**MARTHANDAM COLLEGE OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**Course Outcomes – Odd Semester 2023-24**

| Sl. No. | Semester | Theory/ Practical | Course Code / Course Name |
|---|---|---|---|
| 1) | 3 | Theory | MA3303 Probability and Complex Functions |
| 2) | 3 | Theory | EE3301 Electromagnetic Theory |
| 3) | 3 | Theory | EE3302 Digital Logic Circuits |
| 4) | 3 | Theory | EC3301 Electron Devices and Circuits |
| 5) | 3 | Theory | EE3303 Electrical Machines - I |
| 6) | 3 | Theory | CS3353 C Programming and DataStructures |
| 7) | 3 | Practical | EC3311 Electronic Devices and CircuitsLaboratory |
| 8) | 3 | Practical | EE3311 Electrical Machines Laboratory – I |
| 9) | 3 | Practical | CS3362 C Programming and Data Structures Laboratory |
| 10) | 3 | Practical | GE3361 Professional Development |
| 11) | 5 | Theory | EE3501 Power System Analysis |
| 12) | 5 | Theory | EE3591 Power Electronics |
| 13) | 5 | Theory | EE3503 Control Systems |
| 14) | 5 | Theory | EE3009 Special Electrical Machines |
| 15) | 5 | Theory | EE3019 Embedded Control of Electric Drives |
| 16) | 5 | Theory | EE3024 Digital Signal Processing System Design |
| 17) | 5 | Theory | MX3084 Disaster Risk Reduction and Management |
| 18) | 5 | Practical | EE3511 Power Electronics Laboratory |
| 19) | 5 | Practical | EE3512 Control and Instrumentation Laboratory |
| 20) | 7 | Theory | EE8701 High Voltage Engineering |
| 21) | 7 | Theory | EE8702 Power System Operation and Control |
| 22) | 7 | Theory | EE8703 Renewable Energy Systems |
| 23) | 7 | Theory | GE8071 Disaster Management |
| 24) | 7 | Theory | EE8009 Control of Electrical Drives |
| 25) | 7 | Theory | OML751 Testing of Materials |
| 26) | 7 | Practical | EE8711 Power System Simulation Laboratory |
| 27) | 7 | Practical | EE8712 Renewable Energy Systems Laboratory |

**Course Outcomes – EVEN Semester 2023-24**

| Sl. No. | Semester | Theory/ Practical | Course Code / Course Name |
|---|---|---|---|
| 1) | 4 | Theory | GE3451 Environmental Sciences and Sustainability |
| 2) | 4 | Theory | EE3401 Transmission and Distribution |
| 3) | 4 | Theory | EE3402 Linear Integrated Circuits and Applications |
| 4) | 4 | Theory | EE3403 Measurements and Instrumentation |
| 5) | 4 | Theory | EE3404 Microprocessor and Microcontroller |
| 6) | 4 | Theory | EE3405 Electrical Machines - II |
| 7) | 4 | Practical | EE3411 Electrical Machines Laboratory - II |
| 8) | 4 | Practical | EE3412 Linear and Digital Circuits Laboratory |
| 9) | 4 | Practical | EE3413 Microprocessor and Microcontroller laboratory |
| 10) | 6 | Theory | EE3601Protection and Switchgear |
| 11) | 6 | Theory | EE3602Power System Operation and Control |
|  | 6 | Theory | EE3004 HVDC and FACTS |
| 12) | 6 | Theory | EE3014 Power Electronics for Renewable Energy Systems |
| 13) | 6 | Theory | EE3033 Hybrid EnergyTechnology |
| 14) | 6 | Theory | OCS352 IoT Concepts and Applications |
| 15) | 6 | Practical | EE3611Power System Laboratory |
| 16) | 8 | Theory | EE8011 Flexible AC Transmission Systems |
| 17) | 8 | Theory | EI8073 Biomedical Instrumentation |
| 18) | 8 | Practical | EE8811 Project Work |

