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*D. Y. PatilEducation Society's*

# D. Y. Patil Technical Campus, Talsande
# Faculty of Engineering and Faculty of Management

*(An Autonomous Institute)*

**Approved by AICTE and affiliated to Shivaji University Kolhapur**

*(Accredited by NAAC with 'A' Grade in First Cycle)*

# Department of Electrical Engineering

## Curriculum Structure and Syllabus of

## S.Y B.Tech -Engineering (Course 2025)

**Effective from Academic Year 2025-26**

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# ABBREVIATIONS IN CURRICULUM STRUCTURE

| Sr.No | Abbreviations | Type of Course |
|---|---|---|
| 1 | BSC | Basic Science Course |
| 2 | ESE | Engineering Science Course |
| 3 | PCC | Programme Core Course |
| 4 | PEC | Programme Elective Course |
| 5 | MDM | Multidisciplinary Minor |
| 6 | OE | Open Elective |
| 7 | VSEC | Vocational and Skill Enhancement Course |
| 8 | AEC | Ability Enhancement Course |
| 9 | HSSM | Humanities Social Science and Management |
| 10 | IKS | Indian Knowledge System |
| 11 | VEC | Value Education Course |
| 12 | FP | Field Project |
| 13 | ELC | Experiential Learning Courses |
| 14 | CCA | Co-curricular Courses |
| 15 | MC | Mandatory Course |
| 16 | MSE | Mid Semester Examination |
| 17 | CA | Continuous Assessment |
| 18 | POE | Practical Oral Examination |
| 19 | ESE | END Semester Examination |

# CURRICULUM FRAMEWORK

## The Course and Credit Distribution

| Sr.No | Type of Course | No.of Courses | Total No. Credit |
|---|---|---|---|
| 1 | Basic Science Course (BSC) | 4 | 16 |
| 2 | Engineering Science Course (ESE) | 3 | 12 |
| 3 | Programme Core Course(PCC) | 16 | 54 |
| 4 | Programme Elective Course (PEC) | 6 | 20 |
| 5 | Multidisciplinary Minor (MDM) | 6 | 14 |
| 6 | Open Elective (OE) | 3 | 8 |
| 7 | Vocational and Skill Enhancement Course (VSEC) | 5 | 8 |
| 8 | Ability Enhancement Course (AEC) | 2 | 4 |
| 9 | Humanities Social Science and Management(HSSM) | 2 | 4 |
| 10 | Indian Knowledge System(IKS) | 1 | 2 |
| 11 | Value Education Course (VEC) | 2 | 4 |
| 12 | Research Methodology | 1 | 4 |
| 13 | Field Project (FP) | 1 | 2 |
| 14 | Experiential Learning Courses(ELC) | 2 | 16 |
| 15 | Co-curricular Courses (CC) | 2 | 4 |
| 16 | Mandatory Course (MC) | 8 | - |
| **Total** | | **63** | **172** |

| CREDIT DISTRIBUTION : SEMESTER WISE | | | | | | | | | | Total | Total Credits GR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Lecture hour = 1 Credit 2 Lab Hours = 1 Credit 1 Tutorial Hour = 1 Credit | | | | | | | | | | | |
| Sr. No | Type of Course | No of Credits /Semester | | | | | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | |
| 1 | Basic Science Course (BSC) | 8 | 8 | | | | | | | 16 | 14-18 |
| 2 | Engineering Science Course (ESE) | 8 | 4 | | | | | | | 12 | 16-12 |
| 3 | Programme Core Course(PCC) | | 2 | 10 | 10 | 12 | 10 | 6 | 4 | 54 | 44-56 |
| 4 | Programme Elective Course (PEC) | | | | | 4 | 8 | 6 | 2 | 20 | 20 |
| 5 | Multidisciplinary Minor (MDM) | | | 2 | 2 | 4 | 2 | 2 | 2 | 14 | 14 |
| 6 | Open Elective (OE) | | | 4 | 2 | 2 | | | | 8 | 8 |
| 7 | Vocational and Skill Enhancement Course (VSEC) | 2 | 2 | | 2 | | 2 | | | 8 | 8 |
| 8 | Ability Enhancement Course (AEC) | | 2 | | 2 | | | | | 4 | 4 |
| 9 | Entrepreneurship Management Courses | | | 2 | 2 | | | | | 4 | 4 |
| 10 | Indian Knowledge System(IKS) | 2 | | | | | | | | 2 | 2 |
| 11 | Value Education Course (VEC) | | | 2 | 2 | | | | | 4 | 4 |
| 12 | Research Methodology | | | | | | | 4 | | 4 | 4 |
| 13 | Field Project | | | 2 | | | | | | 2 | 2 |
| 14 | Project | | | | | | | 4 | | 4 | 4 |
| 15 | Internship | | | | | | | | 12 | 12 | 12 |
| 16 | Co-curricular Courses (CC) | 2 | 2 | | | | | | | 4 | 4 |
| Total | | 22 | 20 | 22 | 22 | 22 | 22 | 22 | 20 | 172 | 160-176 |

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Scheme of Instructions: Second YearB.Tech.in Electrical Engineering

**Programme:-Electrical Engineering**

**Semester–III (w.e.f. A.Y. 2024-25)**

| Sr. No. | Course Category | Course Code | Course Title | L | T | P | Course Credits | EXAM SCHEME | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | ISE | MSE | ESE | INT | OE/POE | TOTAL |
| 1 | PCC | EE24-211 | Analog Electronics | 2 | -- | -- | 10 | 20 | -- | 30 | -- | -- | 50 |
| | | EE24-211L | Analog Electronics Lab | -- | -- | 2 | | -- | -- | -- | 25 | 25 | 50 |
| | | EE24-212 | Electrical Measurements & Instrumentation | 3 | -- | -- | | 20 | 30 | 50 | -- | -- | 100 |
| | | EE24-212L | Electrical Measurements & Instrumentation Lab | -- | -- | 2 | | -- | -- | -- | 25 | 25 | 50 |
| | | EE24-213 | Power System | 3 | -- | -- | | 20 | 30 | 50 | -- | -- | 100 |
| 2 | MDM-01 | EE24-214-MDM-1 | List is Attached | 2 | -- | -- | 2 | 20 | -- | -- | 30 | -- | 50 |
| 3 | OE-I | EE24-215-OE-I | Open Elective-I | 3 | 1 | -- | 4 | 20 | 30 | 50 | 25 | -- | 125 |
| 4 | HSSM | EE24-216 | Industrial Management | 2 | -- | -- | 2 | -- | -- | 50 | | -- | 50 |
| 5 | HSSM-VEC | EE24-217 | Positive Attitude and Behavior | 2 | -- | - | 2 | 20 | -- | -- | 30 | -- | 50 |
| 6 | FP | EE24-218-FP | Field Project | -- | -- | 4 | 2 | -- | -- | -- | 50 | -- | 50 |
| 7 | MC | EE24-219 | Finishing School Training III | 3 | - | - | **Audit** | - | - | - | GRADE | - | GRADE |
| **Total** | | | | **20** | **01** | **08** | **22** | **120** | **120** | **230** | **155** | **50** | **675** |

**Course Scheme Abbreviations:**-1.L-Lecture 2.T-Tutorial 3.P-Practical 4.MSE-MidSemesterExamination 5.ISE-InSemesterEvaluation 6. ESE-End Semester Examination 7. INT-Internal Assessment based on Laboratory Work/Practical Work/Tutorial/ Mini Project.

| **TRACK Sustainable Energy Engineering** |
|---|
| Energy and its Resources |

| **Open Elective -I** |
|---|
| Electrical Technology |

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Scheme of Instructions: Second YearB.Tech.in Electrical Engineering

**Programme:-Electrical Engineering**

**Semester–IV (w.e.f. A.Y. 2024-25)**

| No. | Course Category | Course Code | Course Title | L | T | P | Course Credits | EXAM SCHEME | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | ISE | MSE | ESE | INT | OE/POE | TOTAL |
| 1 | PCC | EE24-221 | Electrical Circuits Analysis | 3 | -- | -- | 10 | 20 | 30 | 50 | -- | -- | 100 |
| | | EE24-222 | DC Machines & Transformer | 3 | -- | -- | | 20 | 30 | 50 | -- | -- | 100 |
| | | EE24-222L | DC Machines & Transformer Lab | -- | -- | 2 | | -- | -- | -- | 25 | 25 | 50 |
| | | EE24-223 | Power Electronics | 2 | -- | -- | | 20 | -- | 30 | | -- | 50 |
| | | EE24-223L | Power Electronics Lab | -- | -- | 2 | | -- | -- | -- | 25 | 25 | 50 |
| 2 | MDM-02 | EE24-224-MDM-II | List is Attached | 2 | -- | -- | 2 | 20 | -- | -- | 30 | -- | 50 |
| 3 | OEC-II | EE24-225-OEC-II | Open Elective-II | 2 | -- | -- | 2 | 20 | -- | 30 | - | -- | 50 |
| 4 | VSEC | EE24-226 | Software Tools for Engineers | -- | -- | 2 | 2 | -- | -- | -- | 25 | -- | 25 |
| | | EE24-227 | Mini Project | -- | -- | 2 | | -- | -- | -- | 50 | -- | 50 |
| 5 | AEC | EE24-228 | Professional Communication Skills | 2 | -- | -- | 2 | 20 | -- | -- | 30 | -- | 50 |
| 6 | HSSM-EEMC | EE24-229 | Economics for Engineers | 2 | -- | -- | 2 | 20 | -- | 30 | -- | -- | 50 |
| 7 | VEC | EE24-230 | Environmental Studies | 2 | -- | -- | 2 | 20 | -- | -- | 30 | -- | 50 |
| 8 | MC | EE24-231 | Finishing School Training IV | 3 | - | - | **Audit** | - | - | - | GRADE | - | GRADE |
| 9 | CCA | EE24-232-CCA | Value Added Course | - | - | - | **Audit** | - | - | - | GRADE | - | GRADE |
| **Total** | | | | **21** | **--** | **08** | **22** | **160** | **60** | **190** | **205** | **50** | **675** |
| 10 | HC Optional | EE24-201 | Honors Paper- I | 3 | -- | 2 | 4 | 20 | 30 | 50 | 25 | -- | 125 |

| **TRACK Sustainable Energy Engineering** |
|---|
| Energy Storage for Renewable System |

| **Open Elective -II** |
|---|
| Microcontroller & It's Application |

| **Course Title :-Analog Electronics(PCC)** | |
|---|---|
| **Course Code:-EE24-211** | **Semester:- III** |
| **Teaching Scheme L-T-P :-2-0-0** | **Credits : 2** |
| **Evaluation Scheme: ISE-20Marks MSE-N.A.** | **ESE Marks: 30 Marks** |

| **Prior Knowledge of:** | Basic understanding of circuit theory, including Ohm's Law, Kirchhoff's Laws and Basic Semiconductor Physics |
|---|---|

| **Course Description** | This course is designed to provide students with a comprehensive understanding electronics circuits that process continuous signals. The course focuses on the analysis, design and practical implementation of analog circuits used in various electronic systems. Topic covered include basic semiconductor devices (Diodes, BJT's), amplifiers, operational amplifiers (op-Amp's), Filters, Oscillators. |
|---|---|

| **Course Objectives:** | |
|---|---|
| **1.** | To learn of semiconductor devices such as Diodes, Bipolar Junction Transistors (BJT's) AMP's, including their operating principles, characteristic's and application's in electronic circuits. |
| **2.** | To investigate basic amplifier circuits using semiconductor devices, including common-emitter and common source amplifiers, to achieve desired voltage and power gain characteristics. |
| **3.** | To appeal the knowledge gained during the course to design and implement complex electronic circuits using various circuit building blocks. |

**Curriculum Details:**

| **Course Contents** | **Duration** |
|---|---|
| **Unit- I Introduction to Analog Electronics**<br>• Semiconductor physics<br>• Introduction to P-N junction Diodes<br>• Operation, characteristics of P-N Junction diodes<br>• Concept of load line<br>• Zener diode and its break down phenomena,<br>• Application of zener diode as a voltage regulator<br>• LED, Photo diode, Varactor diode and its characteristics<br>• Half wave and Full wave Rectifiers, filters | **08 Hrs** |
| **Unit- II Amplifiers**<br>• Small signal amplifier's<br>• Single-stage and multistage amplifiers, cascading, need for cascading<br>• working of single stage BJT amplifier, N stage cascaded amplifiers,<br>• working principle, operating characteristics, bandwidth of multistage amplifiers<br>• Power amplifiers: need for power amplifiers, working principle<br>• Classification of power amplifiers: class A, class B, class C, and class D, Push-pull amplifier. | **07 Hrs** |

| | |
|---|---|
| **Unit-III Feedback Amplifier & Oscillators**<br>• General theory of feedback ,importance of negative feedback, types of negative feedback amplifiers<br>• Barkhausen criteria<br>• Oscillators: Hartley oscillator, collpits oscillator, RC phase shift oscillator, Tuned oscillator, Crystal oscillator, wein bridge oscillator, clap oscillator | **07 Hrs** |
| **Unit-IV Operational Amplifiers(OP-AMP) & Multivibrator**<br>• Inverting, non-inverting and differential amplifier, voltage gain derivation (Numerical expected) cascaded op-amp circuits<br>• Applications of op-amps: Summing, scaling and average amplifier, Instrumentation amplifier, Integrator, Differentiator. Log and antilog amplifiers, Schmitt Trigger. D-A convertor,<br>• Introduction of timer, IC 555 Timer functional diagram, IC 555 as Monostable multi-vibrator & Astable multi-vibrator<br>• Introduction to PLL IC 565 | **08 Hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **211.1** | **Apply** the fundamental principles of semiconductor physics to analyze the working and characteristics of P-N junction and special diodes such as Zener, LED, Photodiode, and Varactor diodes & its applications. |
| **211.2** | **Analyze** the performance of small signal analysis. |
| **211.3** | **Relate** various types of feedback amplifiers and oscillator circuits (e.g., Hartley, Colpitts, RC Phase Shift, Wein Bridge, etc.) to generate sinusoidal signals at specified frequencies. |
| **211.4** | **Evaluate** operational amplifier configurations and their applications in analog signal processing and timer ICs (IC 555) to implement Multivibrator circuits and understand their role in timing and waveform generation applications. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| CO \ PO/PSO | BT Level | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | - | - | - | - | - | 2 | - | - | - | 3 | 2 |
| **CO2** | 4 | 3 | 3 | 2 | - | - | - | - | 2 | - | - | - | 2 | 2 |
| **CO3** | 4 | 3 | 3 | 3 | 2 | - | - | - | 2 | - | - | - | 3 | 3 |
| **CO4** | 5 | 3 | 2 | 3 | 2 | 2 | - | - | 2 | - | - | - | 3 | 3 |

