice of transducers. | **09 Hrs** |
| **Module III**<br>**Resistive transducers:** Potential meters: Loading effect, power rating of potential meters, linearity and sensitivity, helipots, materials used for potential meters.<br>**Inductive transducers:** Variable inductive transducers: Transducers working on principle of self inductance, differential output of inductive transducers, transducers working on the principle of mutual inductance, types of inductive transducers, transducers working on the principle of Eddy Currents<br>**Linear variable differential Transformers:** Working, advantages of(LVDT), disadvantages of (LVDT), uses of(LVDT).<br>Rotary variable differential transformer (RVDT). | **08 Hrs** |

| | |
|---|---|
| **Module IV**<br>**Capacitive transducers**: Transducer using change in area of plates, transducer using change in distance between plates, differential agreement of capacitive transducers, variation of dielectric constant for measurement of displacement, variation of dielectric constant for measurement of liquid level, advantages of capacitive transducers, disadvantages of capacitive transducers, uses of capacitive transducers.<br>**Piezoelectric transducers:** Modes of operation of piezoelectric crystals, properties of piezoelectric crystals, uses of piezo electrical materials and transducers.<br>**Halls effect transducer:** Application of hall effect transducer. | **08 Hrs** |
| **Module V**<br>**Opto electronic measurements;** Optical spectrum, international luminosity curve, spectral response, optical transducer, threshold wavelength. Optoelectronic transducers, photo voltaic cell, applications of photo voltaic cell, photo conductive cell, application of conductive cell.<br>**Strain gauges:** Theory of strain gauges, types of strain gauges, unbounded metal strain gauge, bonded wire strain gauges, bonded metal foil strain, your operation deposited thin metal strain gauge, semiconductor strain gauges, diffused strain gauges, Rosettes. | **08 Hrs** |

**Question paper pattern:**
Total ten questions will be asked. Two from each module. The student has to answer five questions, selecting at least one from each module.

**Text books:**
1. Electrical Measurements And Instrumentation by A. K. Sawhney and Puneet Sawhney published by Dhanpat Rai &CO.(P) Ltd., Delhi.

**Reference Books:**
1. Instrument Transducer by K.P. NEUBERT.
2. Instrumentation devices and Systems by Rangan, Mani & Sharma.

**Course outcomes:**
**On completion of the course, the student will have the ability to:**

| Course Code | CO # | Course Outcome (CO) |
|---|---|---|
| **21EI34** | **CO1** | Apply the knowledge of general measurement systems, errors and static characteristics of instrument transducers for various applications. |
| | **CO2** | Describe the dynamic characteristics, primary sensing elements, and develop the transfer function of hydraulic, thermal, pneumatic and electrical systems. |
| | **CO3** | Illustrate the construction and working of resistive and inductive transducers. |
| | **CO4** | Demonstrate the principle, working and construction of capacitive, piezoelectric and halls transducers. |
| | **CO5** | Demonstrate the principle and working, construction of strain gauges and Opto electric transducers. |