**ODD Semester 2023-2024**

**III Semester B.E. EEE**

| MA3303 Probability and Complex Functions |
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| COs Course Outcome : Upon successful completion of the course, students will be able to: |
| CO1: Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon. |
| CO2: Understand the basic concepts of one and two dimensional random variables and apply in engineering applications. |
| CO3: To develop an understanding of the standard techniques of complex variable theory in particular analytic function and its mapping property. |
| CO4: To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.. |
| CO5: To acquaint the students with Differential Equations which are significantly used in engineering problems. |

| EE3301 Electromagnetic Theory |
|---|
| Course Outcome : Upon the successful completion of the course, students will be able to: |
| CO1: Visualize and explain Gradient, Divergence, and Curl operations on electromagnetic vector fieldsand identify the electromagnetic sources and their effects. |
| CO2: Compute and analyse electrostatic fields, electric potential, energy density along with their applications. |
| CO3: Compute and analyse magneto static fields, magnetic flux density, vector potential along with their applications. |
| CO4: Explain different methods of emf generation and Maxwell's equations |
| CO5: Explain the concept of electromagnetic waves and characterizing parameters. |

| EE3302 Digital Logic Circuits |
|---|
| COs Course Outcome : Upon the successful completion of the course, students will be able to: |
| CO1: Explain various number systems and characteristics of digital logic families |
| CO2: Apply K-maps and Quine McCluskey methods to simplify the given Boolean expressions |
| CO3: Explain the implementation of combinational circuit such as multiplexers and de multiplexers - code converters, adders, subtractors, Encoders and Decoders |
| CO4: Design various synchronous and asynchronous circuits using Flip Flops |
| CO5: Explain asynchronous sequential circuits and programmable logic devices |
| CO6: Use VHDL for simulating and testing RTL, combinatorial and sequential circuits |

| EC3301 Electron Devices and Circuits |
|---|
| Course Outcome : Upon successful completion of the course, the students will be able to: |
| CO1- Explain the structure and operation of PN junction devices (diode, Zener diode, LED and Laser diode) |
| CO2- Design clipper, clamper, half wave and full wave rectifier, regulator circuits using PN junction diodes |
| CO3- Analyze the structure and characteristics BJT, FET, MOSFET, UJT, Thyristor and IGBT |
| CO4- Analyze the performance of various configurations of BJT and MOSFET based amplifier |

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|---|
| **CO5- Explain the characteristics of MOS based cascade and differential amplifier** |
| **CO6- Explain the operation of various feedback amplifiers and oscillators** |

| **EE 3303- ELECTRICAL MACHINES - I** |
|---|
| **COs Course Outcome : At the end of the course students will be able to:** |
| **CO1- Apply the laws governing the electromechanical energy conversion for singly and multiple excited systems.** |
| **CO2- Explain the construction and working principle of DC machines.** |
| **CO3- Interpret various characteristics of DC machines** |
| **CO4- Compute various performance parameters of the machine, by conducting suitable tests** |
| **CO5- Draw the equivalent circuit of transformer and predetermine the efficiency and regulation** |
| **CO6- Describe the working principle of auto transformer, three phase transformer with different types of connections** |

| **CS3353 C PROGRAMMING AND DATA STRUCTURES** |
|---|
| **Course Outcome : Upon the completion of this course the students will be able to** |
| **CO1: Develop C programs for any real world/technical application.** |
| **CO2: Apply advanced features of C in solving problems** |
| **CO3: Write functions to implement linear and non–linear data structure operations.** |
| **CO4: Suggest and use appropriate linear/non–linear data structure operations for solving a given problem.** |
| **CO5: Appropriately use sort and search algorithms for a given application.** |
| **CO6: Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.** |