**Suggested Learning Resources:**

**Text Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Analog Electronics | 2nd | J.B.Gupta | S.K. Kataria & Sons | 2012 |
| 2 | Electronic Devices And Circuits Theory | 6th | Robert L. Boylestad, Louis Nashelsky | Pearson Prentice Hall, 2006 | 2012 |
| 3 | Electronic Principles | 9th | Albert P. Malvino , David J. Bates , Patrick E. Hoppe | McGraw Hill | 2021 |

**Reference Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Fundamentals of Microelectronics | 2nd | Behzed Razavi | Willey Precise | 2013 |
| 2 | Microelectronic Circuit | 6th | Adel Sedra , Kenneth C. Smith | Oxford Univ Pr | 2009 |

**Useful Link /Web Resources:**

1. DELNET- http://www.delnet.in
2. NDL-http://ndl.iitkgp.ac.in
3. N-LIST- http://www.nlist.inflib.ac.in

| | |
|---|---|
| **Course Title :-Analog Electronics Lab(PCC)** | |
| **Course Code:-EE24-211L** | **Semester:- III** |
| **Teaching Scheme L-T-P :-0- 0 - 2** | **Credits : 1** |
| **Evaluation Scheme: INT-25 Marks** | **OE/POE Marks: 25 Marks** |

| | |
|---|---|
| **Prior Knowledge of:** | Basic understanding of circuit theory, including Ohm's Law, Kirchhoff's Laws and Basic Semiconductor devices, OP-AMP |

| | |
|---|---|
| **Course Description** | This course is aims to help the students understand practical use and implementation of the theoretical concepts of semiconductor devices and circuits. The students are exposed to different analog electronic components and circuits, their practical feasibility, capability and limitations regarding their best utilization in specific situation. The course emphasizes circuit design and analysis skills that require the student to create and analyze that meet customer/ user specifications as industry professional or entrepreneur. |

| **Course Objectives:** | |
|---|---|
| **211.1** | **Introduce the fundamentals of semiconductor physics** to explain the behavior of electronic components. |
| **211.2** | **Enable understanding of various diodes** (P-N junction, Zener, LED, photodiode, varactor), their characteristics, and practical applications including rectification and voltage regulation. |
| **211.3** | **Familiarize students with amplifier circuits**, including small signal and power amplifiers, and provide insight into multi-stage and cascaded amplifier design. |
| **211.4** | **Explain the concepts of feedback and oscillation**, and guide students in analyzing and designing feedback amplifiers and various oscillator circuits. |
| **211.5** | **Introduce the use of timer circuits (IC 555)** and PLL (IC 565) for waveform generation and control applications. |

**Curriculum Details:**

| List of Experiments | Duration |
|---|---|
| **Experiment 1:** To Perform various semiconductor Devices. | **02 Hrs** |
| **Experiment 2:** To Perform Zener diode as shunt voltage regulator. | **02 Hrs** |
| **Experiment 3:** To Perform Half wave and Full wave rectifier with and without filter. | **02 Hrs** |
| **Experiment 4:** To Perform BJT Power Amplifier. | **02 Hrs** |
| **Experiment 5:** To plot input & output characteristics of BJT. | **02 Hrs** |
| **Experiment 6 :** To Perform RC phase shift oscillator for desired frequency | **02 Hrs** |
| **Experiment 7 :** To Perform Inverting Amplifier using IC 741 | **02 Hrs** |
| **Experiment 8:** To Perform Non-Inverting Amplifier using IC 741 | **02 Hrs** |
| **Experiment 9:** To Perform Adder, subratractor and average using IC 741 | **02 Hrs** |
| **Experiment 10:** To Perform Schmitt Trigger using IC 741 | **02 Hrs** |
| **Experiment 11:** To Perform Differentiator and Integrator using IC 741 | **02 Hrs** |
| **Experiment 12:** To Perform Astable and Monostable Multivibrator using IC 555 | **02 Hrs** |
| **Experiment 13:** To Perform IC 741 as Log & Antilog Amplifiers | **02 Hrs** |
| **Experiment 14:** To plot frequency response of single stage RC coupled CE amplifier & determine its bandwidth.( MATLAB Software Based) | **02 Hrs** |
| **Experiment 15:** To observe the negative feedback (Emitter Bypass Capacitor) on the frequency response of an amplifier.( MATLAB Software Based) | **02 Hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **211.1** | **Analyze** the characteristics and behavior of semiconductor devices |
| **211.2** | **Evaluate** the performance of rectifier circuits (half-wave and full-wave) with and without filters for AC to DC conversion. |
| **211.3** | **Design & Develop** amplifier and oscillator circuits including BJT power amplifiers and RC phase shift oscillators for signal amplification and generation. |
| **211.4** | **Differentiate** analog timing circuits using IC 555 and operational amplifiers. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| CO \ PO/PSO | BT Level | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 4 | 2 | 2 | 1 | 0 | 1 | - | - | - | - | - | - | 2 | 2 |
| **CO2** | 5 | 2 | 2 | 2 | 1 | 2 | - | - | - | - | - | - | 2 | 2 |
| **CO3** | 6 | 2 | 2 | 2 | 2 | 2 | - | - | 1 | - | - | - | 3 | 3 |
| **CO4** | 5 | 2 | 2 | 3 | 2 | 2 | - | - | 1 | - | - | - | 3 | 3 |

**Suggested Learning Resources:**

**Text Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Analog Electronics | 2nd | J.B.Gupta | S.K. Kataria & Sons | 2012 |
| 2 | Electronic Devices And Circuits Theory | 6th | Robert L. Boylestad, Louis Nashelsky | Pearson Prentice Hall, 2006 | 2012 |
| 3 | Electronic Principles | 9th | Albert P. Malvino , David J. Bates , Patrick E. Hoppe | McGraw Hill | 2021 |

**Reference Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Fundamentals of Microelectronics | 2nd | Behzed Razavi | Willey Precise | 2013 |
| 2 | Microelectronic Circuit | 6th | Adel Sedra , Kenneth C. Smith | Oxford Univ Pr | 2009 |

Useful Link /Web Resources:
4. DELNET- http://www.delnet.in
5. NDL-http://ndl.iitkgp.ac.in
6. N-LIST- http://www.nlist.inflib.ac.in

| **Course Title:-Measurement & Instrumentation(PCC)** | |
|---|---|
| **Course Code:-EE24-212** | **Semester:-III** |
| **Teaching Scheme : L-T-P:-3-0-0** | **Credits:3** |
| **Evaluation Scheme: ISE-20 Marks, MSE-30 Marks** | **ESE Marks:50Marks** |

| **Prior Knowledge of:** | Knowledge of basic electrical laws, basic electrical parameters and power system. |
|---|---|

| **Course Description** | This course deals with the working of instruments used for measurement of various electrical quantities. It introduces various measurement techniques available for measurement of power, energy and deals with various types of signal generators, oscilloscopes, computer controlled measurement and test systems, instrumentation of non-electrical quantities and characteristics of measuring devices. Also, it deals with different industrial process controllers and signal condition devices used in industries. |
|---|---|

| **Course Objectives:** | |
|---|---|
| **1** | To demonstrate a comprehensive understanding of various measurement systems, their fundamental principles, and their practical applications. |
| **2** | Apply knowledge of instrumentation techniques and the measurement system behavior to solve real-world measurement and control problems. |
| **3** | Select appropriate instruments and interpret measurement results effectively. |

**Curriculum Details:**

| **Course Contents** | **Duration** |
|---|---|
| **Unit-I Basic Concept of Measuring Instruments**<br>• Characteristics of measuring instruments, International Standards, Primary Standards, secondary Standards, Working Standards,<br>• Types of Errors<br>• Analog Indicating instruments Moving Coil, Moving Iron and Rectifier type Instruments,<br>• Multi range ammeter and voltmeter, Synchroscope.<br>• Problems based on shunt & multiplier. | **07Hrs** |
| **Unit-II Measurement of Electrical parameters and Electronic instrument**<br>• Dynamometer wattmeter, power factor measurement<br>• Power measurement in single phase circuit, active and reactive power measurement in three phase circuit using wattmeter.<br>• Construction and working principle of single phase and three phase energy meter, Error and their compensation,<br>• Power Analyzer<br>• Digital voltmeter, frequency meter, digital LCR meter, tachometer, Digital multi-meter, Q-meter.<br>• CRO, signal generator and DSO | **08 Hrs** |

| | |
|---|---|
| **Unit-III Measurement of Resistance, Inductance and Capacitance**<br>• Bridge circuit: advantages, Types of Bridges, Wheatstone bridge, Kelvin double bridge,<br>• AC bridges for measurement of inductance and capacitance.<br>• Megger, insulation resistance, earth resistance.<br>• Problems based on Maxwell Inductance Bridge. | **08Hrs** |
| **Unit-IV Instrument Transformers**<br>• Construction and working principle of Current Transformer (CT) and Potential Transformer (PT), phasor diagram, transformation ratio and phase angle error,<br>• classes of C.T and P.T., application of C.T. and P.T<br>• capacitive potential transformer<br>• Potentiometers. | **06 Hrs** |
| **Unit-V Instrumentation Systems and Transducer**<br>• Specifications of instruments, their static and dynamic characteristics of measuring devices.<br>• Transducers: Definition, various types of transducers, selection factors and applications of transducers,<br>• Resistance type: potentiometer, strain gauge;<br>• inductive type: LVDT, RVDT;<br>• Capacitive type: piezo-electric transducers, speed resolver, encoders, Hall Effect transducers, types and applications. | **08Hrs** |
| **Unit-VI Measurement of Non-Electrical Quantities**<br>• Pressure sensing elements: bourdon tube, diaphragm, bellows, McLeod gauge.<br>• Flow sensing type: head meters (orifice, venture), area meters, Rota meters, electromagnetic flow meter, coriolis flow meter, ultrasonic flow meter<br>• Temperature sensing type: thermistors, thermocouple;<br>• Measurement circuit: Deflection Bridge, instrumentation amplifier. | **08 Hrs** |

**Course Outcomes (Cos):** After successful completion of the course, students will be able to:

| **Course Outcome:** | |
|---|---|
| **1.** | **Understand** the fundamental concepts, standards, and types of errors associated with electrical measuring instruments |
| **2** | **Apply** knowledge of measurement techniques to determine electrical parameters using analog and digital instruments. |
| **3** | **Analyze and evaluate** the use of bridge circuits and insulation testing methods in measuring resistance, inductance, and capacitance. |
| **4** | **Examine** the construction, operation, and performance parameters of instrument transformers and potentiometers |
| **5** | **Design and assess** instrumentation systems using transducers and sensors for electrical and non-electrical quantity measurement. |

**Course Articulation Matrix:** Mapping of Course Outcomes (Cos) with Program Outcomes (Pos)

| CO \ PO/PSO | BT Level | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 2 | - | 1 | 2 | 1 | 1 | - | - | - | 2 | 3 | 1 |
| **CO2** | 3 | 3 | 3 | 1 | 2 | 3 | 1 | 1 | - | 1 | 1 | 2 | 3 | 2 |
| **CO3** | 4 | 3 | 3 | 1 | 3 | 3 | 1 | 1 | - | 1 | 1 | 2 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 1 | 2 | 3 | 1 | 1 | - | 1 | 1 | 2 | 3 | 2 |
| **CO5** | 6 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 3 | 3 | 3 |

**Suggested Learning Resources:**

**Text Books:**

| Sr.No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | A course in Electrical and Electronic Measurements and Instrumentation | 2nd | A.K. Sawhney | Dhanpat Rai and Sons | 1995 |
| 2 | Electronic Instrumentation | 3rd | H. S. Kalsi | McGraw Hill Education | 2013 |
| 3 | A Course in Electronic and Electrical measurements and Instrumentation | 11th | J. B. Gupta, S. K. Kataria | McGraw Hill | 2020 |
| 4 | Electrical & Electronic Measurement & Instrumentation | 2nd | R.K.Rajput | S.Chand 2015 | 2019 |

**Reference Books:**

| Sr.No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Electronic measurement and instrumentation | 1st | Dr. Rajendra Prasad | Khanna Publisher | 2009 |
| 2 | Modern Electronic Instrumentation and Measurement Techniques | - | Helfrick and Cooper | Pearson | 2007 |
| 3 | Instrumentation and measurement. | 3rd | Robert B. Northop | CRC press | 2005 |

| **Course Title:-Measurement & Instrumentation Lab(PCC)** | |
|---|---|
| **Course Code:-EE24-212 L** | **Semester:-III** |
| **Teaching Scheme L-T-P:-0-0-2** | **Credits:1** |
| **Evaluation Scheme: INT-25 Marks** | **OE/POE Marks:25marks** |

| **Prior Knowledge of:** | Understanding of Basic Electrical Engineering and fundamental of power system |
|---|---|

| **Course Description** | This course deals with the working of instruments used for measurement of various electrical quantities. It introduces various measurement techniques available for measurement of power, energy and deals with various types of signal generators, oscilloscopes, computer controlled measurement and test systems, instrumentation of non-electrical quantities and characteristics of measuring devices. |
|---|---|

| **Course Objectives:** | |
|---|---|
| **1.** | To Follow standard measurements and measuring instruments. |
| **2.** | To recognize the instruments for each measurement and their connections. |