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

| Course Title: Constitution of India Professional Ethics and Cyber Law | | |
|---|---|---|
| Course Code | 21HU35 | CIE: 50 |
| Number of Lecture Hours/Week | 02 Hrs (Theory) | SEE: 50 |
| Total Number of Lecture Hours : 28 | Credits: 01 | SEE Hours: 03 |
| Prerequisite: Humanities and Social Sciences (H.S.S) | | |
| To enable the students to obtain the basic knowledge about The Constitution of India and Professional Ethics in the following topics:-<br>1. Introduction and Fundamental Rights<br>2. Directive Principles of the State Policy and the State Executive<br>3. The Union Executive<br>4. Constitutional Provisions for women, Children & SC/ST 'S , Emergency Provisions and Election Process<br>5. Engineering Ethics | | |
| **Modules** | | **Teaching Hours** |
| **Module I**<br>**Introduction and Fundamental Rights** : The Constitution of India. Evolution of the Constitution. The Constituent Assembly of India. Sources and Features of the Indian Constitution. Preamble to the Constitution of India. Salient Features of Fundamental Rights and their classification. General exercise of Fundamental Rights and their limitations. RTI (Right to Information Act of 2005 Under Article 19(1)) and The Right of Children to Free and Compulsory Education Act or Right to Education Act (RTE) Under Article 21-A of the Constitution. Special Provisions (Article 370.371 & 371J) for some | | **06 Hrs** |
| **Module II**<br>**Directive Principles of the State Policy and The State Executive**: Under Article 36 to 51 of The Constitution and their Relevance. Fundamental Duties Under Article 51A of The Constitution and their Relevance. State Government - The Governor- Appointment, Powers and Functions of the Governor. The Appointment of Chief Minster, his Powers and Functions. The State Council of Ministers and their Functions. The State legislature and The State Council. The High Court of the State, its Powers and Jurisdiction. Appointment and Qualifications of High Court Judges. | | **06 Hrs** |
| **Module III**<br>**The Union Executive**: Central Government. The President of India, his Election, Powers and Functions. The Vice-President of India, his Election, Powers and Functions. The Supreme Court of India and its Structure. Appointment and Qualification of Supreme Court Judges. Their Powers and Functions. The Structure of Judiciary in India. The Parliament of India. The Prime Minister, his Appointment, Powers and Functions. The Union Council of Ministers their Powers and Responsibilities. Concept of Public Interest Litigation (PIL) | | **06 Hrs** |
| **Module - IV** | | |

| | |
|---|---|
| **Constitutional Provisions and Emergency Provisions and Election Process** : Constitutional for Women, Children, Backward Classes and Scheduled Caste and Scheduled Tribes under different Article of The Constitution. Different types of Emergencies under Article 352, 356 and 360 of the Constitution of India. The Election Commission of India- its Powers and Functions. The State Election Commission | **05 Hrs** |
| **Module V**<br>**Engineering Ethics :** Its Aims and Scope, Responsibilities of Engineers, Impediments to their Responsibilities, Honesty, Integrity, Reliability, Risk and Safety Measures, Liabilities of Engineers. | **05 Hrs** |

**Question paper pattern:**
Solve five full questions selecting atleast one question from each Module

**Text Books:**

1. An introduction to the constitution of India and Profession Ethics. by B. R. Venkatesh and Merunandan K. B. Publisher : Idea International Publication Bangalore.
2. The Constitution of India and Professional Ethics.by K. R. Phaneesh. Publisher : Sudha Publication Bangalore.
3. Professional Ethics. By S. Chand. Publisher : S. Chand & Company Ltd. Ram Nagar, New Delhi - 110055.

**Reference Books :**

1. Constitution of India and Professional Ethics By : M Raja Ram. Publisher : New Age International(P) Limited, New Delhi.
2. The Constitutional law of India By : J.N. Pandhey . Publisher : Central Law agency , Allahabad.

**Pre requisites:** None

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

| Course Code | CO # | Course Outcome (CO) |
|---|---|---|
| 21HU35 | **CO1** | Explain the evolution and features of constitution, fundamental rights and their classification L 2 |
| | **CO2** | Describe the directive principles of state policy, fundamental duties and The State Executive L 2 |
| | **CO3** | Describe about The Union Executive and concept of Public Interest Litigation L 2 |
| | **CO4** | Explain the Constitutional Provisions for women, children, SC/ST'S, Emergency Provisions and Election Process L 2 |
| | **CO5** | Identifies the qualities required for an professional engineers to be ethical L 4 |

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

| Course Title: Summer Internship-I | | |
|---|---|---|
| Course Code | 21INT36 | CIE: 50 |
| Number of Practical Hours/Week: | | SEE: 50 |
| | Credits: 02 | |

| Course Title: Electronics Circuits Lab Using PSPICE | | |
|---|---|---|
| Course Code | 21EIAE36A | CIE: 50 |
| Number of Practical Hours/Week | 02 Hrs (Practical) | SEE: 50 |
| | Credits: 01 | SEE Hours: 03 |

Prerequisite: Analog Electronics Lab.