## Laboratory

| **EC3311 Electronic Devices and CircuitsLaboratory** |
|---|
| **COs Course Outcome : Upon successful completion of the course, the students will be able to:** |
| **CO1-Analyze the characteristics of PN, Zener diode and BJT in CE,CC,CB configurations experimentally** |
| **CO2-Analyze the characteristics of JFET and UJT experimentally** |
| **CO3 -Analyze frequency response characteristics of a Common Emitter amplifier experimentally** |
| **CO4 -Analyze the characteristics of RC phase shift and LC oscillators experimentally** |
| **CO5 -Analyze the characteristics of half-wave and full-wave rectifier with and without filters experimentally** |
| **CO6 -Analyze the characteristics of FET based differential amplifier experimentally** |
| **CO7-Calculate the frequency and phase angle using CRO experimentally** |
| **CO8-Analyze the frequency response characteristics of passive filters experimentally** |

| **EE3311 Electrical Machines Laboratory – I** |
|---|
| **Course Outcome : At the end of the course students will be able to:** |
| **CO1- Construct the circuit with appropriate connections for the given DC machine/transformer.** |
| **CO2- Experimentally determine the characteristics of different types of DC machines.** |
| **CO3- Demonstrate the speed control techniques for a DC motor for industrial applications.** |
| **CO4- Identify suitable methods for testing of transformer and DC machines.** |
| **CO5- Predetermine the performance parameters of transformers and DC motor.** |
| **CO6- Understand DC motor starters and 3-phase transformer connections.** |

| CS3362 C PROGRAMMING AND DATA STRUCTURES LABORATORY |
|---|
| COs Course Outcome : At the end of the course, the students will be able to: |
| CO1-Use different constructs of C and develop applications |
| CO2 -Write functions to implement linear and non-linear data structure operations |
| CO3 -Suggest and use the appropriate linear / non-linear data structure operations for a given problem |
| CO4-Apply appropriate hash functions that result in a collision free scenario for data storage and Retrieval |
| CO5-Implement Sorting and searching algorithms for a given application |

| GE3361 PROFESSIONAL DEVELOPMENT |
|---|
| COs Course Outcome : On successful completion the students will be able to |
| CO1-Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements |
| CO2-Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding |
| CO3 -Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects. |

**V Semester B.E. EEE**

| EE3501 Power System Analysis |
|---|
| COs Course Outcome : Upon the successful completion of the course, students should have the: |
| CO1: Ability to model the power system under steady state operating condition. |
| CO2: Ability to carry out power flow analysis using. |
| CO3: Ability to infer the significance of short circuit studies in designing circuit breakers. |
| CO4: Ability to analyze the state of the power system for various unsymmetrical faults. |
| CO5: Ability to analyze the stability of power system using different methods. |

| EE3591 POWER ELECTRONICS |
|---|
| COs Course Outcome : Upon the successful completion of the course, students will be able to: |
| CO1: Understand the operation of semiconductor devices and dynamic characteristics and to design &analyze the low power SMPS |
| CO2. Analyze the various uncontrolled rectifiers and design suitable filter circuits |
| CO3. Analyze the operation of the n-pulse converters and evaluate the performance parameters |
| CO4. Understand various PWM techniques and apply voltage control and harmonic elimination methods to inverter circuits. |
| CO5. Understand the operation of AC voltage controllers and its applications. |

| EE3503 CONTROL SYSTEMS |
|---|
| **COs Course Outcome : Upon the successful completion of the course, students will be able to:** |
| **CO1: Represent simple systems in transfer function and state variable forms.** |
| **CO2: Analyze simple systems in time domain.** |
| **CO3: Analyze simple systems in frequency domain.** |
| **CO4: Infer the stability of systems in time and frequency domain.** |
| **CO5: Interpret characteristics of the system and find out solution for simple control problems.** |

| EE3009 Special Electrical Machines |
|---|
| **Course Outcome : The students, after the completion of the course, are expected to** |
| **CO1: Ability to model and analyze power electronic systems and equipment using computational software.** |
| **CO2: Ability to optimally design magnetics required in special machines based drive systems using FEM based software tools.** |
| **CO3: Ability to analyse the dynamic performance of special electrical machines.** |
| **CO4: Ability to understand the operation and characteristics of other special electrical machines.** |
| **CO5: Ability to design and conduct experiments towards research.** |

| EE3019 Embedded Control of Electric Drives |
|---|
| **Course Outcome : At the end of this course, the students will have the ability to** |
| **CO1: Interpret the significance of embedded control of electrical drives** |
| **CO2: Deliver insight into various control strategies for electrical drives.** |
| **CO3: Developing knowledge of Machine learning and optimization techniques for motor control.** |
| **CO4: Develop embedded system solutions for real-time application such as Electric vehicles and UAVs.** |
| **CO5: Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded system skills required for motor control strategy.** |