**Curriculum Details:**

| Sr.No | Name of Experiment | Period |
|---|---|---|
| 1 | Familiarization with measuring instruments. | 2 Hr |
| 2 | Analyzing and Evaluating Active Power in Three-Phase Circuits Using the Two-Wattmeter Method | 2 Hr |
| 3 | Analyzing and Evaluating three phase power measurement using single wattmeter method. | 2 Hr |
| 4 | Computing Reactive Power in Three-Phase Circuits | 2 Hr |
| 5 | Testing and Validating the Calibration of a Single-Phase Energy Meter | 2 Hr |
| 6 | To determine medium resistance using Wheatstone Bridge. | 2 Hr |
| 7 | To determine inductance using Maxwell Inductance Bridges. | 2 Hr |
| 8 | To determine capacitance using Schering Bridge. | 2 Hr |
| 9 | Measurement of displacement using linear variable differential transducer. | 2 Hr |
| 10 | Measurement of strain by using strain gauge. | 2 Hr |
| 11 | Electrical Parameters measurement using digital multi meters & LCR meter. | 2 Hr |
| 12 | Measurement of low resistance by Kelvin's Double Bridge(Virtual Lab) | 2 Hr |
| 13 | To measure the value of unknown inductance with the help of Anderson's Bridge (Virtual Lab) | 2 Hr |
| 14 | To measure High Resistance using the Loss of Charge Method (Virtual Lab) | 2 Hr |
| 15 | Measurement of insulation resistance. | 2 Hr |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **1.** | **Apply** fundamental bridge methods such as Wheatstone, Maxwell, Schering, and Anderson's Bridges to measure resistance, inductance, and capacitance accurately. *(BT-3: Apply)* |
| **2.** | **Analyze** electrical power parameters, including active and reactive power, in single-phase and three-phase systems using wattmeter's and energy meters. *(BT-4: Analyze)* |
| **3.** | **Demonstrate** the use of transducers like LVDT and strain gauges for measuring displacement and strain in mechanical structures. *(BT-3: Apply)* |
| **4** | **Evaluate** unknown electrical quantities using modern digital instruments such as digital multimeters, LCR meters, and virtual lab tools. *(BT-5: Evaluate)* |
| **5** | **Assess** insulation and high resistance properties of materials using specialized techniques like the Loss of Charge method and insulation testers. *(BT-5: Evaluate)* |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| CO \ PO/PSO | BT Level | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | - | 2 | 3 | - | - | - | - | - | 1 | 3 | 2 |
| **CO2** | 4 | 3 | 3 | - | 2 | 3 | - | - | - | - | - | 1 | 3 | 2 |
| **CO3** | 3 | 2 | 2 | - | 2 | 3 | - | - | 2 | 2 | 1 | 1 | 3 | 2 |
| **CO4** | 5 | 3 | 2 | - | 3 | 3 | - | - | - | - | 1 | 2 | 3 | 2 |
| **CO5** | 5 | 3 | 2 | - | 2 | 3 | 1 | - | - | - | - | 2 | 3 | 2 |

**Suggested Learning Resources:**

**Text Books:**

| Sr.No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Electrical & Electronic Measurement & Instrumentation | 1 st | R.K.Rajput | S.Chand | 2015 |
| 2 | A course in Electrical and Electronic Measurements and Instrumentation | - | A.K. Sawhney | Dhanpat Rai and Sons | 1995 |

**Reference Books:**

| Sr.No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Electronic instrumentation | 3rd | H. S. Kalsi | McGraw Hill Education | **2013** |
| 2 | Electrical Measurements | - | U.A.Bakshi,A.V.Bakshi, K.A.Bakshi | Technical Publication | |
| 3 | Instrumentation and measurement. | 3rd | Robert B. Northop | CRC press | 2005 |
| 4 | Electronic measurement and instrumentation | 1st | Dr. Rajendra Prasad | Khanna Publisher | 2009 |
| 5 | Modern Electronic Instrumentation and Measurement Techniques | - | Helfrick and Cooper | Pearson | 2007 |

# D.Y.PATIL TECHNICALCAMPUS

FACULTY OF ENGINEERING & FACULTY OF MANAGEMENT,

*(An Autonomous Institute)*

**Department of Electrical Engineering**

S. Y. BTech. Curriculum (Programme- Electrical Engineering)

**w. e. f. A.Y. 2025-2026**

| **Course Title :-Power System(PCC)** | |
|---|---|
| **Course Code:- EE24-213** | **Semester:- III** |
| **Teaching Scheme L-T-P :-3 - 0 - 0** | **Credits :3** |
| **Evaluation Scheme: ISE-20 Marks MSE-30Marks** | **ESE Marks: 50 Marks** |

| **Prior Knowledge of:** | Basic understanding of basic electrical laws and A.C.- D.C. circuit parameters |
|---|---|

| **Course Description** | This course covers the different types of conventional and nonconventional energy sources, deal with various types of tariff with special references to their advantages and disadvantages and various methods of power factor improvement. Moreover, this course covers power transmission over long distances is carried out by using overhead lines, various aspects of mechanical design of overhead lines and the construction of underground system through use of different types of cables, grading of underground cables and distribution system. |
|---|---|

| **Course Objectives:** | |
|---|---|
| **1.** | To reliably and efficiently produce electricity to meet the energy demands of consumers and introduce the general structure of the network for transferring power from generating stations to the consumers. |
| **2.** | Enhance the power factor to reduce electricity costs, improve system efficiency, enhance voltage stability, and increase the capacity of the electrical system. |
| **3.** | Develop the overhead and underground transmission systems is to efficiently and reliably transport electrical power from generating stations to substations and consumers, minimizing losses and maintaining power quality. |

**Curriculum Details:**

| **Course Contents** | **Duration** |
|---|---|
| **Unit- I Power Generation**<br>• Single Line Diagram (SLD)<br>• Generating Stations<br>• Operation and working of conventional energy sources<br>• Operation and working of nonconventional energy sources<br>• Comparison of the various Power Plants | **07 hrs** |
| **Unit-II Supply System**<br>• A.C. and D.C. Transmission<br>• Advantage and Limitation of high transmission AC voltage<br>• Comparison of conducting material in transmission line<br>• Elements of Transmission line<br>• Economics of Power Transmission<br>• Economics choice of Conductor size<br>• Economics choice of Transmission voltage<br>• Requirements of satisfactory Electric supply | **08 hrs** |

| Course Contents | Duration |
|---|---|
| **Unit-III Tariff and Power factor Improvement**<br>• Characteristics of a Tariff<br>• Types of Tariff<br>• Power factor<br>• Causes of low power factor<br>• Power factor improvement equipment<br>• Most economical power factor | **07hrs** |
| **Unit-IV Overhead Transmission line**<br>• Main component of Transmission line<br>• Types of Conductors, Insulators and Line supports<br>• String efficiency<br>• Methods improving String efficiency<br>• Corona effect<br>• Factor affecting corona<br>• Advantages and disadvantages of corona<br>• Methods of reducing corona effect.<br>• Sag in overhead line and sag calculations<br>• Skin Effect of conductor | **08 hrs** |
| **Unit-V Underground Cables**<br>• Construction of Cables<br>• Insulating Materials for Cables<br>• classification of Cables<br>• Cables for 3-Phase Service<br>• Laying of Underground Cables<br>• Insulation Resistance of Single Core Cable<br>• Capacitance of Single Core Cable<br>• Dielectric Stress in a Single Core Cable<br>• Grading of Cables<br>• Types of cable faults | **08 hrs** |
| **Unit-VI Distribution System**<br>• AC distribution<br>• Connection schemes- radial, ring main, interconnected system.<br>• DC distribution: Types of distributors<br>• DC distributor fed at one end<br>• DC distributor fed at both end<br>• Ring distributor<br>• Three wire DC system<br>• Comparison of 3 wire and 2 wire dc distribution | **07 hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| 213.1 | **Explain** the working principles of conventional and non-conventional energy sources |
| 213.2 | **Analyze** the **most economical power factor** for minimizing energy losses and improving efficiency |
| 213.3 | **Evaluate** the effect of different parameters on sag and fault types in underground cables |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs / COs | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 2 | 2 | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 2 |
| **CO2** | 4 | 3 | 3 | 2 | 2 | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | 2 |
| **CO3** | 5 | 3 | 3 | 2 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 1 |

## Suggested Learning Resources:

### Text Books:

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Principles of Power System | 4th | V.K.Mehta Rohit Mehta | S.Chand & Company | 2008 |
| 2 | Modern Power System Analysis | 5th | I.J. Nagrath& D.P.Kothari | Tata McGraw-Hill | 2022 |
| 3 | Power System Analysis | -- | W.D. Stevenson & J.J. Grainger | McGraw-Hill | 1994 |

### Reference Books:

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Electrical Power System | 5th | Ashpaq Husain | English Publication | 2011 |
| 2 | Electrical Power System | 6th | C. L. Wadhawa | John Wiley & Sons | 2010 |
| 3 | Power System Analysis | 3rd | Hadi Saadat | Tata McGraw-Hill | 2011 |

Useful Link:

- **https://onlinecourses.nptel.ac.in/noc22_ee17/preview**
- **https://archive.nptel.ac.in/courses/108/105/108105104/**
- **https://mrcet.com/downloads/digital_notes/EEE/31082020/Power**

| **Course Title :- Energy and Resourses(MDM-01)** | |
|---|---|
| **Course Code:- MDM24-214-MDM1** | **Semester:- III** |
| **Teaching Scheme L-T-P:-2-0-0** | **Credits : 2** |
| **Evaluation Scheme:-ISE-20 Marks, MSE-30 Marks** | **ESE Marks: N.A.** |

| | |
|---|---|
| **Prior Knowledge of:** | Basic knowledge of electrical engineering, energy conversion, and environmental impact. Familiarity with renewable energy, energy storage, and smart grid concepts. |

| **Course Descriptions** |
|---|
| This course focuses on the principles and technologies of sustainable energy generation and utilization. It explores various renewable energy sources, energy efficiency strategies, and smart grid integration. Environmental impact, economic feasibility, and advancements in sustainable energy solutions are also covered. |

## Course Objectives:

| | |
|---|---|
| **1.** | To explore the principles of sustainable energy generation and its environmental impact. |
| **2.** | To examine the design, operation, and performance of various renewable energy systems. |
| **3.** | To assess the role of energy storage and smart grid integration in sustainable energy systems. |

## Curriculum Details:

| Course Contents | Duration |
|---|---|
| **Unit-I: Introduction to Sustainable Energy**<br>• Concept of Sustainability,<br>• Need for Renewable Energy,<br>• Global Energy Scenario,<br>• Environmental Impact of Conventional Energy Sources,<br>• Overview of Renewable Energy Sources,<br>• Energy Conservation and Management,<br>• Government Policies and Incentives | **07 Hrs** |
| **Unit-II : Solar and Wind Energy Systems**<br>• Solar Radiation and Measurement,<br>• Photovoltaic (PV) Systems,<br>• Solar Thermal Energy, Design and Performance of PV Systems,<br>• Wind Energy Fundamentals,<br>• Types of Wind Turbines, Wind Energy Conversion Systems (WECS), Site Selection for Wind Farms,<br>• Hybrid Solar-Wind Systems | **08 Hrs** |

| | |
|---|---|
| **Unit-III: Alternative Renewable Energy Sources**<br>• Biomass Energy: Types, Conversion Technologies, Biogas Production,<br>• Hydro Power: Small and Large-Scale Systems,<br>• Ocean Energy: Tidal and Wave Power,<br>• Geothermal Energy: Principles and Applications, Fuel Cells and Hydrogen Economy,<br>• Smart Grid and Energy Storage | **07 Hrs** |
| **Unit-IV: Energy Storage and Grid Integration**<br>• Types of Energy Storage Systems (Batteries, Flywheels, Supercapacitors, Pumped Hydro),<br>• Grid-Connected Renewable Energy Systems,<br>• Energy Management in Smart Grids,<br>• Demand Response Strategies,<br>• Economic and Environmental Considerations of Renewable Energy Deployment, Future Trends in Sustainable Energy | **08 Hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **214.1** | **Analyze** the effects of using traditional and renewable energy on the environment. |
| **214.2** | **Evaluate** which solar or wind system works best for different situations. |
| **214.3** | **Compare** different types of renewable energy like biomass, hydro, and geothermal.. |
| **214.4** | **Design** a simple energy system using storage and smart grid ideas. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs / Cos/PSos | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 4 | 3 | 2 | - | 2 | 1 | 3 | 2 | - | 1 | - | 2 | 3 | 2 |
| **CO2** | 5 | 3 | 2 | 2 | 2 | 2 | 3 | - | - | 1 | - | 2 | 3 | 2 |
| **CO3** | 5 | 3 | 2 | 1 | 2 | 2 | 3 | - | - | 1 | - | 2 | 3 | 2 |
| **CO4** | 6 | 3 | 2 | 3 | 2 | 3 | 3 | - | 1 | 2 | 2 | 2 | 3 | 3 |

## Suggested Learning Resources:

### Text Books:

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Renewable Energy: Power for a Sustainable Future | 4th | Godfrey Boyle | Oxford University Press | 2017 |
| 2 | Solar Engineering of Thermal Processes | 4th | John A. Duffie, William A. Beckman | Wiley | 2013 |
| 3 | Wind Energy Explained: Theory, Design, and Application | 2nd | James F. Manwell, Jon G. McGowan | Wiley | 2009 |

### Reference Books:

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Biomass for Renewable Energy, Fuels, and Chemicals | 1st | Donald Klass | Academic Press | 1998 |
| 2 | Smart Grids: Fundamentals of Design and Analysis | 1st | James Momoh | Wiley | 2012 |

### Useful Link /Web Resources:

1 https://www.ieee.org
2 https://ndl.iitkgp.ac.in/

| | |
|---|---|
| **Course Title:- Electrical Technology (Open Elective -I )** | |
| **Course Code:-EE24-215-OE-I** | **Semester:-III** |
| **Teaching Scheme L-T-P:-3-1-0** | **Credits: 4** |
| **Evaluation Scheme: ISE -20 Marks, MSE -30 Marks, INT-25 Marks** | **ESEMarks:50 Marks** |

| | |
|---|---|
| **Prior Knowledge of**: | Basic Electrical Engineering concepts & Electrical Machines Fundamentals. |

| | |
|---|---|
| **Course Descriptions** | This course provides a foundational understanding of electrical machines, heating systems, and electrical drives used in industrial and domestic applications. The subject introduces students to the principles, construction, and operation of DC motors, single-phase and three-phase induction motors, fractional horsepower (FHP) motors, and various electric heating methods. The course also covers motor control techniques, performance evaluation, and drive systems used for mechanical load operations in real-world applications like elevators, pumps, and conveyors. |

**Course Objectives:**

| | |
|---|---|
| **215.1** | To learn the basic principles of operation of rotating electric machines |
| **215.2** | To explore AC & DC Systems |