**Course Objectives**

1. To provide practical exposure to the students on designing, setting up, executing and debugging various electronic circuits using simulation software.
2. To give the knowledge and practical exposure on simple applications of electronic circuits.

**Experiments: Electronics Circuits Lab Using PSPICE**

1. Experiments to realize diode clipping ( Single and double ended) circuits.
2. Experiments to realize diode clipping (positive, negative) circuits.
3. Experiments to realize Full wave rectifier without filter (and set-up to measure the ripple factor, Vp-p, Vrms, etc.)
4. Design and conduct an experiment on series Voltage Regulator using Zener diode to determine line/ load regulation characteristics.
5. Realize BJT Darlington Emitter follower without bootstrapping and determine the gain, input and output impedances
6. Experiment to realize Input and Output characteristics of BJT Common emitter configuration and evaluation of parameters.
7. Experiment to realize transfer and drain characteristics of a MOSFET.
8. Set-up and study the working of class A power amplifier and calculate the efficiency.
9. Set-up and study the response of a two stage RC-coupled amplifier and calculate the bandwidth
10. To design and test the Common emitter -Common base cascade amplifier to determine the gain and bandwidth from its frequency response.
11. Design and set-up the Wein bridge oscillator and determine frequency of oscillator.
12. Design and set-up the oscillator circuits (Hartley/Colpitts using BJT/FET) and determine the frequency of oscillator.

**Course outcomes:**
**On completion of the course, the student will have the ability to:**

| Course Code | CO # | Course Outcome (CO) |
|---|---|---|
| 21EIAE36A | **CO1** | Explain the circuit schematic and its working. |
| | **CO2** | Study the characteristics of different electronic devices. |
| | **CO3** | Design and test simple electronics circuits as per the specifications using discrete electronic components. |

| | | |
|---|---|---|
| | **CO4** | Compute the parameters from the characteristics of active devices. |
| | **CO5** | Familiarize with EDA software which can be used for electronic circuit simulation |

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

| Universal Human Values-I | | |
|---|---|---|
| Course Code | 21HUV36B | CIE: 50 |
| Number of Lecture Hours/Week | 2hrs (Tutorial) | SEE: 50 |
| Total Number of Theory Hours :14 | Credits:1 | SEE Hours: 03 |

**Course Objectives:**

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 the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards 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 behaviour and mutually enriching interaction with Nature.

| Modules | Teaching Hours |
|---|---|
| **Module I**<br>**Introduction To Value Education:** Understanding Value Education, Need Of Value Education, Basic Guidelines For Value Education, The Content Of Value Education, The Process Of Value Education.<br>**Self- Exploration As The Process For Value Education:** Starting To Observe Inside, What Is Self-Exploration? What Is Its Purpose?, Content Of Self-Exploration, Natural Acceptance, What Is The State Today?, What Is The Way Out? What Do We Need To Do?. | **03 Hrs** |
| **Module II**<br>**The Basic Human Aspirations- Continuous Happiness And Prosperity:** Continuous Happiness And Prosperity- Our Basic Aspiration, Exploring Happiness And Prosperity, A Look At The Prevailing Notions Of Happiness And Prosperity, Some Possible Questions/ Confusions.<br>**The Program To Fulfill Basic Aspiration:** Basic Requirements For Fulfillment Of Human Aspirations, What Is Our State Today?, Why Are We In This State?- Living With Wrong Assumptions, What Is The Solution?- The Need For Right Understanding, Our Program: Understand And Live In Harmony At All Levels Of Living, Our State Today?, Our Natural Acceptance For Harmony At All Levels Of Our Living, Human And Animal Consciousness. | **03 Hrs** |
| **Module III**<br>**Understanding The Harmony At Various Levels:** Understanding The Human Being As Co-Existence Of Self(I) And Body, Human Being Is More Than Just The Body, Understanding Myself As Coexistence Of Self And The Body, Understanding The Needs Of The Self And Needs Of The Body, Understanding The Self(I) As A Conscious Entity, The Body As The Material Entity, Exercise On Distinguishing Needs Of The Self(I) And The Body, Exercise On Distinguishing Activities Of The Self(I) And Body, Understanding The Body As An Instrument Of 'I'(I Being The Seer, Doer And Enjoyer). | **03 Hrs** |