| EE3024 Digital Signal Processing System Design |
|---|
| **Course Outcome : At the end of this course, the students will have the ability to** |
| **CO1: Explain the concepts of digital signal processing** |
| **CO2: Illustrate the system representation using transforms** |
| **CO3: Learn the transformation techniques for time to frequency conversion** |
| **CO4 :Design suitable digital FIR, IIR algorithm for the given specification** |
| **CO5: Use digital signal processor for application development** |

| MX3084 Disaster Risk Reduction and Management |
|---|
| **Course Outcome : At the end of this course, the students will have the ability to** |
| **CO1: To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction (DRR)** |
| **CO2: To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction** |
| **CO3: To develop disaster response skills by adopting relevant tools and technology** |
| **CO4: Enhance awareness of institutional processes for Disaster response in the country and** |
| **CO5: Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity** |

## Laboratory

| EE3511 Power Electronics Laboratory |
|---|
| **Course Outcome : Upon the successful completion of the course, students will be able to:** |
| **CO1: Determine the characteristics of SCR, IGBT, TRIAC, MOSFET and IGBT** |
| **CO2: Find the transfer characteristics of full converter, semi converter, step up and step down choppers by simulation experimentation.** |
| **CO3: Analyze the voltage waveforms for PWM inverter using various modulation techniques.** |
| **CO4: Design and experimentally verify the performance of basic DC/DC converter topologies used for SMPS.** |
| **CO5: Understand the performance of AC voltage controllers by simulation and experimentation** |

| EE3512 Control and Instrumentation Laboratory |
|---|
| **COs Course Outcome : At the end of this course, the students will demonstrate the ability** |
| **CO1: To model and analyze simple physical systems and simulate the performance in analog and digital platform.** |
| **CO2: To design and implement simple controllers in standard forms.** |
| **CO3: To design compensators based on time and frequency domain specifications.** |
| **CO4: To design a complete closed control loop and evaluate its performance for simple physical systems.** |
| **CO5: To analyze the stability of a physical system in both continuous and discrete domains.** |

## VII Semester B.E. EEE

| EE8701- High Voltage Engineering |
|---|
| **COs Course Outcome : The students, after the completion of the course, are having the** |
| **CO1 -Ability to understand various types of over voltages in power system.** |
| **CO2 -Ability to Understand the concept of Breakdown mechanism in solid, liquid and gaseous dielectrics** |
| **CO3 -Ability to understand Generation of high voltages.** |
| **CO4 -Ability to understand measurement of high voltages.** |
| **CO5 -Ability to test power apparatus and insulation coordination** |

| EE8702 Power System Operation and Control |
|---|
| COs Course Outcome : The students, after the completion of the course, are having the |
| CO1. Ability to understand the day-to-day operation of electric power system. |
| CO2. Ability to analyze the control actions to be implemented on the system to meet theminute-to-minute variation of system demand. |
| CO3. Ability to understand the significance of power system operation and control. |
| CO4. Ability to acquire knowledge on real power-frequency interaction. |
| CO5. Ability to understand the reactive power-voltage interaction. |
| CO6. Ability to design SCADA and its application for real time operation. |

| EE8703 Renewable Energy Systems |
|---|
| Course Outcome : The students, after the completion of the course, are having the |
| CO1- Ability to create awareness about renewable Energy Sources and technologies. |
| CO2-Ability to explain the Wind energy resources and technologies and their applications. |
| CO3-Ability to explain the solar energy resources and technologies and their applications. |
| CO4-Ability to explain the basics about biomass energy |
| CO5-Ability to explain the other renewable energy sources technologies and their applications. |

| GE8071 Disaster Management |
|---|
| Course Outcome : The students, after the completion of the course, are expected to |
| CO1: Differentiate the types of disasters, causes and their impact on environment and society. |
| CO2: Assess vulnerability and various methods of risk reduction measures as well as mitigation. |
| CO3: Draw the vulnerability profile of India, Scenarios in Indian context, disaster damage assessment and management. |