**Curriculum Details:**

| **Course Contents** | **Duration** |
|---|---|
| **Unit-I : DC motors**<br>• Construction, Working, Types,<br>• Back emf, Speed equation, Torque equation, Speed torque characteristics,<br>• Power losses in d.c. Motors.<br>• Need of starter, 3 point starter, 4 point starter.<br>• Speed control of D.C. Shunt and series motor (numerical treatment on speed control methods). Reversal rotation of D.C motor | **08 Hrs** |
| **Unit-II Single-Phase Induction Motor**<br>• Construction and working principle<br>• Difference between single-phase and three-phase induction motors<br>• Types of Single-Phase Induction Motors<br>• Applications and limitations | **07Hrs** |

| Course Contents | Duration |
|---|---|
| **Unit-III Three Phase Induction Motor**<br>• Construction, Types, Working,<br>• Speed equation, Torque equation, Starting torque, full load torque,<br>• Torque speed characteristics,<br>• Power stages in motor, Advantages of 3- Phase Induction motor. (Numerical treatment on power stages) | **08Hrs** |
| **Unit-IV Electric Heating**<br>• Construction and Working of - Direct & Indirect resistance Heating,<br>• Direct arc furnace, Indirect arc furnace,<br>• Horizontal Core type induction furnace, Coreless induction furnace. (Numerical treatment on Electrical to Thermal energy conversion) | **07Hrs** |
| **Unit-V Fractional Horse Power Motors**<br>• Construction, Working, characteristics and Applications of Single phase permanent capacitor type Induction motor,<br>• AC servo motor, DC servo motor,<br>• Stepper motor (VR type and PM type) | **07Hrs** |
| **Unit-VI Electrical Drives**<br>• Types – Individual & Group drive, Advantages of electrical drives<br>• Nature of Mechanical loads With respect to speed–torque variation,<br>• 4 quadrant operation of DC motor.<br>• Criteria for selection of motors for applications like lathe, Traction, pumps, Conveyors, Lift, etc | **08Hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **215.1** | **Analyze** the performance of AC & DC Motors. |
| **215.2** | **Evaluate** effectiveness of different heating methods in industrial applications. |
| **215.3** | **Differentiate** the construction and applications of fractional horsepower motors &different electrical drive systems |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs/Cos/ PSOs | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 4 | 3 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | 3 | 2 |
| **CO2** | 4 | 3 | 2 | 2 | - | 2 | 3 | - | - | - | - | - | 2 | 2 |
| **CO3** | 5 | 2 | 2 | 3 | - | 2 | - | - | 2 | 2 | 2 | - | 3 | 3 |

**Suggested Learning Resources:**

**Text Books**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | "A Textbook of Electrical Technology" | 23rd | B.L.Theraja and A.K. Theraja | S. Chand & Company Ltd. | 2005 |
| 2 | Electrical Technology | 2nd | - | 3G E-Learning | 2020 |

**Reference Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Electrical Technology | 4th | U. A. Bakshi | Technical Publication Pune | 2009 |
| 2 | Utilisation of electric power &Electric traction | 10 | J.B.Gupta | S.K.Kataria &Sons | 2012 |

**Useful Link/Web Resources:**

1. https://nptel.ac.in/courses/108/101/
2. https://www.coursera.org/browse/engineering/electrical-engineering
3. https://www.edx.org/learn/electrical-engineering

| | |
|---|---|
| **Course Title:-Industrial Management(HSSM)** | |
| **Course Code:-EE24-216** | **Semester:-III** |
| **Teaching Scheme L-T-P:-2-0-0** | **Credits:2** |
| **Evaluation Scheme –ISE-N.A. MSE-N.A.** | **ESE Marks:50 Marks** |

| | |
|---|---|
| **Prior Knowledge of:** | Basic Industrial Terminology relative to Management. |

| | |
|---|---|
| **Course Description** | This course provides a comprehensive overview of the principles and practices necessary to effectively manage industrial operations, focusing on efficiency, productivity, and resource optimization across various sectors. Students will explore methods for improving efficiency, reducing costs, and enhancing productivity within industrial environments. |

| **Course Objectives:** | |
|---|---|
| **1.** | Build a good leader and managerial skills |
| **2.** | Apply Knowledge for handling and execution of the project work. |

**Curriculum Details:**

| Course Contents | Duration |
|---|---|
| **Unit-I: Introduction to Management**<br>● Management: Introduction; Definition and Functions<br>● Management Approaches – Mintzberg's Ten Managerial Roles – Principles of Taylor; Henry Fayol ; Weber; Parker<br>● Forms of Organization: Sole Proprietorship; Partnership; Company (Private and Public); Cooperative , Public Sector Vs. Private Sector Organization<br>● Business Environment: Economic; Social; Political; Legal | **08Hrs** |
| **Unit-II Functions of Management**<br>● Definition of Management,<br>● Planning –Objectives, Steps in Planning, elements of planning,<br>● Organizing – Process of Organizing importance and principle of organizing, departmentation, Span of control.<br>● Staffing – Nature, Purpose, Scope, Human resource management, Policies, Recruitment procedure, training and development, appraisal methods.<br>● Leading – Leadership style, Communication process, Barriers, remedies, Motivation, importance Herzberg's theory, Maslow's theory, McGregor's theory.<br>● Controlling–Process, Requirement for control management | **08Hrs** |
| **Unit-III Modern Small Business Enterprises**<br>● Types of small scale industries (SSI)<br>● stages in starting SSI<br>● Qualities required to be Entrepreneur,<br>● Government policies for SSI<br>● Problems of SSI, | **07 hrs** |

| | |
|---|---|
| • Feasibility Report writing,<br>• Industrial Safety,<br>• Management Information System. | |
| **Unit-IV Functional areas of Management**<br>• Production Management-Product mix, line balancing, break even analysis, Material Handling Equipment, TPM, Problem solving Techniques.<br>• Marketing Management –Principles & Functions, Types of Market, Market Research, Market Segmentation, Marketing Mix, Advertisement, Channel Of Distribution. | **07hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| **Course Outcome:** | |
|---|---|
| **1.** | **Analyze** various classical and modern management theories, functions, and approaches to interpret the roles and responsibilities of managers in different organizational settings. |
| **2.** | **Apply** the key managerial functions—planning, organizing, staffing, leading, and controlling—by applying management principles and models to real-world business scenario |
| **3.** | **Design** the structure and workflow of a small-scale enterprise (SSI) by integrating entrepreneurial competencies, government support schemes, and industrial safety regulations. |
| **4** | **Examine** functional areas of production and marketing management to optimize operational efficiency through product mix, market segmentation, and distribution strategies.BT-4) |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| CO\PO/ PSO | BT Level | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 4 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | 1 | 2 | 2 | 2 | 3 | 2 |
| **CO2** | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 3 | 3 | 3 | 3 |
| **CO3** | 6 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 2 | 3 |
| **CO4** | 4 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 3 | 3 |

**Suggested Learning Resources:**
**Text Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Industrial Management and Operation Research | 6t | Nandkumar Hukeri | Electrotech Publication. | 2014 |
| 2 | Industrial Engineering and Management | 2nd | O.P. Khanna | Dhanpat Rai Publications, Delhi. | 2018 |

**Reference Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Essentials of Management: An International Perspective | 8th | Koontz. H. and Weihrich. H | Tata McGraw-Hill, New Delhi | 2010 |
| 2 | Management, Today – Principles and Practice | 1st | Gene Burton and Manab Thakur, | Tata McGraw Hill Publishing Company, New Delhi. | 2002 |
| 3 | Business Management | 4th | J.P.Bose, S. Talukdar, | New Central Agencies (P) Ltd. | 2009 |

**Useful Link /Web Resources:**

1. https://archive.nptel.ac.in/courses/110/107/110107150/
2. https://nptel.ac.in/courses/122108038

| **Course Title:-Positive Attitude and Behavior (HSSM-VEC)** | |
|---|---|
| **Course Code:-EE24-217** | **Semester:-III** |
| **Teaching Scheme L-T-P:-2-0-0** | **Credits:2** |
| **Evaluation Scheme: ISE-20 Marks, INT-30 Marks** | **ESE Marks: N.A.** |

| **Prior Knowledge of:** | Basic knowledge of English and Basic understanding of Attitude and self-esteem. |
|---|---|

| **Course Description** | A positive attitude and behavior involve a proactive, optimistic outlook and actions that are constructive and respectful, fostering a positive environment and promoting personal and collective well-being. |
|---|---|

| **Course Objectives:** | |
|---|---|
| **1.** | Understand the personal well-being, improve relationships, enhance resilience, and promote overall success in life, both personally and professionally |
| **2.** | Enhance the positive aspects of yourself and your life can boost self-esteem and confidence, leading to a more positive self-image |
| **3** | Evaluate theoretical behavioral patterns of human beings at individual and group levels |

**Curriculum Details:**

| **Course Contents** | **Duration** |
|---|---|
| **Unit-I Attitude & Motivation**<br>• Attitude<br>• Factors affecting attitudes<br>• Positive attitude and Negative attitude<br>• Ways to develop positive attitude<br>• Differences between personalities having positive and negative attitude<br>• Concept of motivation<br>• Factors leading to de-motivation | **08 Hrs** |
| **Unit-II Self-esteem**<br>• Term self-esteem<br>• Symptoms<br>• Do's and Don'ts to develop positive self-esteem<br>• Low self esteem<br>• Positive and negative self esteem.<br>• Interpersonal Relationships<br>• Defining the difference between aggressive, submissive and assertive behaviors | **07 Hrs** |
| **Unit-III Other Aspects of Behavior**<br>• Body language<br>• Conflict and Stress Management | **07 Hrs** |

| | |
|---|---|
| • Decision-making skills<br>• Leadership and qualities of a successful leader<br>• Character building<br>• Team-work and Time management<br>• Work ethics, Good manners and etiquette. | |
| **Unit-IV Individual Behavior**<br>• Personality<br>• Types and Factors influencing personality<br>• Theories. Learning<br>• Types of learners<br>• The learning process and Learning theories.<br>• Perceptions<br>• Factors influencing perception<br>• Emotions and Moods in workplace | **08 Hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| 217.1 | **Understand** the concept of positive attitude and concept of motivation |
| 217.2 | **Explain** the term self-esteem, Symptoms and advantages |
| 217.3 | **Analyze** the different aspects of behavior |
| 217.4 | **Evaluate** factors influencing personality and individual behavior |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs/Cos/ PSOs | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | - |
| CO2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | 2 | 2 | 3 | 1 | - |
| CO3 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | - |
| CO4 | 4 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | - |

**Suggested Learning Resources:**

**Text Books:**

| Sr.No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Personality Development | -- | Hurlock | Tata McGraw Hill | 2006 |
| 2 | Organizational Behavior | 16th | Stephen P. Robbins and Timothy A. Judge | Prentice Hall | 2014 |

**Reference Books:**

| Sr.No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Reducing Stress | -- | Hindle, Tim | Dk Publishing | 2003 |
| 2 | Power of positive thinking | -- | Mile | Rohan Book Company | 2004 |
| 3 | All about Self- Motivation | -- | Pravesh Kumar | Goodwill Publishing House | 2005 |

**Useful Link/Web Resources:**

1. https://www.mayoclinic.org/healthy-lifestyle/stress-management/in-depth/positive-thinking
2. https://compass.rauias.com/ethics/relation-attitude-behaviour

| | |
|---|---|
| **Course Title :- Field Project (FP)** | |
| **Course Code:- EE24-218-FP** | **Semester:- III** |
| **Teaching Scheme L-T-P :- 0 - 0 - 4** | **Credits : 2** |
| **Evaluation Scheme:- INT -50 Marks** | **ESE Marks: - N.A.** |

| | |
|---|---|
| **Course Description:** | The Field Project integrates academic learning with community service, allowing Electrical Engineering (EE) students to apply their technical skills in real-world settings. This course aims to provide social responsibility, enhance problem-solving skills, and provide practical experience through direct involvement in community projects. |

## Course Objectives:

| | |
|---|---|
| **1.** | To conduct thorough community needs assessments and analyze data to identify specific challenges and opportunities for engineering interventions. |
| **2.** | To apply engineering principles, techniques, and methodologies effectively to develop innovative solutions that address identified community needs. |

## Curriculum Details:

**Course Contents**

**List of Field Project Activities:**

1. Solar Power Installation for Community Centers: Design and install solar panels for local schools, libraries, or community centers to provide them with sustainable energy solutions.
2. Energy Audits for Local Homes and Businesses: Conduct energy audits to help residents and businesses identify ways to reduce energy consumption and costs.
3. Smart Lighting Systems: Develop and install smart lighting solutions for public parks or community areas to enhance energy efficiency and safety.
4. Water Purification Systems: Create and implement water purification systems in areas with limited access to clean drinking water.
5. Public Wi-Fi Networks: Set up free Wi-Fi hotspots in underserved areas to help bridge the digital divide.
6. Electric Vehicle Charging Stations: Design and install EV charging stations in public spaces to encourage the use of electric vehicles.
7. Assistive Technology for Disabled Individuals: Create custom electronic devices or systems to aid individuals with disabilities in the community.
8. Renewable Energy Workshops: Conduct workshops on building small-scale renewable energy projects, like wind turbines or solar chargers, to educate and empower the community.
9. Smart Irrigation Systems: Design and implement smart irrigation systems for community gardens or local farms to optimize water usage and improve crop yields.
10. E-Waste Recycling Program: Set up a program to collect and properly recycle electronic waste, educating the community on the importance of e-waste management.
11. Home Automation for Elderly: Install simple home automation systems for elderly residents to enhance their safety and convenience.

***Note-**

Students must deliver a final presentation and submit a comprehensive report as the end of their project. The final presentation should be a concise, visually engaging slide deck that includes an introduction, methodology, results with data visualizations, discussion, and conclusion, followed by a Q&A session to address audience queries. Concurrently, students must submit a detailed report that documents every aspect of their project from start to finish. This report should adhere to the specified guidelines and include sections such as the title page, abstract, introduction, methodology, results, discussion, and conclusion, providing in-depth information and supporting evidence for the project's findings.