| | |
|---|---|
| **Harmony In Self(I)- Understanding Myself:** Why Should I Study Myself?, Getting To Know The Activities In I Related?, The Activities In I Are Continuous, What Is The Problem Today?, Effects Of The Problem, What Then Is The Solution?, Result Of Realization And Understanding- Living With Definiteness.<br>**Harmony With The Body- Understanding *Sanyama* And *Svashtya:*** Our Body- A Self-Orgnaised Unit, Harmony Of I With The Body: *Sanyama* And *Svashtya*, What Is Our State Today?, What Is The Way Out?, Understanding And Living With Sanyama, Correct Appraisal Of Our Physical Needs. | |
| **Module IV**<br>**Harmony In The Family- Understanding Values In Human Relationships:** Family As The Basic Unit Of Human Interaction, Harmony In The Family, Justice*(Nyaya)*, What Is The State Today?, Values In Human Relationships, Trust(*Visvasa*),Respect(*Sammana*), The Basis For Respect, Assumed Bases For Respect Today, The Problem Due To Differentiation, Difference Between Attention And Respect, What Is The Way Out?, Affection (*Sneha*), Care(*Mamata*), Guidance(*Vatsalya*),Reverence(*Shraddha*),Glory(*Gaurava*),Gratitude(*Kritagyata*),Love(*Prema*), Harmony From Family To World Family: Undivided Society.<br>**Harmony In The Society-From Family Order To World Family Order:** Extending Relationship From Family To Society, Identification Of The Comprehensive Human Goal, Where Are We Today?, Programs Needed To Achieve The Comprehensive Human Goal: Five Dimensions Of Human Endeavour, Education-Right Living (*Siksha-Sanskara*), Health-Self-Regulation (*Svasthya-Sanyama),* Justice-Preservation (Nyaya-Suraksha), Production-Work (*Utpadana-Karya*), Exchange-Stotage (*Vinimaya-Kosa*), What Is Our State Today?, Harmony From Family Order To World Family Order: Universal Human Order. | **03 Hrs** |
| **Module V**<br>**Harmony In Nature-Understanding The Interconnectedness And Mutual Fulfillment:** The Four Orders Of Nature, Incconnectedness And Mutual Fulfillment(Parasparta And Paraspara Purakata), Recyclability And Self-Regulation In Nature, Understanding The Four Orders-Things (Vastu), Activity(Kriya), Innateness(Dharana), Natural Characteristic(Svabhava), Basic Activity, Conformance(Anu-Sangita), Human Beings-Our State Today, What Is The Way Out?.<br>**Harmony In Existence-Understanding Existence As Co-Existence**:An Introduction To Space(Sunya), Co-Existence Of Units In Space, Limited And Unlimited, Active And No-Activity, Energised And Energy In Equilibrium, Each Unit Recognizes…. Space Is Reflecting Or Transparent, Self-Organised And Self-Organisation Is Available, Existence Is Co-Existence, What Are We Doing Today?, Where Do We Want To Be? | **02 Hrs** |

**Text Books:**


1. The Text Book R.R Gaur, R Sangal, G P Bagaria, A Foundation Course In Human Values And Professional Ethics, Excel Books, New Delhi, 2010, ISBN 978-8-174-46781-2.
2. The teacher's manual R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010


**Reference Books:**


1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA

5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6. Subhas Palekar, 2000, How to practce Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, Small is Beautful: a study of economics as if people mattered, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, Human Values, New Age International Publishers.