| EE8009 Control of Electrical Drives |
|---|
| COs Course Outcome : The students, after the completion of the course, are having the |
| CO1. Ability to understand the DC drives control. |
| CO2. Ability to study and analyze the Induction motor drive control. |
| CO3. Ability to study and understand the Synchronous motor drive control. |
| CO4. Ability to study and analyze the SRM and BLDC motor drive control. |
| CO5. Ability to analyze and design the Digital control for drives. |

| OML751 Testing of Materials |
|---|
| Course Outcome : The students, after the completion of the course, are expected to |
| CO1: Identify suitable testing technique to inspect industrial component |
| CO2: Possess the ability to use mechanical testing technique and know its applications and limitations |
| CO3: Possess the ability to use non destructive testing technique and know its applications and limitations |

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| **CO4: Possess the ability to use material characterization testing technique and know its applications and limitations** |
| **CO5: Possess the ability to use thermal and chemical testing technique and know its applications and limitations** |

**Laboratory**

| **EE8712 Renewable Energy Systems Laboratory** |
|---|
| **Course Outcome : The students, after the completion of the course, are having the** |
| **CO1: Ability to understand and analyze Renewable energy systems** |
| **CO2: Ability to train the students in Renewable Energy Sources and technologies.** |
| **CO3: Ability to provide adequate inputs on a variety of issues in harnessing Renewable Energy.** |
| **CO4: Ability to simulate the various Renewable energy sources.** |
| **CO5: Ability to recognize current and possible future role of Renewable energy sources.** |
| **CO6: Ability to understand basics of Intelligent Controllers.** |

| **EE8711-Power System Simulation Laboratory** |
|---|
| **COs Course Outcome : The students, after the completion of the course, are having the** |
| **CO1. Ability to understand power system planning and operational studies** |
| **CO2. Ability to acquire knowledge on Formation of Bus Admittance and Impedance Matricesand Solution of Networks.** |
| **CO3. Ability to analyze the power flow using GS and NR method** |
| **CO4. Ability to find Symmetric and Unsymmetrical fault** |
| **CO5. Ability to understand the economic dispatch.** |
| **CO6. Ability to analyze the electromagnetic transients.** |

**EVEN Semester**

**IV Semester – B.E. EEE**

| **GE3451 ENVIRONMENTAL SCIENCES AND SUSTAINABILITY** |
|---|
| **Course Outcome : Upon successful completion of the course, students should be able to:** |
| **CO1: To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation** |
| **CO2: To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.** |
| **CO3: To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.** |
| **CO4: To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.** |
| **CO5: To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.** |

| **EE3401 TRANSMISSION AND DISTRIBUTION** |
|---|
| **Course Outcome : On the successful completion of the course, students will be able to:** |
| **CO1: Understand the structure of power system, computation of transmission line parameters for different configurations.** |

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| **CO2: Model the transmission lines to determine the line performance and to understand the impact of Ferranti effect and corona on line performance.** |
| **CO3: Do Mechanical design of transmission lines, grounding and to understand about the insulators in transmission system.** |
| **CO4: Design the underground cables and understand the performance analysis of underground cable.** |
| **CO5: Understand the modelling, performance analysis and modern trends in distribution system.** |

| **EE3402 LINEAR INTEGRATED CIRCUITS** |
|---|
| **COs Course Outcome : Upon successful completion of the course, the students will be able to:** |
| **CO1. Explain monolithic IC fabrication process** |
| **CO2. Explain the fabrication of diodes, capacitance, resistance, FETs and PV Cell.** |
| **CO3. Analyze the characteristics and basic applications (inverting/non-inverting amplifier, summer,differentiator, integrator, V/I and I/V converter) of Op-Amp** |
| **CO4. Explain circuit and applications of op-amp based instrumentation amplifier, log/antilog amplifier,analog multiplier /divider, active filters, comparators, waveform generators, A/D and D/A converters** |
| **CO5. Explain Functional blocks, characteristics and applications of Timer, PLL, analog multiplier ICs.** |
| **CO6. Explain the applications of ICs in Instrumentation amplifier, fixed and variable voltage regulator, SMPS and function generator** |