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **218.1** | **Apply** technical knowledge and skills to develop and implement community service projects |
| **218.2** | **Identify** and analyze community needs to design appropriate engineering solutions. |
| **218.3** | **Collaborate** effectively with team members and community stakeholders to achieve project goals. |
| **218.4** | **Reflect** on the ethical, social, and professional implications of engineering projects within the community. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs/Cos/ PSos | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 2 | 3 | 2 | - | 2 | - | 2 | 2 | 3 | 3 |
| **CO2** | 4 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | - | - | 2 | 2 | 3 | 1 |
| **CO3** | 5 | - | 2 | 2 | - | - | 2 | 2 | 3 | 3 | 3 | 2 | 1 | 3 |
| **CO4** | 5 | - | 2 | 2 | - | 3 | 3 | 2 | 2 | 2 | - | 2 | 3 | 3 |

| **Course Title: Finishing School Training III(MC)** | |
|---|---|
| **Course Code: EE24-219** | **Semester: III** |
| **Teaching Scheme: L-T-P: 3-0-0** | **Credits: Audit** |
| **Evaluation Scheme: GRADE** | **ESE Marks: GRADE** |

| **Prior Knowledge of:** | Mathematics, Logical |
|---|---|

**Course Objectives:**

| | |
|---|---|
| 1. | To develop strong quantitative aptitude and problem-solving skills for various competitive and placement exams. |
| 2. | To enhance logical reasoning and critical thinking abilities for effective decision-making. |
| 3 | To improve verbal aptitude, reading comprehension, and advanced grammar for effective communication. |
| 4. | To train students in data interpretation techniques for analyzing and understanding numerical data. |

**Curriculum Details**

| Course Contents | Duration |
|---|---|
| **UNIT I: Aptitude Training**<br>**A) Quantitative Aptitude**: Arithmetic, Algebra & Calculus, Geometry & Mensuration, Probability & Statistics.<br>**B) Logical Reasoning**: Puzzles, Series & Sequences, Blood Relations, Coding-Decoding, Logical Deduction.<br>**C) Data Interpretation**: Bar Graphs, Pie Charts, Line Graphs, Tables. | **15 hours**<br>**15 hours**<br>**10 hours** |
| **UNIT II: Revision**<br>**A) Mock Tests & Assessments**: Practice tests for Aptitude and Verbal.<br>**B) Review Sessions**: Doubt Clearing Sessions, recap of key concepts. | **8 Hrs** |

**Course Outcomes (COs):** Upon successful completion of this course, students will be able to:

| CO | Statements |
|---|---|
| **219.1** | Apply advanced mathematical concepts such as arithmetic, algebra, calculus, probability, and statistics in problem-solving. |
| **219.2** | Solve complex logical reasoning problems, including puzzles, coding-decoding, and logical deductions. |
| **219.3** | Interpret and analyze data using bar graphs, pie charts, line graphs, and tables. |
| **219.4** | Successfully attempt mock tests and assessments to gauge their readiness for competitive exams and placements. |
| **219.5** | Clarify doubts and reinforce learning through review sessions and concept recaps. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs / Cos/Psos | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | PSOs 1 | PSOs 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |

**Useful Link /Web Resources:**
www.campuscredentials.com
www.prepcrazy.com

| | |
|---|---|
| **Course Title: - Electrical Circuits Analysis(PCC)** | |
| **Course Code: - EE24-221** | **Semester: -IV** |
| **Teaching Scheme: L-T-P: -3-0-0** | **Credits: 3** |
| **Evaluation Scheme: - ISE -20 Marks, MSE -30 Marks** | **ESE Marks: 50 Marks** |

| | |
|---|---|
| **Prior Knowledge of:** | Basic knowledge of electrical engineering, Basic Knowledge of electric and magnetic field, Basic Mathematics |

## Course Objectives:

| | |
|---|---|
| **1.** | To equip students with the ability to apply various circuit analysis methods such as mesh analysis, nodal analysis, and superposition theorem. |
| **2.** | To familiarize students with two-port network parameters, their inter-relationships, and their use in analyzing electrical networks |
| **3.** | To develop understanding of AC circuit behavior, including Phasor analysis, resonance phenomena, and power measurement in single-phase and three-phase circuits. |
| **4.** | To introduce Laplace transform techniques for solving differential equations related to electrical circuits and for determining system responses in the s-domain. |

## Curriculum Details:

| Course Contents | Duration |
|---|---|
| **Unit-I: Analysis of DC Circuits**<br>• Active and passive elements<br>• Independent and dependent sources<br>• Energy stored in inductance and capacitance<br>• Kirchhoff's laws<br>• Node voltage method, Mesh current method including super node and super mesh analysis<br>• Source transformations<br>• Star-delta transformations | **07 Hrs** |
| **Unit-II: Network Theorems**<br>• Superposition theorem<br>• Thevenin's theorem<br>• Norton's theorem<br>• Maximum power transfer theorem<br>• Tellegen's theorem<br>• Application of theorems for both AC and DC circuits | **07 Hrs** |
| **Unit-III: Single phase and Poly phase circuits**<br>• RMS and average values of periodic sinusoidal and non- sinusoidal waveforms<br>• Phasor representation<br>• Steady-state response of series, parallel and series-parallel circuits<br>• Impedance, Admittance<br>• Resonance: Series and parallel circuits, Bandwidth and Q-factor<br>• Analysis of balanced and unbalanced 3-phase circuits.<br>• Star and delta connections | **08 Hrs** |

| | |
|---|---|
| • Measurement of three-phase power for balanced and unbalanced load | |
| **Unit-IV Two Port Network**<br>• Open circuit impedance<br>• Short circuit admittance parameter<br>• Transmission parameter<br>• Hybrid parameters<br>• Relationship among different parameters<br>• Network functions for two port network | **07 Hrs** |
| **Unit –V First order and Second Order Circuit**<br>• Source free R-C Circuit, Source free R-L Circuit,<br>• Step Response of R-C Circuit, Step Response of R-L Circuit<br>• Transient analysis. Initial condition of switched circuits<br>• Unit step, ramp and impulse function<br>• Response of R-C, R-L series circuit to these signals<br>• Second order circuits: Source free Series RLC circuit<br>• Step response of series R-L-C Circuit<br>• General second order circuits | **08 Hrs** |
| **Unit –VI Network Solution using Laplace transform**<br>• Introduction to Laplace transform,<br>• Properties of Laplace transforms,<br>• impulse function,<br>• application to solution of differential equation<br>• describing voltage-current relationship for circuit in time domain,<br>• transformed circuit, transfer function,<br>• Determination of Initial Conditions | **08 Hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **221.1** | **Analyze DC electrical circuits** using basic laws (Kirchhoff's laws) and techniques such as node voltage, mesh current, source transformations, and star-delta transformations. |
| **221.2** | **Apply network theorems** to both AC and DC circuits for simplification and analysis. |
| **221.3** | **Solve and interpret** the **transient response** of first-order (RC, RL) and second-order (RLC) circuits to various excitations |
| **221.4** | **Apply Laplace transform techniques** for solving electrical networks, analyzing circuit behavior in the s-domain, and determining system response and initial conditions. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs/Cos/ PSos | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | 1 | - | 1 | - | 1 | 2 | 1 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 1 | - | 1 | - | 1 | 2 | 1 | 3 | 3 |
| **CO3** | 4 | 3 | 3 | 3 | 3 | - | - | - | 1 | 2 | 2 | 1 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 1 | - | - | 1 | 2 | 2 | 1 | 3 | 3 |

**Suggested Learning Resources:**

**Text Books:**

| Sr. No. | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Fundamentals of Electric Circuits | 7th | Alexander and Sadiku | McGraw Hill Education | 2022 |
| 2 | Network Analysis | 3rd | Van Valkenburg | Pearson Education India | 2015 |
| 3 | Circuit Theory: Analysis and Synthesis | 1st | A. Chakrabarti | Dhanpat Rai & Co. | 2018 |

**Reference Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Circuit Analysis: Theory and Practice | 5th | Allan H. Robbins & Wilhelm C. Miller | Cengage | 2013 |
| 2 | Engineering Circuit Analysis | 8th | William H. Hayt & Jack E. Kemmerly | McGraw Hill Education | 2015 |

Useful Link/Web Resources:

1. DELNET-http://www.delnet.in
2. NDL-http://ndl.iitkgp.ac.in
3. N-LIST-http://www.nlist.inflib.ac.in
4. NPTEL Link: https://archive.nptel.ac.in/courses/108/105/108105159/

| | |
|---|---|
| **Course Title: - DC Machines and Transformers(PCC)** | |
| **Course Code: - EE24-222** | **Semester: -IV** |
| **Teaching Scheme: L-T-P: -3-0-0** | **Credits: 3** |
| **Evaluation Scheme: - ISE-20 Marks, MSE-30 Marks** | **ESE Marks: 50 Marks** |

| | |
|---|---|
| **Prior Knowledge of:** | Basic knowledge of electrical engineering, Basic Knowledge of electric and magnetic field |

## Course Objectives:

| | |
|---|---|
| **1.** | Understand the fundamental principles and working mechanisms of single-phase and three-phase transformers. |
| **2.** | Analyze and interpret the electrical and magnetic behavior of transformers through phasor diagrams, voltage regulation, efficiency calculations, and performance characteristics. |
| **3.** | Investigate the principles of electromechanical energy conversion and the operational aspects of DC machines. |
| **4.** | Examine characteristic analysis and testing of DC generators, motors and to determine performance, efficiency, and speed control. |

## Curriculum Details:

| Course Contents | Duration |
|---|---|
| **Unit-I: Single Phase Transformers**<br>• Single-phase Transformer-EMF equation<br>• Equivalent circuit refer to either side<br>• Transformer on different loads<br>• Phasor diagram<br>• Voltage regulation, Losses<br>• Efficiency, maximum efficiency, energy efficiency<br>• Performance characteristics<br>• Testing. | **07 Hrs** |
| **Unit-II: Three Phase Transformers**<br>• Construction<br>• working principle<br>• connections, factors affecting the choice of connection<br>• voltage Phasor diagram, vector groups<br>• open delta or V-V connection<br>• performance characteristics | **07 Hrs** |
| **Unit-III: Applications, Standards, and Troubleshooting of Transformers**<br>• Applications of various transformers<br>• Scott connections<br>• autotransformers<br>• troubleshooting of various transformers,<br>• study of relevant Indian Standard Specifications | **07 Hrs** |

| | |
|---|---|
| • transformer cooling<br>• parallel operation of the transformer, testing | |
| **Unit-IV: D.C. Machine**<br>• Electromechanical Energy conversion- Principle of energy conversion,<br>• Magnetic system,<br>• Construction details,<br>• working principle,<br>• back EMF, generated EMF,<br>• methods of excitation,<br>• types of DC Machines,<br>• armature reaction, effect of armature reaction,<br>• commutation, magnetizing and demagnetizing ampere turns,<br>• torque equation, speed equation | **08 Hrs** |
| **Unit –V: Characteristics and Testing of DC Machine**<br>• Open circuit characteristics of DC generator<br>• DC motor: break test, Swinburne test, Hopkinson's test<br>• losses and efficiency<br>• types of starters<br>• speed control of DC Motors<br>• braking methods of DC Motors | **08 Hrs** |
| **Unit –VI: Special purpose machines and Trouble Shooting of DC Machines**<br>• Permanent Magnet DC Motor (PMDC),<br>• Brushless DC Motor (BLDC),<br>• Steeper Motor,<br>• Servo Motor,<br>• SRM, Universal motor.<br>• Applications of various, DC motors,<br>• various equipment's used to diagnose fault,<br>• troubleshooting of various DC motors<br>• Study of relevant Indian Standard Specifications. | **08 Hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| 221.1 | **Explain** working principle and operation of single-phase and three-phase transformers |
| 221.2 | **Analyze** performance with different applications of three-phase transformers. |
| 221.3 | **Evaluate** performance and interpret characteristics of DC machines. |
| 221.4 | **Interpret** suitable DC Machine and transformer for industrial applications. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs/Cos/ PSOs | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | - | 2 | - | - | 2 | 2 | - | - | - | - | 3 | 2 | 2 |
| CO2 | 4 | 3 | 3 | - | 3 | 2 | 2 | - | 1 | - | - | - | 2 | 3 | 3 |
| CO3 | 5 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 3 | 2 | 3 | 3 |
| CO4 | 2 | 3 | 3 | 3 | 3 | 2 | - | 1 | - | 2 | 2 | 2 | 3 | 2 | 2 |

**Suggested Learning Resources:**

**Text Books:**

| Sr. No. | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Electrical Technology (Volume II) | 1st | B. L. Theraja | S. Chand | 2005 |
| 2 | Electric Machines | 3rd | Ashfaq Husain Haroon Husain | Dhanpat Rai & Co. | 2015 |
| 3 | Electric Machinary | 6th | A E. Fitzgerald | McGraw Hill Education | 2017 |

**Reference Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Electrical Machinary | 1st | P. S. Bimbhra | Khanna Publishing | 2021 |
| 2 | **Electrical Machines** | 4th | S K Bhattacharya | McGraw Hill Publications | 2017 |

**Useful Link/Web Resources:**

1. DELNET-http://www.delnet.in
2. NDL-http://ndl.iitkgp.ac.in
3. N-LIST-http://www.nlist.inflib.ac.in
4. NPTEL Link: https://archive.nptel.ac.in/courses/108/105/108105155/

| **Course Title :- DC Machines and Transformers Lab(PCC)** | |
|---|---|
| **Course Code: - EE24-222L** | **Semester:- IV** |
| **Teaching Scheme L-T-P :-0- 0 - 2** | **Credits : 1** |
| **Evaluation Scheme: INT -25 Marks** | **OE/POE Marks: 25 Marks** |

| **Prior Knowledge of:** | Ohm's Law, Kirchhoff's Laws, Series and parallel circuits Power, energy, voltage, current relationships, Basic AC and DC circuit theory |
|---|---|

| **Course Description** | This laboratory course is designed to provide hands-on experience and practical understanding of DC machines and single-phase transformers, which are fundamental components in electrical engineering. The course emphasizes the construction, working principles, characteristics, performance evaluation, testing procedures**,** and speed control techniques of DC shunt and series motors, as well as various methods of testing transformers such as open circuit, short circuit, load test, and Sumpner's test. |
|---|---|

| **Course Objectives:** | |
|---|---|
| **1.** | To provide foundational understanding of the construction, working principles, and operation of DC machines and transformers. |
| **2.** | To familiarize students with various testing methods used to evaluate performance characteristics of DC motors and transformers. |
| **3.** | To enhance practical skills in setting up electrical machines, taking measurements, interpreting data, and drawing performance conclusions. |