**Course outcomes: On completion of the course, the student will have the ability to:**

| Course Code | CO | Course Outcome (CO) |
|---|---|---|
| 21HUV36B | **CO1** | The students are able to see that verification on the basis of natural acceptance and experiential validation through living is the only way to verify right or wrong, and referring to any external source like text or instrument or any other person cannot enable them to verify with authenticity; it will only develop assumptions |
| | **CO2** | The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time, and all they need to do is to refer to their natural acceptance to remove this disharmony |
| | **CO3** | The students are able to see that lack of right understanding leading to lack of relationship is the major cause of problems in their family and not the lack of physical facilities in most of the cases, while they have given higher priority to earning of physical facilities in their life ignoring relationships and not being aware that right understanding is the most important requirement for any human being |
| | **CO4** | The students feel confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different courses of study relate to the different units and levels. Also they are able to make out how these courses can be made appropriate and holistic. |
| | **CO5** | The students are able to grasp the right utilization of their knowledge in their streams of Technology/Engineering/ Management to ensure mutually enriching and recyclable productions systems. |
| | **CO6** | The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for a happy and prosperous society. |

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

| Course Title: Analog Electronics Lab | | |
|---|---|---|
| Course Code | 21EIL31 | CIE: 50 |
| Number of Practical Hours/Week | 03 Hrs (Practical) | SEE: 50 |
| | Credits: 01 | SEE Hours: 03 |

Prerequisite: Basic Electronics.

**Course Objectives**

This laboratory course enables students to get practical knowledge & experience in design, assembly and evaluation/testing of

1. BJT as Amplifier without and with feedback
2. JFET Characteristics and as Amplifier.
3. MOSFET Characteristics
4. BJT as Power Amplifiers
5. Oscillators using BJT, UJT and FET for frequency generation
6. UJT characteristics.

1. To study the VI characteristics of BJT and graphical calculation of operating point
2. To study the VI characteristics of JFET and graphical calculation of operating point
3. Design and study of transistor biasing using base resistor method comparing the theoretical values with practical values.
4. Design and study of transistor biasing circuit using voltage divider method and comparing the theoretical values with practical values.
5. Study of RC coupled single stage amplifier and determination of the gain, frequency response, input and output impedances.
6. Study of voltage shunt feedback amplifier and determination of the gain, frequency response.
7. Testing of class-B push pull amplifier and determination of its conversion efficiency.
8. Design and testing for the performance of RC phase shift oscillator for the frequency 1kHz to 5kHz.
9. Design and testing for the performance of Hartley oscillator for the frequency 5kHz to 10kHz.
10. Design and testing for the performance of Colpitts oscillator for RF range 20kHz to 50kHz.
11. Design and testing for the UJT oscillator.
12. To design and study the frequency response of Common Source JFET amplifier and to determine its bandwidth.

**Course outcomes:**

**On completion of the course, the student will have the ability to:**

| Course | CO # | Course Outcome (CO) |
|---|---|---|

| Code | | |
|---|---|---|
| **21EIL31** | **CO1** | Demonstrate the characteristics of bipolar transistors, FET and MOSFET. |
| | **CO2** | Design the biasing circuits of bipolar transistors. |
| | **CO3** | Demonstrate the working and frequency response of BJT amplifiers and JFET amplifiers. |
| | **CO4** | Design the various types of oscillator circuits using bipolar transistor and UJT. |
| | **CO5** | Demonstrate to show working of power amplifier and improve its efficiency |

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

| Course Title: **Digital Systems Design Lab** | | |
|---|---|---|
| Course Code | 21EIL32 | CIE: 50 |
| Number of Practical Hours/Week | 03 Hrs (Practical) | SEE: 50 |
| | Credits: 01 | SEE Hours: 03 |

Prerequisite: Basic Electronics, C programming.

**Course Objectives:** This course will enable the students to

1. Understand the operation of various logic gates and digital circuits .
2. Design of logic circuits for combinational and sequential.
3. Synthesis of digital circuits, FFs and Shift registers using ICs.
4. Design different counters.