| **EE3403 MEASUREMENTS AND INSTRUMENTATION** |
|---|
| **COs Course Outcome : Upon successful completion of the course, the students should have the:** |
| **CO1: Ability to understand the fundamental art of measurement in engineering.** |
| **CO2: Ability to understand the structural elements of various instruments.** |
| **CO3: Ability to understand the importance of bridge circuits.** |
| **CO4: Ability to understand about various transducers and their characteristics by experiments.** |
| **CO5: Ability to understand the concept of digital instrumentation and virtual instrumentation by experiments.** |

| **EE3404 MICROPROCESSOR AND MICROCONTROLLER** |
|---|
| **Course Outcome : Upon successful completion of the course, the students should have the:** |
| **CO1: Ability to write assembly language program for microprocessor and microcontroller** |
| **CO2: Ability to design and implement interfacing of peripheral with microprocessor and microcontroller** |
| **CO3: Ability to analyze, comprehend, design and simulate microprocessor based systems used for control and monitoring.** |
| **CO4: Ability to analyze, comprehend, design and simulate microcontroller based systems used for control and monitoring.** |
| **CO5: Ability to understand and appreciate advanced architecture evolving microprocessor field** |

| **EE3405 ELECTRICAL MACHINES - II** |
|---|
| **COs Course Outcome : Upon the successful completion of the course, students will have the:** |
| **CO1: Ability to understand the construction and working principle of Synchronous generator** |
| **CO2: Ability to understand the construction and working principle of Synchronous Motor** |
| **CO3: Ability to understand the construction and working principle of Three Phase Induction** |

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| **Motor** |
| **CO4: Acquire knowledge about the starting and speed control of induction motors.** |
| **CO5: To gain knowledge about the basic principles and working of Single phase induction motors and Special Electrical Machines.** |

**Laboratory**

| **EE3411 Electrical Machines Laboratory-II** |
|---|
| **COs Course Outcome : At the end of the course, the student should have the:** |
| **CO1: Ability to understand and analyze EMF and MMF methods** |
| **CO2: Ability to analyze the characteristics of V and Inverted V curves** |
| **CO3: Acquire hands on experience of conducting various tests on alternators and obtaining their performance indices using standard analytical as well as graphical methods. to understand the importance of Synchronous machines** |
| **CO4: Acquire hands on experience of conducting various tests on induction motors and obtaining their performance indices using standard analytical as well as graphical methods. to understand the importance of single and three phase Induction motors** |
| **CO5: Ability to acquire knowledge on separation of losses** |

| **EE3412 LINEAR AND DIGITAL CIRCUITS LABORATORY** |
|---|
| **COs Course Outcome : At the end of the course, the student should have the:** |
| **CO1: Ability to understand and implement Boolean Functions.** |
| **CO2: Ability to understand the importance of code conversion** |
| **CO3: Ability to Design and implement circuits with digital ICs like decoders, multiplexers, register.** |
| **CO4: Ability to acquire knowledge on Application of Op-Amp** |
| **CO5: Ability to Design and implement counters using analog ICs like timers, VCOs and digital ICs like Flip-flops and counters.** |

| **EE3413 MICROPROCESSOR AND MICROCONTROLLER LABORATORY** |
|---|
| **Course Outcome : After studying the above subject, students should have the:** |
| **CO1: Ability to write assembly language program for microprocessor.** |
| **CO2: Ability to write assembly language program for microcontroller** |
| **CO3: Ability to design and implement interfacing of peripheral with microprocessor and microcontroller** |
| **CO4: Ability to analyze, comprehend, design and simulate microprocessor based systems used for control and monitoring** |
| **CO5: Ability to analyze, comprehend, design and simulate microcontroller based systems used for control and monitoring.** |

**VI Semester B.E. EEE**

| **EE3601 PROTECTION AND SWITCHGEAR** |
|---|
| **COs Course Outcome : Upon the successful completion of the course, students will have theability to:** |
| **CO1: Understand and select proper protective scheme and type of earthing.** |