**Curriculum Details:**

| **List of Experiments** | **Duration** |
|---|---|
| **Experiment 1:** Study of Starters used for DC Machine | **02 Hrs** |
| **Experiment 2:** Determination of Open circuit characteristics of D.C Generator | **02 Hrs** |
| **Experiment 3:** Speed control of DC Shunt motor by armature voltage control method | **02 Hrs** |
| **Experiment 4:** Speed control of DC Shunt motor by flux control method | **02 Hrs** |
| **Experiment 5:** Speed control of DC Series motor by flux control method | **02 Hrs** |
| **Experiment 6:** Load Test on DC Shunt Motor | **02 Hrs** |
| **Experiment 7:** To perform Swinburne's test on DC shunt motor | **02 Hrs** |
| **Experiment 8:** To perform short circuit & open circuit test on single phase transformer | **02 Hrs** |
| **Experiment 9:** To perform load test on single phase transformer | **02 Hrs** |
| **Experiment 10:** To perform Polarity test on a single phase transformer. | **02 Hrs** |
| **Experiment 11:** To perform sumpner's test on single phase Transformer | **02 Hrs** |
| **Experiment 12:** To perform speed control of Dc motor by field resistance control ( Using Virtual Lab) | **02 Hrs** |

| | |
|---|---|
| **Experiment 13:** To perform speed control of Dc motor by Armature resistance control ( Using Virtual Lab) | **02 Hrs** |
| **Experiment 14:** To perform speed control of Dc motor by ward Leonard control ( Using Virtual Lab) | **02 Hrs** |
| **Experiment 15:** To perform load test on separately excited DC motor ( Using Virtual Lab) | |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **222L.1** | Understand the operation, working principle, and characteristics of DC machines and transformers. |
| **222L.2** | Analyze and evaluate the performance of DC machines and transformers under various operating conditions. |
| **222L.3** | Apply speed control techniques for DC machines in different configurations. |
| **222L.4** | Perform tests to determine key operational characteristics of DC machines and transformers and apply them to real-world applications |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs/Cos/ PSOs | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | - | - | - | 2 | - | - | - | - | - | - | 3 | - |
| **CO2** | 4 | 3 | 2 | - | 3 | 2 | - | - | - | - | 2 | - | 3 | 2 |
| **CO3** | 3 | 3 | | 3 | 2 | 2 | - | - | - | - | - | - | 3 | 3 |
| **CO4** | 5 | 3 | 2 | - | 3 | 3 | - | - | - | - | 2 | - | 3 | 3 |

**Suggested Learning Resources:**

**Text Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Electrical Machines | 3rd | D.P. Kothari, I.J. Nagrath | McGraw Hill Education | 2017 |
| 2 | Electric Machines | 3rd | Ashfaq Hussain | Dhanpat Rai & Co. | 2015 |
| 3 | Theory and Performance of Electrical Machines | 2nd | J.B. Gupta | S.K. Kataria & Sons | 2015 |

**Reference Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Electrical Machinery | 7th | P.S. Bimbhra | Khanna Publishers | 2011 |
| 2 | Electric Machinery Fundamentals | 10th | Stephen J. Chapman | McGraw Hill Education | 2010 |

**Useful Link /Web Resources:**

NPTEL link: https://archive.nptel.ac.in/courses/108/102/108102145/

| **Course Title :- Power Electronics(PCC)** | |
|---|---|
| **Course Code:- EE24-223** | **Semester:- IV** |
| **Teaching Scheme L-T-P :-2 - 0 – 0** | **Credits: 2** |
| **Evaluation Scheme: ISE-20 Marks, MSE –N.A.** | **ESE Marks: 30 Marks** |

| **Prior Knowledge of:** | Basic Electrical Engineering, Basic electronics |
|---|---|

## Course Objectives:

| | |
|---|---|
| **1.** | Introduce basic theory of power semiconductor devices and passive components, their practical applications in power electronics. |
| **2.** | Impart skills of analysis for different types of converters such as rectifiers, controlled converters, inverters and choppers. |
| **3.** | Acquainted with design of different types of converters such as rectifiers, controlled converters, inverters, choppers and their associated control circuit |
| **4.** | Provide strong foundation for further study of power electronic circuits and systems. |

## Curriculum Details:

| **Course Contents** | **Duration** |
|---|---|
| **Unit- I: Power Semiconductor Devices**<br>• Introduction to Power Electronics<br>• Classification of power converters<br>• Construction and characteristics of Thyristors, MOSFET, IGBT, TRIAC and GTO<br>• Comparison of Controllable switches. | **08 Hrs** |
| **Unit-II: AC-DC Converters**<br>• Single phase half wave uncontrolled rectifiers with R and RL configurations<br>• single phase full wave uncontrolled center tapped and bridge type rectifiers<br>• Three phase half wave and full wave uncontrolled rectifier<br>• Principle of phase control<br>• Single phase half wave controlled rectifiers with R and RL configurations<br>• single phase full wave controlled center tapped and bridge type rectifiers<br>• Three phase half wave and full wave uncontrolled rectifier | **08 Hrs** |

| Course Contents | Duration |
|---|---|
| **Unit-III: DC-DC Converters**<br>• Principle of step-down and step-up choppers<br>• control strategies for chopper<br>• chopper configurations<br>• quadrants of operations<br>• Buck converter<br>• Boost converter<br>• Buck-Boost converter | **07 Hrs** |
| **Unit-IV: DC – AC Converters and cycloconveters**<br>• Principle of inverter<br>• Single phase half bridge and full bridge inverter<br>• Three phase- six-step inverter in 120-degree mode<br>• Three phase- six-step inverter in 180-degree mode<br>• Principle of AC voltage controllers,<br>• Single phase cycloconveters<br>• Three phase cycloconverters | **07 Hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **223.1** | **Describe** basic operation and compare performance of various power semiconductor devices, passive components and switching circuits |
| **223.2** | **Analyze** the different topologies of converters. |
| **223.3** | **Explain** working principles and characteristics of cycloconverters. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs/Cos/ PSOs | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 | 2 |
| CO2 | 4 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 |
| CO3 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - | 2 | 2 |

**Suggested Learning Resources:**

**Text Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Power Electronics | 5th | P. S. Bimbhra | Khanna Publishers | 2020 |
| 2 | Power Electronics - circuits, devices and applications | 4th | M. H. Rashid | PHI, New Delhi | 2017 |

**Reference Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Power Electronics | 2nd | P.C. Sen | Tata McGraw-Hill Publishing | 2017 |
| 2 | Power Electronics | 2nd | M. D. Singh & K. B. Kanchandhani | Tata McGraw, Hill Publishing | 2008 |

**Useful Link /Web Resources:**

NPTEL link: https://archive.nptel.ac.in/courses/108/102/108102145/

| **Course Title :- Power Electronics Lab** | |
|---|---|
| **Course Code: -EE24-223L** | **Semester:- IV** |
| **Teaching Scheme L-T-P :-0- 0 - 2** | **Credits : 1** |
| **Evaluation Scheme: INT -25 Marks** | **OE/POE Marks: 25 marks** |

| **Prior Knowledge of:** | Basic understanding of circuit theory, including Ohm's Law, Kirchhoff's Laws and Basic Semiconductor Physics |
|---|---|

| **Course Description** | The **Power Electronics Laboratory** provides hands-on experience with the fundamental principles and applications of power electronic devices and circuits. This course covers the practical implementation of rectifiers, inverters, DC-DC converters, and motor drive circuits using power semiconductor devices such as diodes, Thyristors, MOSFETs, and IGBTs. Students will learn to design, simulate, and test power electronic circuits, analyze their performance |
|---|---|

| **Course Objectives:** | |
|---|---|
| **1.** | Understanding the basic working of different semiconductor switches |
| **2.** | Design and implement rectifiers, inverters, and DC-DC converters. |
| **3.** | Perform simulations using software tools like MATLAB/Simulink |

**Curriculum Details:**

| **List of Experiments** | **Duration** |
|---|---|
| **Experiment 1:** To Perform Characteristics of SCR/MOSFET/IGBT/TRIAC | **02 Hrs** |
| **Experiment 2:** To Perform Single phase half and full controlled bridge converter | **02 Hrs** |
| **Experiment 3:** To Perform Three phase half and full controlled bridge converter | **02 Hrs** |
| **Experiment 4:** To Perform Single phase Cycloconverter | **02 Hrs** |
| **Experiment 5:** To Perform Jone's Chopper | **02 Hrs** |
| **Experiment 6:** To Perform Firing circuits of SCR | **02 Hrs** |
| **Experiment 7:** To Perform Single phase PWM Inverter | **02 Hrs** |
| **Experiment 8:** To Perform simulation analysis of Single phase diode bridge rectifier using MATLAB/Simulink | **02 Hrs** |
| **Experiment 9:** To Perform simulation analysis of Single phase Controlled rectifier using MATLAB/Simulink | **02 Hrs** |
| **Experiment 10:** To Perform simulation analysis of Three phase diode rectifier using MATLAB/Simulink | **02 Hrs** |

| | |
|---|---|
| **Experiment 11:** To Perform simulation analysis of Three phase Controlled rectifier using MATLAB/Simulink | **02 Hrs** |
| **Experiment 12:** To Perform simulation analysis of buck convertor using MATLAB/Simulink | **02 Hrs** |
| **Experiment 13:** To Perform simulation analysis of boost convertor using MATLAB/Simulink | **02 Hrs** |
| **Experiment 14:** To Perform simulation analysis of buck-boost convertor using MATLAB/ Simulink | **02 Hrs** |
| **Experiment 15:** To Perform simulation analysis of DC-AC convertor using MATLAB/ Simulink | **02 Hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **223L.1** | **Understand** and demonstrate the characteristics of power electronic devices. |
| **223L.2** | **Analyze** waveforms and experimental results to evaluate circuit behavior and component interactions. |
| **223L.3** | **Implement** and test different control strategies such as PWM in inverters and converters. |
| **223L.4** | **Evaluate** power converter performance based on simulation results, considering factors like efficiency, power quality, and harmonics |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs/Cos/ PSOs | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 2 | 2 | 2 | - | - | - | - | 2 | - | 2 | 1 | 3 | 2 |
| **CO2** | 4 | 3 | 2 | 2 | 2 | 1 | - | - | - | 2 | - | 2 | 1 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 3 | 2 | - | - | - | 2 | - | 2 | 1 | 3 | 3 |
| **CO4** | 5 | 3 | 3 | 3 | 3 | 3 | - | - | - | 2 | - | 2 | 1 | 3 | 3 |

**Suggested Learning Resources:**

**Text Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Power Electronics | 5th | P. S. Bimbhra | Khanna Publishers | 2020 |
| 2 | Power Electronics - circuits, devices and applications | 4th | M. H. Rashid | PHI, New Delhi | 2017 |
| 3 | Simulation of Power Electronics Circuits with MATLAB/Simulink | - | Farzin Asadi | Apress Berkeley, CA | 2022 |

**Reference Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Power Electronics | 2nd | P.C. Sen | Tata McGraw-Hill Publishing | 2017 |
| 2 | Power Electronics | 2nd | M. D. Singh & K. B. Kanchandhani | Tata McGraw, Hill Publishing | 2008 |

| **Course Title :- Energy Storage for Renewable Energy Systems (MDM-02)** | |
|---|---|
| **Course Code:- EE24-224-MDM -II** | **Semester:- IV** |
| **Teaching Scheme L –T-P:-2-0-0** | **Credits : 2** |
| **Evaluation Scheme:-ISE-20 Marks INT-30 Marks** | **ESE Marks: N.A.** |

| **Prior Knowledge of:** | Basic knowledge of electrical systems, renewable energy sources**,** and power electronics**.** Familiarity with energy storage fundamentals, thermodynamics, and grid integration is recommended. |
|---|---|

| **Course Descriptions** |
|---|
| This course provides an in-depth study of energy storage technologies used in renewable energy systems. It examines the integration of storage with solar, wind, and other renewables, along with grid applications. Economic viability, sustainability, and future trends in energy storage solutions are also discussed. |

## Course Objectives:

| | |
|---|---|
| **1.** | **Recognize** the role and importance of energy storage in renewable energy systems. |
| **2.** | **Examine** different energy storage technologies and their working principles. |
| **3.** | **Explore** the integration of energy storage with renewable sources and grid applications. |
| **4.** | **Assess** the economic and sustainability aspects of energy storage for renewables. |

**Curriculum Details:**

| **Course Contents** | **Duration** |
|---|---|
| **Unit-I: Introduction to Energy Storage in Renewable Systems**<br>• Need for energy storage in renewable energy systems<br>• Overview of renewable energy sources and their intermittency<br>• Classification of energy storage systems<br>• Performance parameters: Energy and power density, efficiency, cycle life<br>• Energy storage for off-grid and grid-connected applications<br>• Case studies on energy storage in renewable systems | **07 Hrs** |
| **Unit-II : Electrochemical and Mechanical Energy Storage Technologies**<br>• Batteries: Lead-Acid, Lithium-ion, Sodium-ion, Flow batteries<br>• Super capacitors: Working principle, advantages, and limitations<br>• Flywheel energy storage: Construction and working<br>• Pumped hydro storage: Operation, advantages, and limitations<br>• Compressed air energy storage (CAES)<br>• Performance comparison of different storage systems | **07 Hrs** |

| | |
|---|---|
| **Unit-III: Thermal and Hydrogen-Based Energy Storage**<br>• Thermal energy storage: Sensible, Latent, and Thermochemical storage<br>• Phase change materials (PCMs) and their applications<br>• Hydrogen storage: Production, storage methods, and fuel cells<br>• Role of hydrogen in renewable energy systems<br>• Integration of hydrogen storage with solar and wind power<br>• Environmental and economic considerations of hydrogen storage | **08 Hrs** |
| **Unit-IV: Integration, Economic Feasibility, and Sustainability**<br>• Integration of storage with solar, wind, and hybrid energy systems<br>• Smart grid and energy storage integration<br>• Economic feasibility and cost-benefit analysis of energy storage<br>• Life cycle assessment of energy storage systems<br>• Government policies and incentives for energy storage<br>• Future trends and advancements in renewable energy storage | **08 Hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **224.1** | **Differentiate** energy storage needs for various renewable sources based on their intermittency and application type. |
| **224.2** | **Compare** electrochemical and mechanical storage technologies in terms of performance and suitability. |
| **224.3** | **Evaluate** thermal and hydrogen-based energy systems for their environmental and economic impact. |
| **224.4** | **Design** a hybrid renewable energy system integrated with suitable storage, considering cost and sustainability. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs/Cos/ PSOs | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 4 | 3 | 2 | – | – | – | 2 | 3 | – | – | – | – | 3 | – |
| **CO2** | 4 | 3 | 3 | – | – | 2 | – | 2 | – | – | – | – | 3 | – |
| **CO3** | 5 | 3 | 3 | – | 2 | 2 | 2 | 3 | – | – | – | 2 | 3 | 2 |
| **CO4** | 6 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | – | 2 | 2 | 3 | 3 | 3 |

**Suggested Learning Resources:**

**Text Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Energy Storage: Fundamentals, Materials, and Applications | 2nd | Robert Huggins | Springer | 2016 |
| 2 | Energy Storage | 2nd | Robert A. Huggins | Springe | 2016 |

**Reference Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Handbook of Batteries | 4th | David Linden, Thomas B. Reddy | McGraw Hill | 2010 |
| 2 | Battery Systems Engineering | 1st | Christopher D. Rahn, Chao-Yang Wang | Wiley | 2013 |

**Useful Link /Web Resources:**

1. https://ndl.iitkgp.ac.in
2. https://www.sciencedirect.com
3. https://www.ieee.org

| **Course Title :- microcontroller and It's Applications(OE-II)** | |
|---|---|
| **Course Code:-EE24-225-OE-II** | **Semester:- III** |
| **Teaching Scheme L-T-P :-2 - 0 - 0** | **Credits : 2** |
| **Evaluation Scheme: ISE-20 Marks** | **ESE Marks: 30 marks** |

| **Prior Knowledge of:** | Basic understanding of Analog Electronics, semiconductor devices, Integrated Circuits. |
|---|---|

| **Course Description** | A "Microcontroller and Applications" course typically provides an in-depth study of microcontroller architecture, programming, and interfacing techniques, enabling students to design and implement embedded systems by applying these concepts to various real-world applications, often utilizing programming languages like C and assembly language to control external devices through the microcontroller's input/output ports. |
|---|---|

| **Course Objectives:** | |
|---|---|
| **215.1** | To describe basic knowledge of microcontrollers and their features. |
| **215.2** | To provide skills for programming microcontroller for applications in Electrical Engineering. |
| **215.3** | To enable students to interface and program different peripherals to microcontrollers. |

**Curriculum Details:**

| **Course Contents** | **Duration** |
|---|---|
| **Unit- I Microcontroller Overview and 8051 Architecture**<br>• Features and selection factors for Microcontroller<br>• Block diagram of 8051 Microcontroller: CPU, input device, output device, memory and buses<br>• Comparison of Microcontroller and Microprocessor<br>• Typical examples of Microcontrollers and Microprocessors<br>• 8051 Microcontroller: Architecture, Pin Configuration, Memory Organization, System Clock. Special Function Registers, Program Status Word, Registers, I/O Ports | **08 Hrs** |
| **Unit-II 8051 Programming**<br>• Addressing Modes : Immediate, Register, Direct, Indirect, Indexed<br>• Instruction set :Data Transfer, Arithmetic, Logical, Branching, Machine control and Boolean<br>• Assembly Language Programming (ALP): Data manipulation, Masking , Stack operation | **07 Hrs** |

| Course Contents | Duration |
|---|---|
| **Unit-III Timers, Interrupts, Serial and Parallel Communication**<br>• Configuration and Programming of Timer/Counter using Special Function Registers [SFRs]: TMOD, TCON, THx, TLx,<br>• Configuration of interrupts using SFRs: IE, IP,<br>• Serial Communication SFRs: SCON, SBUF, PCON ,Modes of serial communication<br>• Serial Communication using MAX 232 | **08 Hrs** |
| **Unit-IV 8051 Interfacing & Applications**<br>• I/O Interfacing: Keyboard, Relays, LED, LCD, Seven Segment display, Stepper motor<br>• Temperature sensor (LM35) interfacing using ADC to 8051<br>• Water Level controller design using 8051<br>• Stepper Motor Interfacing to 8051 to rotate in clockwise and anticlockwise direction | **07 Hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **215.1** | **Analyze** the architecture, internal components, and system organization of the 8051 microcontroller including memory, I/O ports, and special function registers. |
| **215.2** | **Develop** and **implement** assembly language programs using appropriate addressing modes and instruction sets to perform arithmetic, logical, and control operations. |
| **215.3** | **Apply** input/output devices such as LEDs, LCDs, relays, switches, and motors with the 8051 for real-time control applications. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| CO/ PO/PS O | BT Level | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 4 | 2 | 2 | 2 | 1 | 2 | 0 | 1 | 1 | 2 | 1 | 1 | 2 | 2 |
| **CO2** | 6 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 3 | 2 |
| **CO3** | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 3 | 2 |

**Suggested Learning Resources:**

**Text Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | The 8051 Microcontroller and Embedded systems using Assembly and C | 2nd | Muhammad Mazidi, Janice Mazidi and Rolin McKinlay | Pearson Education | 2007 |
| 2 | 8051 Architecture, Programming and Applications | 3rd | Kenneth Ayal | Delmar Cengage Learning | 2007 |
| 3 | Electronic Principles | 9th | Albert P. Malvino , David J. Bates , Patrick E. Hoppe | McGraw Hill | 2021 |

**Reference Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | PIC Microcontroller and Embedded Systems using Assembly and C for PIC18 | 2nd | Mazidi, RolinMc Kinlay and Danny Causey | Pearson Education | 2007 |
| 2 | Texas Instruments MSP 430 microcontroller: Guide and Datasheets | | | | |

Useful Link /Web Resources:

1. DELNET- http://www.delnet.in
2. NDL-http://ndl.iitkgp.ac.in
3. N-LIST- http://www.nlist.inflib.ac.in

| | |
|---|---|
| **Course Title :- Software Tools for Engineers(VSEC)** | |
| **Course Code:- EE24-226** | **Semester:- IV** |
| **Teaching Scheme L-T-P :- 0 - 0 - 2** | **Credits : 2** |
| **Evaluation Scheme:- INT -25 Marks** | **ESE Marks: N.A.** |

| | |
|---|---|
| **Prior Knowledge of:** | A general understanding of the basic concepts within Electrical engineering field. Differential and integral calculus is essential, especially for simulation and modeling tasks in engineering. Proficiency in using a computer for basic tasks like file management, using an operating system and installing software applications. |

| | |
|---|---|
| **Course Description:** | The course introduces students to a range of software tools and platforms commonly used in engineering disciplines to support design, analysis, simulation, modeling, and decision-making. As engineering becomes more interdisciplinary and dependent on technology, proficiency in these tools is essential for modern engineers. Students will gain hands-on experience with the software and learn how to leverage these tools to improve the efficiency, accuracy, and effectiveness of their engineering solutions. |

**Course Objectives:**

| | |
|---|---|
| **1.** | To provide basic knowledge of software for developing, modeling and programming techniques. |
| **2.** | It intends to impart skills to implement different tool for electrical engineering application |
| **3.** | To solve electrical engineering problems with different tool. |
| **4.** | To design electrical systems with software. |

**List of Experiments / Lab Activities/Topics:**

| **List of Experiments / Lab Activities/Topics** |
|---|
| Perform experiments from following list using any professional software like MATLAB/Simulink, AutoCAD Electrical/EPLAN & Revit.<br>• To perform **basic commands** likes Arithmetic, variables in MATLAB<br>• To perform **basic commands** likes **V**ectors, matrices in MATLAB<br>• To study simple DC circuits (series circuits) to determine voltage, current, and power in MATLAB<br>• To study simple DC circuits (parallel circuits) to determine voltage, current, and power in MATLAB<br>• To study the behavior of AC circuits containing resistors (R), inductors (L), and capacitors (C) to determine impedance, voltage, current, and phase relationships.<br>• To generate and plot various signals in MATLAB (sine, cosine etc.)<br>• To generate and plot various signals in MATLAB (square, triangular etc.)<br>• To design various common electrical symbols (resistors, capacitors, inductors, switches, fuses, etc.). |

- To design and draw simple electrical circuits, such as series circuits, using AutoCAD.
- To design and draw simple electrical circuits, such as parallel circuits, using AutoCAD.
- To design house wiring diagram and layout
- To design industrial wiring diagram and layout
- To draw single line diagram of power system
- To sketch different type Transmission tower
- To study the designing about frames and winding assembly of transformer.

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **226.1** | **Relate** the role of software tools in engineering practice |
| **226.2** | **Understand** use and coding in different software tools used in electrical circuit design. |
| **226.3** | **Solve** engineering problems using computational methods |
| **226.4** | **Create** and modify engineering designs |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs/Cos/ PSOs | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 2 | 2 | - | 3 | - | - | - | - | - | 2 | 2 | 3 |
| **CO2** | 2 | 3 | 2 | 2 | 2 | 3 | - | - | 2 | - | 2 | 2 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 2 | 3 | 3 | - | - | 2 | - | 2 | 3 | 3 | 2 |
| **CO4** | 6 | 2 | 2 | 3 | 2 | 3 | 2 | - | 2 | - | 2 | 2 | 2 | 3 |

**Suggested Learning Resources:**

**Text Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | MATLAB and its Applications in Engineering | 2nd | R. K. Bansal/A. K. Goel/M. K.Sharma | Pearson Education | 2016 |
| 2 | A Course in Electrical Machine Design | - | Dhanpat Rai and Co | A. K. Sawhney | 2016 |

**Reference Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Introduction to MATLAB for Engineers | 3rd | William Palm | McGraw Hill / Asia | 2010 |
| 2 | Design of Rotating Electrical Machines | 2nd | J. Pyrhonen, T. Jokinen, and V. Hrabovcova | John Wiley and Sons Inc. | 2013 |

Useful Link /Web Resources:

1. NPTEL- https://archive.nptel.ac.in/courses/108/102/108102044/
2. NPTEL- https://onlinecourses.nptel.ac.in/noc20_ge05/preview
3. NPTEL- https://onlinecourses.nptel.ac.in/noc24_ee50/preview

| **Course Title :- Mini Project(VSEC)** | |
|---|---|
| **Course Code:- EE24-227** | **Semester:- IV** |
| **Teaching Scheme L-T-P :- 0 - 0 - 2** | **Credits : 2** |
| **Evaluation Scheme:- INT -50 Marks** | **ESE Marks: - N.A.** |

| | |
|---|---|
| **Course Description:** | The course offers students an opportunity to apply the knowledge and skills they have acquired throughout their academic program to a real-world or simulated engineering problem. This hands-on project focuses on providing students with practical experience in planning, designing, developing, and presenting a solution to an engineering challenge. It serves as a bridge between theoretical concepts and their application in real-world settings. he mini project will culminate in a comprehensive project report and a final presentation, offering students the opportunity to showcase their technical, analytical and communication skills. |

## Course Objectives:

| Sr. No | |
|---|---|
| **01** | Develop technical skills related to circuit design, testing, and troubleshooting. |
| **02** | Promote critical thinking, creativity, and innovation in designing efficient and effective solutions. |
| **03** | Collaborate effectively, allocate resources, manage timelines, and deliver outcomes within specific constraints. |
| **04** | Involve in teamwork and project management. |

## Curriculum Details:

**Course Contents**

**Higher Education and Case Study training**

- Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity.
- Allocation of mentor.

**Topic Selection**

- Briefly interact with students to provide hand-holding for topic selection.
- Students should do survey and identify needs, which shall be converted into problem statement for mini project in consultation with faculty supervisor.
- **Illustrative Examples : Any Industry or Societal Problem**
  Finalization of Title.

**Case Study Design**

- If needed, provide hand-holding to students for finalizing objectives.
- Review the objectives of the case study groups.
- Identify what can be quantified related to your topic and how.
- Decide objectives for your case study.
- Continue reading especially recent work specific to your topic.
- Prepare a roadmap of your case study; identify what is to be measured on the field.
- Ensure student groups have finalized the objectives.

**Survey Design**

- Prepare a questionnaire and try it out with your group members as mock.
- Decide sampling strategy.

**Analysis Phase**

- Students in a group shall understand problem effectively, propose multiple solution.
- The students have to work on different approaches and search for the different methodology to solve the problem in consultation with the project guide.
- The students have to finalize the best methodology to solve the problem in consultation with the project guide.
- Analyze the data

**Fieldwork Data**

- Collection: Collect quantitative data (e.g., statistics, usage metrics) and qualitative data (e.g., user stories, testimonials).
- Use data collection tools like questionnaires, observation checklists, and digital analytics.
- Ensure data accuracy and reliability through proper sampling and recording methods.

**Trails and Experimentation**

- Initial Setup and Configuration
- Concept Validation
- Feasibility Testing
- Prototyping
- Functionality Testing
- Bug Identification and Fixing Integration Testing
- Security Testing

**Results**

- Coordinator has to check and verify below points in term of result
- Functional Performance Accuracy and Precision
- Efficiency
- Safety

**Validation**

- Coordinator has to check and verify below points in term of validation
- Testing and Verification
- Compliance with Standards

**Integration Testing**

- Validate that the hardware integrates seamlessly with other systems or components as intended
- Perform compatibility tests with software, other hardware, and network systems.

**Documentation and Reporting**

- Maintain comprehensive documentation of design, development, testing, and validation processes
- Provide detailed reports on test results, issues found, and corrective actions taken.

**Final Presentation & Exhibition**

- 100% Presentation has to be conducted by mentor/guide based on above activity.
- Prototype/Final Software solution is mandatory at the time of final presentation along with report
- Mini project exhibition will be schedule with interdepartmental evaluation.

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **227.1** | **Understand** the basics concepts used in Mini Project. |
| **227.2** | **Analyze** the reference literature critically and efficiently. |
| **227.3** | **Construct** the model of the project. |
| **227.4** | **Evaluate** the performance of the project |
| **227.5** | **Write and Present** the report of the project. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs/Cos/ PSOs | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | - | 2 | - | - | 2 | - | 2 | 2 | 3 | 2 |
| CO2 | 4 | 2 | 3 | 2 | 3 | 2 | - | 2 | 2 | - | - | 2 | 3 | 3 |
| CO3 | 6 | 3 | 2 | 3 | 2 | 3 | 2 | - | 3 | - | 2 | 2 | 2 | 3 |
| CO4 | 5 | 2 | 3 | 3 | 3 | 2 | 2 | - | 2 | - | 2 | 2 | 3 | 3 |
| CO5 | 6 | - | 2 | 2 | 2 | - | - | 2 | 2 | 3 | 2 | 2 | 2 | 3 |

**Useful Link /Web Resources:**

1. Electronicsforu: https://www.electronicsforu.com/electronics-projects/eee-projects-ideas
2. NevonProjects: https://nevonprojects.com/mini-projects-for-ece-eee/

| **Course Title:- Professional Communication Skills (AEC)** | |
|---|---|
| **Course Code:- EE24-228** | **Semester:-IV** |
| **Teaching Scheme: L-T-P:-2-0–0** | **Credits: 2** |
| **Evaluation Scheme: -ISE-20 Marks INT-30 Marks** | **ESE Marks: N.A.** |

| | |
|---|---|
| **Prior Knowledge of:** | To enable students how to improve communication skills. |

**Course Objectives**

| | |
|---|---|
| **1.** | To teach the four language skills - Listening, Speaking, Reading and Writing; critical thinking skills to students. |
| **2.** | To enable students comprehend the concept of communication. |
| **3.** | To help students cultivate the habit of Reading and develop their critical reading skills. |

**Curriculum Details:**

| **Course Contents** | **Duration** |
|---|---|
| **Unit-I: Concepts of Communications**<br>• Introduction: Definition and Process of Communication - Forms of Verbal and Non-verbal Communication.<br>• Barriers of Communication: Communication Barriers and Overcoming<br>• Communication Barriers - Guidelines for Effective Communication.<br>• Business Writing: Direct and Indirect approaches to Business Writing – Five<br>• Main Stages of Writing Business Messages. Exercise: Role Play, Square Talk Activity. | **08 Hrs** |
| **Unit-II: Written Business Communication**<br>• External Communication: The Seven C's of Letter writing - Kinds of Business Letters - Business<br>• Reports and Proposals - Purpose of Business Reports.<br>• Internal Communication: Format and Principles of Writing Memos - General Warning - Cautions.<br>• Exercise: Preparation of Reports on different issues. | **07 Hrs** |
| **Unit-III: Oral Communication**<br>• Public Speaking: Types of Public Speaking - importance of Public Speaking.<br>• Power Point Presentation: Planning the Presentation - Delivering the Presentation - Developing & Displaying Visual Aids - Handling Questions from the Audience.<br>• Listening: Definition - Types of Listening Skills - Features of a Good Listener - Causes and effects of Poor Listening.<br>• Exercise: Elocution and Extempore | **08 Hrs** |

| | |
|---|---|
| **Unit-IV: Behavioral Techniques & Etiquettes**<br>• Body Language: Facial Expressions - Body Posture - Gestures - Eye Movement - Touch and the use of Personal Space.<br>• Business Attire and Grooming: Different types of Attire - Guidelines for Business Attire.<br>• Exercise: Power of Body Language, Charades.<br>• Etiquettes: Greeting Etiquette - Corporate Etiquette - Telephone Etiquette - E-mail<br>• Etiquette - Meeting Etiquette - Netiquette - Personal Etiquette - Social Etiquette - Dining Etiquette.<br>• Exercise: Introduction and Art of Conversation, Telephonic Activity. | **07 Hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **228.1** | **Develop** Writing skills in preparing business letters, report, memos, and proposals. |
| **228.2** | **Develop** Oratory skills through public speaking. |
| **228.3** | **Understand** importance of professional attire in corporate environment. |
| **228.4** | **Apply** the knowledge on various business etiquette and inculcate the etiquette for corporate fit. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs/Cos/ PSOs | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 6 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 3 | 2 | 2 | 1 | 1 |
| **CO2** | 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 2 | 1 | 1 |
| **CO3** | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 |
| **CO4** | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 2 | 3 | 2 | 2 | 1 | 1 |

**Suggested Learning Resources:**

**Reference Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Business Communication | | Meenakshi Raman and Prakash Singh | Oxford | |
| 2 | Basic Business Communication | | Lesikar | TMH | |
| 3 | Effective Business Communications | | David Irwin | Viva- Thorogood. | |

| **Course Title :- Economics for Engineers (HSSM)** | |
|---|---|
| **Course Code:-EE24-229** | **Semester:- IV** |
| **Teaching Scheme L-T-P:-2 - 0 - 0** | **Credits : 2** |
| **Evaluation Scheme:-ISE-20 Marks, MSE-N.A.** | **ESE Marks: 30 Marks** |

| **Prior Knowledge of:** | Basic Economic Concepts, Engineering and Economics Relationship |
|---|---|

**Course Description:**

This course is to familiarize the prospective engineers with elementary principles of economics. It also deals with acquainting the students with standard concepts and tools that they are likely to find useful in their profession when employed in the firm/industry/corporation in public or private sector. It also seeks to create and awareness about the status of the current economic parameters indicators/ policy debates.

## Course Objectives:

| | |
|---|---|
| **1.** | To know the economics principles applicable to engineering. • |
| **2.** | To Learn the techniques of economic decision making. |
| **3.** | To Familiarize the students with basic fundamentals of Indian financial economy |

## Curriculum Details:

| Course Contents | Duration |
|---|---|
| **Unit- I Introduction & demand analysis**<br>• Principles of economics, how markets work: market forces of supply and demand<br>• Elasticity and its application, Consumer equilibrium<br>• Economics definition, Functions & Scope of Engineering economics, Basic economic problem, Relationship between Science, Engineering, Technology and Economics. | **08Hrs** |
| **Unit- II Theory of production, Cost, Firms**<br>• Firms production, cost and revenue behavior<br>• resources optimization; Firms' behavior under- competitive markets, monopoly, monopolistic competition and oligopoly. | **08 Hrs** |
| **Unit- III Engineering Economy**<br>• Time value of money: Single-Payment and Uniform Series, Nominal and Effective Interest Rates,<br>• Evaluation Methods: Present Worth Analysis, Annual Worth Analysis, Rate of Return Analysis | **07 Hrs** |

| Course Contents | Duration |
|---|---|
| **Unit- IV Indian Economy**<br>• Nature and size of Indian Economy<br>• Problems- Poverty, Unemployment, Inflation, measures for controlling these problems<br>• Monetary policy- meaning, objectives, tools, fiscal policy-meaning, objectives, tools. | **07 Hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statement |
|---|---|
| **CO 229.1** | **Apply** the concepts of economics and will also learn to use the principles of economics in the engineering discipline. |
| **CO 229.2** | **Develop** the insight of students in understanding the consumer and production behavior and functioning of market economy. |
| **CO 229.3** | **Relate** the implications of monetary and fiscal policies in Indian economy. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs/Cos/ PSOs | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | - | - | - | - | 2 | - | - | 3 | - | 3 | - | 2 |
| **CO2** | 6 | 2 | 2 | - | - | - | 3 | - | - | - | - | 3 | - | |
| **CO3** | 4 | 2 | - | - | - | - | 3 | - | - | 3 | - | 3 | - | 2 |

**Suggested Learning Resources:**

**Text Books:**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Engineering Economy | - | Leland T. Blank & Anthony J. Tarquin | McGraw Hill | 2020 |
| 2 | Intermediate Microeconomics, | 10th | Hal R. Varian | W. W. Norton and Company | 2019 |
| 3 | Indian Economy | - | Ruder Dutt and Sundaram, | S.chand | - |

**Reference Books:-**

| Sr. No | Title | Edition | Author(s) | Publisher | Year |
|---|---|---|---|---|---|
| 1 | Principles of Microeconomics | 9th | N.Gregory Mankiw | **Cengage Learning** | 2020 |
| 2 | Engineering Economy | 17th | WG Sulliman, EM Wicks and CP Koelling | Pearson | 2018 |
| 3 | Fundamentals of Engineering Economics | 4th | Chan S Park, | Pearson | 2018 |

**Useful Link /Web Resources:**

1. www.managementstudyguide.com :
2. www.tutorialspoint.com

# D.Y.PATIL TECHNICALCAMPUS

FACULTY OF ENGINEERING & FACULTY OF MANAGEMENT,

*(An Autonomous Institute)*

**Department of Electrical Engineering**

**S. Y. BTech. Curriculum (Programme- Electrical Engineering)**

**w.e.f. 2025-26**

| **Course Title: Environmental Studies (VEC)** | |
|---|---|
| **Course Code: EE24-230** | **Semester: IV** |
| **Teaching Scheme: L-T-P: 2-0-0** | **Credits: 2** |
| **Evaluation Scheme:- ISE-20 Marks, INT-30 Marks** | **ESE Marks: N.A** |

| **Prior Knowledge of:** | This course is imparting fundamental knowledge and awareness of Environmental Studies among students and importance of conservation of environment. |
|---|---|

**Course Objectives:**

| | |
|---|---|
| 1. | Study scope and importance of natural resources, ecosystems, biodiversity for creating awareness and their conservation in multiple disciplines. |
| 2. | Learn various types of pollution, their impacts and control measures for minimizing pollution and sustainable development. |
| 3 | Understand social issues related to the environment, environmental ethics and human rights towards the environment. |
| 4. | Study various laws and regulations related to environment and its applicability in society and industries. |

**Curriculum Details**

| **Course Contents** | **Duration** |
|---|---|
| **UNIT I: Nature of Environmental Studies:**<br>• Definition, scope and importance. Multidisciplinary nature of environmental studies. Need for public awareness. | **02 Hrs** |
| **UNIT II: Natural Resources and Associated Problems**<br>• **Forest resources**: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people.<br>• **Water resources**: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.<br>• **Mineral resources**: Usage and exploitation. Environmental effects of extracting and using mineral resources.<br>• **Food resources:** World food problem, changes caused by effect of modern agriculture, fertilizer-pesticide problems.<br>• **Energy resources:** Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy.<br>• **Land resources:** Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification.<br>• Role of individuals in conservation of natural resources | **05Hrs** |

| | |
|---|---|
| **UNIT III: Ecosystems**<br>• Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem.<br>• Types, characteristics features, structure and function of **any one** of the following ecosystem :-<br>a) Forest ecosystem,<br>b) Grassland ecosystem<br>c) Desert ecosystem<br>d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, Estuaries). | **05 Hrs** |
| **UNIT IV: Introduction and Value of biodiversity**<br>• Definition, types of biodiversity, consumptive use, productive use, social, ethical, aesthetic and option values.<br>• India as a mega diversity nation.<br>• Ghats as a biodiversity region. Hot-spot of biodiversity. Threats to biodiversity.<br>• Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. | **05 Hrs** |
| **UNIT V: Environmental Pollution & Social Issues**<br>• Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards<br>• Role of an individual in prevention of pollution)<br>• Disaster management: floods, earthquake, cyclone, tsunami and landslides. Urban problems related to energy Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns.<br>• Environmental ethics: Issue and possible solutions. Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. | **08 Hrs** |
| **UNIT VI: : Environmental Protection**<br>• Environmental Protection Act.<br>• Air (Prevention and Control of Pollution) Act.<br>• Water (Prevention and control of Pollution) Act.<br>• Wildlife Protection Act.<br>• Forest Conservation Act.<br>• Population Growth and Human Health, Human Rights. | **05 Hrs** |

**Course Outcomes (COs):** After successful completion of the course, students will be able to:

| CO | Statements |
|---|---|
| **VECL202.1** | Summarize natural resources, importance of ecosystem and conservation of biodiversity with respect to multiple disciplines |
| **VECL202.2** | Explain causes, effects, solutions for various pollution problems and its minimization strategies. |
| **VECL202.3** | Interpret environmental ethics and their implementation for betterment of environment and human life. |
| **VECL202.4** | Outline the requirements of laws and regulations for environmental conservation and applicability of legislations in society and industries. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs / COs | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSO-1 | PSO-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 1 | - | - | - | 2 | 3 | - | - | - | - | 2 | - |
| **CO2** | 2 | 3 | 2 | 2 | - | - | 2 | 3 | - | - | - | 1 | 3 | 2 |
| **CO3** | 2 | 1 | 1 | - | - | - | 3 | 3 | 3 | - | 2 | - | 2 | 1 |
| **CO4** | 2 | 2 | 2 | - | - | - | 3 | 3 | 2 | - | 2 | 1 | 2 | 2 |

**Text Books:**

1. Environmental Studies by Dr. P.D.Raut (Shivaji University, Kolhapur)

**Reference Books:**

1. Miller T.G. Jr., Environmental Science. Wadsworth Publications Co.(TB).
2. Odum, E.P.1971, Fundamentals of Ecology, W.B. Saunders Co. USA,574p
3. Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, vol. I and II, Environmental Media (R)

# D.Y.PATIL TECHNICALCAMPUS

FACULTY OF ENGINEERING & FACULTY OF MANAGEMENT,

*(An Autonomous Institute)*

**Department of Electrical Engineering**

**S. Y. BTech. Curriculum (Programme- Electrical Engineering)**

**w.e.f. 2025-26**

| **Course Title: Finishing School Training –IV (MC)** | |
|---|---|
| **Course Code: EE24-231** | **Semester: IV** |
| **Teaching Scheme: L-T-P: 3-0-0** | **Credits: AUDIT** |
| **Evaluation Scheme: GRADE** | **ESE Marks: GRADE** |

| **Prior Knowledge of:** | English language, Basic Speaking Skills |
|---|---|

**Course Objectives:**

| | |
|---|---|
| 1 | To improve verbal aptitude, reading comprehension, and advanced grammar for effective communication. |
| 2 | To prepare students for group discussions by teaching the structure, importance, and strategies to excel. |
| 3 | To develop interview skills through resume building, mock interviews, and personalized feedback. |
| 4 | To assess students' readiness through mock tests and assessments. |
| 5 | To provide revision and doubt-clearing sessions for reinforcing key concepts. |

**Curriculum Details**

| **Course Contents** | **Duration** |
|---|---|
| **UNIT I: Verbal Training**<br>Vocabulary, Critical Reasoning, Reading & Comprehension, Grammar | **10 Hrs** |
| **UNIT II: Group Discussions & Personal Interviews (GDPI)**<br>A. **Group Discussions:** JAM sessions, Importance & Structure of GD, Strategies to excel in GD, Regular practice sessions of speaking skills with feedback.<br>B. **Personal Interviews**: Life Skills, Resume Building, Run through the interview preparation tips, Feedback with practice sessions on life skills. | **14 Hrs** |
| **UNIT III: Revision**<br>A. **Mock Tests & Assessments**: Practice tests for Aptitude and Verbal.<br>B. **Review Sessions**: Doubt Clearing Sessions, recap of key concepts. | **8 Hrs** |

**Course Outcomes (COs):** Upon successful completion of this course, students will be able to:

| CO | Statements |
|---|---|
| **231.1** | Demonstrate strong verbal aptitude by effectively using advanced vocabulary, comprehension skills, and critical reasoning. |
| **231.2** | Participate confidently in group discussions by applying structured techniques and strategies. |
| **231.3** | Build a strong resume and perform well in personal interviews with professional preparation techniques. |
| **231.4** | Successfully attempt mock tests and assessments to gauge their readiness for competitive exams and placements. |
| **231.5** | Clarify doubts and reinforce learning through review sessions and concept recaps. |

**Course Articulation Matrix:** Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| POs / COs | BTL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | PSOs 1 | PSOs 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | - | - | - | - | - | - | 3 | 2 | 3 | - | - | - |
| **CO2** | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 | - | - | - |
| **CO3** | 2 | - | - | - | - | - | - | - | 3 | - | 1 | - | - | - |
| **CO4** | 2 | - | - | - | - | - | - | - | 3 | - | - | - | - | - |
| **CO5** | 2 | - | - | - | - | - | - | - | 3 | - | - | - | - | - |

**Useful Link /Web Resources:**
www.campuscredentials.com
www.prepcrazy.com