**List of Experiments**

**Note:** 1. Use discrete components to test and verify the logic gates.

1. Simplification, realization of Boolean expressions using logic gates / Universal gates.
2. To design and implement
   a) Adder / Subtractor - Full / half using logic gates.
   b) 4-bit Parallel Adder / Subtractor using 7483.
3. To realize BCD to Excess-3 code conversion.
4. To realize Binary to Grey code conversion and vice versa.
5. To realize
   a) 4:1 Multiplexer using gates
   b) 1:8 Demux
6. To realize Priority encoder and 3:8 Decoder using IC74138
7. To Design and realize One bit / Two bit comparators.
8. To realize the following flip-flops using NAND Gates
   a) T type b) JK Master slave c) D type
9. To realize the 3-bit counters as a sequential circuit and Mod-N counter design (7476, 7490, 74192, 74193)
10. To study shift registers .

**Text books:**

1. Digital Design by Morris Mano.
2. HDL with Digital Design VHDL & Verilog. Author: N. Botros

**Reference Books:**

1. Digital Principles and Design - Donald D Givone, 12th reprint, TMH, 2008.
2.HDL Programming VHDL and Verilog by Nazeih M Botros, 2009 reprint, Dreamtech press.
3. Digital Logic Applications and Design by John M Yarbrough, Thomson Learning, 2001.
4. Fundamentals of HDL - Cyril P R, Pearson / Sanguine 2010

| **Course outcomes:**<br>**On completion of the course, the student will have the ability to:** | | |
|---|---|---|
| **Course Code** | **CO #** | **Course Outcome (CO)** |
| **21EIL32** | **CO1** | Realize Boolean expression using Universal gates / basic gates. |
| | **CO2** | Demonstrate the function of adder / subtractors circuits using gates/ICs. |
| | **CO3** | Design and analyze the comparator, Multiplexers, Decoders, Encoder circuits using ICs. |
| | **CO4** | Design and implement shift registers and counters. |
| | **CO5** | Design and analysis of different mod N counters using FFs. |

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

| Course Title: Transducers Lab | | |
|---|---|---|
| Course Code | 21EIL33 | CIE: 50 |
| Number of Practical Hours/Week | 02 Hrs (Practical) | SEE: 50 |
| | Credits: 01 | SEE Hours: 03 |

Prerequisite: Basic Instrumentation

**Course Objectives:** The course will enable the students to understand the concepts of

1. Measuring leaner, angular displacement using capacitive, potentiometer.
2. Displacement measurement using Photo voltaic transducer and LVDT.
3. Working of strain gauge, load cell, Piezo electric transducer and Hall transducer.
4. Photo diode, photo transistor and dependent resistor.

**List of Experiments**

1. Conduct an experiment to measure the angular displacement using capacitive transducer.
2. Conduct an experiment to measure linear and angular distance using potentiometer transducer.
3. Conduct an experiment for distance measurement with Photo voltaic transducer.
4. Conduct an experiment to study the behavior of strain gauge.
5. Conduct an experiment to study the characteristics of loadcell.
6. Conduct an experiment on Piezo electric transducer.
7. Conduct an experiment to measure displacement using LVDT.
8. Conduct an experiment to measure speed by Hall transducer.
9. Conduct an experiment to study the characteristics of photo transistor.
10. Conduct an experiment to study the characteristics of photo diode.
11. Conduct an experiment to measure characteristics of light dependent resistor (LDR)

**Course outcomes:**
**On completion of the course, the student will have the ability to:**

| Course Code | CO # | Course Outcome (CO) |
|---|---|---|
| **21EIL33** | **CO1** | Demonstrate the working of capacitive transducer and potentiometer |
| | **CO2** | Illustrate the principle of strain gauge, and Photo voltaic transducer |
| | **CO3** | Demonstrate the working of LVDT and load cell |
| | **CO4** | Demonstrate the working of Hall transducer and Piezo electric transducer. |
| | **CO5** | Analyze the characteristics of photo diode, photo transistor and LDR. |

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