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| **CO2: Explain the operating principles of various relays** |
| **CO3: Suggest suitable protective scheme for the protection of various power system apparatus.** |
| **CO4 : Analyze the importance of static relays and numerical relays in power system protection.** |
| **CO5: Summarize the merits and demerits and application areas of various circuit breakers.** |

| **EE3602 POWER SYSTEM OPERATION AND CONTROL** |
|---|
| **COs Course Outcome : On the successful completion of the course, students will be able to:** |
| **CO1: Understand the day – to – day operation of power system.** |
| **CO2: Model and analyse the control actions that are implemented to meet the minute-to minute variation of system real power demand.** |
| **CO3: Model and analyze the compensators for reactive power control and various devices used for voltage control.** |
| **CO4: Prepare day ahead and real time economic generation scheduling.** |
| **CO5: Understand the necessity of computer control of power systems** |

| **EE3014 POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS** |
|---|
| **Course Outcome : At the end of the course, students should be able to:** |
| **CO1: Examine the available renewable energy sources.** |
| **CO2: Demonstrate the working principles of electrical machines and power converters used for wind energy conversion system** |
| **CO3: Demonstrate the principles of power converters used for solar PV systems** |
| **CO4: Examine the available hybrid renewable energy systems** |
| **CO5: Simulate AC-DC converters, buck/boost converters, AC-AC converters and PWM inverters.** |

| **EE3033 HYBRID ENERGY TECHNOLOGY** |
|---|
| **Course Outcome : Upon completion of the course, students will be able to:** |
| **CO1: Analyze the impacts of hybrid energy technologies on the environment and demonstrate them to harness electrical power.** |
| **CO2: Select a suitable Electrical machine for Wind Energy Conversion Systems and simulate wind energy conversion system** |
| **CO3: Design the power converters such as AC-DC, DC-DC, and AC-AC converters for SPV systems.** |
| **CO4: Analyze the power converters such as AC-DC, DC-DC, and AC-AC converters for Hybrid energy systems.** |
| **CO5: Interpret the hybrid renewable energy systems.** |

| **OCS352 IOT CONCEPTS AND APPLICATIONS** |
|---|
| **Course Outcome : The students, after the completion of the course, are having the** |
| **CO 1: Explain the concept of IoT.** |
| **CO 2: Understand the communication models and various protocols for IoT.** |
| **CO 3: Design portable IoT using Arduino/Raspberry Pi /open platform** |
| **CO 4: Apply data analytics and use cloud offerings related to IoT.** |
| **CO 5: Analyze applications of IoT in real time scenario.** |

**Laboratory**

| EE3611 POWER SYSTEM LABORATORY |
|---|
| COs Course Outcome : On the successful completion of the laboratory, students will be able to: |
| CO1: Model and analyze the performance of the transmission lines. |
| CO2: Perform power flow, short circuit, and stability analysis for any power system network. |
| CO3: Understand, design, and analyze the load frequency control mechanism. |
| CO4: Perform optimal scheduling of generators and compute the state of the power system. |
| CO5: Understand, analyze, and apply the relays for power system protection. |

**VIII Semester B.E. EEE**

| EE8011 Flexible AC Transmission system |
|---|
| Course Outcome : The students, after the completion of the course, they have the |
| C01: Ability to understand, analyze and develop analytical model of FACTS controllers. |
| C02: Ability to understand the power system application. |
| C03: Ability to understand the concepts about load compensation techniques. |
| C04: Ability to acquire knowledge on facts devices. |
| C05: Ability to understand the start-of-art of the power system. |

| EI8073 Biomedical Instrumentation |
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| Course Outcome : At the end of the course students will have the |
| CO1 Ability to understand the philosophy of the heart, lung, blood circulation and respiration system. |
| CO2 Ability to provide latest ideas on devices of non-electrical devices. |
| CO3 Ability to gain knowledge on various sensing and measurement devices of electrical origin. |
| CO4 Ability to bring out the important and modern methods of imaging techniques and their analysis. |
| CO5 Ability to explain the medical assistance/techniques, robotic and therapeutic equipments. |

**Laboratory**

| EE8811- PROJECT WORK |
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| COs Course Outcome : The students, after the completion of the course, are expected to |
| CO1: On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology |