Mewar University, Gangrar, Chittorgarh

Department of Electrical Engineering

Programme Educational Objectives (PEOs)

PEO1: The graduate will have understanding of fundamental principles in electrical Engineering, enabling them to analyze, design, and implement solution for complex engineering problems across various domains such as Power System, Power Electronics, Electrical Machines & Control Systems.

PEO2: The graduate will pursue higher education and be involved in research activities for the betterment of society and the nation.

PEO 3: The graduate will exhibit leadership skills and become an entrepreneur thus creating employment opportunities locally and globally.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

Mewar University, Gangrar, Chittorgarh

Department of Electrical Engineering

Programme Outcomes (POs) for B.Tech

Engineering Graduates will be able to:

	Program Outcome
PO1.	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineeringfundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2.	**Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3.	**Design/development of solutions**: Design solutions for complex engineering problemsand design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4.	**Conduct investigations of complex problems**: Use research-based knowledge andresearch methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5.	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, andmodern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6.	**The engineer and society**: Apply reasoning informed by the contextual knowledge toassess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7.	**Environment and sustainability**: Understand the impact of the professional engineeringsolutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8.	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities andnorms of the engineering practice.
PO9.	**Individual and team work**: Function effectively as an individual, and as a member orleader in diverse teams, and in multidisciplinary settings.
PO10.	**Communication**: Communicate effectively on complex engineering activities with theengineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11.	**Project management and finance**: Demonstrate knowledge and understanding of theengineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12.	**Life-long learning**: Recognize the need for, and have the preparation and ability toengage in independent and life-long learning in the broadest context of technological change.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

Mewar University, Gangrar, Chittorgarh

Department of Electrical Engineering

Program Specific Outcomes (B.Tech-Electrical Engineering)

On completion of the B.Tech (Electrical Engineering) degree the graduates will be able to

PSO 1: Able to apply the knowledge gained during the course of the program from Mathematics(including differential equations, discrete mathematics, linear algebra and complex variables), electronics and computer science, Basic Computing, Basic Sciences, Social Sciencesand engineering knowledge to identify, formulate, design & investigate complex engineering problems of electric circuits, analog and digital electronics circuits, control systems, electrical machines, Power system and solve real life problems faced in industries and/or during research work.

PSO 2: Able to provide socially acceptable technical solutions to complex electrical engineering problems with the application of modern and appropriate techniques for sustainable development.

PSO 3: Apply the appropriate techniques and modern engineering hardware and software tools in electrical engineering to engage in life-long learning and to successfully adapt in multi-disciplinary environments.

PSO 4: Able to apply the knowledge of ethical and management principles required to work in a team as well as to lead a team and aware of the impact of professional engineering solutions in societal, environmental context, professional ethics and be able to communicate effectively.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

Mewar University, Gangrar, Chittorgarh

Department of Electrical Engineering

Program Specific Outcomes (M.Tech-Power System Engineering)

On completion of M. Tech. (Renewable Energy) programme, graduates will be able to

PSO1: Ability to apply the enhanced knowledge in advanced technologies for modeling, analyzing and solving contemporary issues in power sector with a global perspective and to carry out detailed and independent investigation on multifaceted complex problems in the area of power systems and to envisage advanced research in allied thrust areas.

PSO2: Ability to critically analyze and identify real-life engineering problems in the area of power systems, and professionally and ethically provide strategic solutions satisfying the safety, societal, cultural, financial and environmental aspects/ needs with an eagerness for continued pursuance of research to design, develop or propose theoretical and practical methodologies towards the research and development support for the power system infrastructure.

PSO3: Ability to utilize and develop modern tools for modeling, analyzing and solving various scientific problems related to power systems and to take up technical/administrative challenges including the management of various projects of interdisciplinary nature, working in a team with mutual understandings to take unsophisticated challenges leading and motivating the group to inculcate multidisciplinary and collaborative approach.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

Mewar University, Gangrar, Chittorgarh

Department of Electrical Engineering

Program Specific Outcomes (M.Tech-Renewable Energy)

On completion of M. Tech. (Renewable Energy) programme, graduates will be able to

PSO 1: To impart the theoretical knowledge and practical skills to meet the industrial need in renewable energy sector.

PSO 2: Develop model, analyze and system simulation for performance evaluation and optimization of energy systems.

PSO 3: To understand the design needs to architect the system that efficiently generate, transmit, distribute, convert & utilize electric power.

PSO 4: To improve the communication skills & self-learning process in team work so as to engage in lifelong learning for a successful professional carrier.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

Mewar University, Gangrar, Chittorgarh

Department of Electrical Engineering

Program Specific Outcomes (M.Tech-Power Electronics & Drives)

On completion of M. Tech. (Power Electronics & Drives) programme, graduates will be able to

PSO1: Apply technical knowledge, skills and analytical ability to design, develop and test power electronic converters and drives using modern tools and technologies.

PSO 2: Design the modern electric machines, drives, power converters, and control circuits for specific application. And use modern tools, professional software platforms, embedded systems for the diversified applications.

PSO 3: Solve the real world problems in the emerging fields like smart grid, renewable energy interfaces, and electric vehicles and to develop innovative technologies relevant to social, ethical, economic and environmental issues.

PSO 4: sense and demonstrates the professional ethics and social responsibility and explore ideas for inculcating research skills

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

Mewar University, Gangrar, Chittorgarh

Department of Electrical Engineering

Course: - B.Tech (Electrical Engineering)

Course Outcomes

Year & Sem.:- 2nd Years & 3rd Sem			
S.No.	**Course Code**	**Name of Subject**	**Course Outcomes**
1.	BSC107	Mathematics-III	CO-1: Apply advanced mathematical techniques to analyze and solve engineering problems related to electrical circuits and systems. CO-2: Develop proficiency in differential equations, linear algebra, and transform methods to model and solve engineering problems in the field of electrical engineering. CO-3: Demonstrate the ability to apply mathematical concepts and principles to analyze and design electrical networks, control systems, and signal processing systems. CO-4: Utilize mathematical tools and techniques to analyze and optimize electrical machines, power systems, and electronic devices. CO-5: Apply mathematical modeling and simulation techniques to evaluate the performance and behavior of electrical systems, and make informed decisions for their design and implementation.
2.	BSC107	Biology for Engineers	CO-1: Identify and describe the fundamental principles of biology that are relevant to engineering applications in the field of electrical engineering. CO-2: Apply biological concepts and knowledge to analyze and design engineering systems and solutions in electrical engineering that are inspired by or mimic biological structures and processes. CO-3: Evaluate the potential impact of biological factors, such as microorganisms or biotic systems, on electrical engineering projects, and propose appropriate measures for mitigation and control. CO-4: Demonstrate an understanding of the ethical, social, and environmental implications of applying biological principles and techniques in electrical engineering, and incorporate responsible practices in the design and implementation of engineering solutions. CO-5: Collaborate effectively in interdisciplinary

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			teams, integrating biological and engineering perspectives to solve complex problems related to electrical engineering, and communicate the solutions clearly and convincingly to diverse audiences.
3.	PCC-EE201	Electrical Machines – I	CO-1: Analyze the fundamental principles and working mechanisms of electrical machines, including transformers, DC machines, and synchronous machines. CO-2: Apply mathematical modeling and principles of electromagnetism to predict the performance and characteristics of electrical machines. CO-3: Design and analyze electrical machine systems by considering factors such as efficiency, power factor, and torque-speed characteristics. CO-4: Utilize appropriate testing methods and equipment to evaluate the performance and efficiency of electrical machines, and interpret the obtained results. CO-5: Apply knowledge of electrical machine principles to troubleshoot and diagnose common faults and problems in electrical machines, and propose effective solutions for their rectification.
4.	PCC-EE202	Analog Electronics	CO-1: Apply principles of analog electronics to design and analyze various electronic circuits, such as amplifiers, filters, and oscillators, to meet desired specifications. CO-2: Analyze the behavior of semiconductor devices, including diodes, transistors, and operational amplifiers, and utilize this knowledge to design and troubleshoot electronic circuits. CO-3: Utilize various mathematical techniques, such as circuit analysis methods and signal processing concepts, to solve complex problems related to analog electronic circuits. CO-4: Demonstrate proficiency in using modern electronic measurement instruments and simulation tools to measure, analyze, and verify the performance of analog electronic circuits. CO-5: Develop critical thinking and problem-solving skills to diagnose and rectify faults in analog electronic systems by employing systematic troubleshooting techniques and applying appropriate corrective measures.
5.	PCC-EE203	Electrical Circuit	CO-1: Apply fundamental principles and laws of electrical circuits to analyze and solve complex electrical engineering problems. CO-2: Design and evaluate electrical circuits using appropriate tools and techniques, considering factors such as safety, efficiency, and cost-effectiveness.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			CO-3: Demonstrate an understanding of various circuit components, their characteristics, and their interactions within electrical circuits. CO-4: Develop the ability to analyze and interpret the behavior of electrical circuits under different conditions, including steady-state, transient, and alternating current (AC) conditions. CO-5: Apply knowledge of electrical circuit theory to troubleshoot and diagnose faults in electrical systems, and propose appropriate solutions to rectify the issues.
6.	PCC-EE204	**Generation of Electrical Power**	CO-1: Analyze and evaluate different methods and technologies used in the generation of electrical power, including conventional and renewable energy sources. CO-2: Apply principles of electrical engineering to design and optimize power generation systems, considering factors such as efficiency, reliability, and environmental impact. CO-3: Understand and utilize the various components and equipment involved in power generation, such as generators, transformers, switchgear, and control systems. CO-4: Evaluate and interpret data related to power generation, including load demand, system stability, and power quality, and make informed decisions to ensure efficient and reliable power supply. CO-5: Demonstrate proficiency in the operation, maintenance, and troubleshooting of power generation systems, adhering to safety guidelines and industry standards.
7.	PCC-EE205	**Electrical Machines Laboratory - I**	CO-1: Apply theoretical knowledge to analyze and experimentally verify the behavior of electrical machines. CO-2: Design and conduct experiments to measure and evaluate the performance characteristics of electrical machines. CO-3: Utilize appropriate instruments and equipment to perform electrical machine tests and measurements accurately. CO-4: Demonstrate competence in operating and controlling different types of electrical machines. CO-5: Develop skills in interpreting and analyzing experimental data to draw conclusions and make recommendations for improving the performance of electrical machines.
8.	PCC-EE206	**Analog Electronics & Electrical Circuit Laboratory**	CO-1: Apply fundamental principles of analog electronics to design and analyze electrical circuits, including amplifiers, filters, and oscillators, in the laboratory setting.

Head
Department of
Electrical Engineering
University, Chittorgarh (Raj.)

			CO-2: Demonstrate proficiency in using laboratory instruments and equipment to measure and characterize electrical signals, such as voltage, current, and frequency, for various analog electronic circuits. CO-3: Analyze and interpret experimental data obtained from analog electronic circuits, and draw meaningful conclusions about circuit performance and behavior. CO-4: Troubleshoot and diagnose common problems encountered in analog electronic circuits, and develop effective strategies to rectify and improve circuit performance. CO-5: Collaborate effectively in a laboratory setting, by actively participating in group discussions, sharing knowledge and expertise, and contributing to the overall success of the experiments and projects conducted in the Analog Electronics & Electrical Circuit Laboratory.
9.	HSMC201	Organizational Behavior	CO-1: Apply knowledge of organizational behavior theories and concepts to analyze and explain individual and group behavior within an organization. CO-2: Identify and evaluate the impact of organizational structure, culture, and leadership styles on employee behavior, motivation, and job satisfaction. CO-3: Analyze and assess the dynamics of teamwork and collaboration in organizations, including the role of communication, conflict resolution, and decision-making processes. CO-4: Evaluate the ethical dimensions and social responsibilities of organizations, and understand the implications of ethical behavior on employee and organizational outcomes. CO-5: Develop effective strategies for managing organizational change and effectively dealing with challenges and obstacles that arise during change processes.

Year & Sem.:- 2nd Years & 4th Sem

S.No.	Course Code	Name of Subject	Course Outcomes
1.	PCC-EE207	Digital Electronics	CO-1: Analyze and design digital circuits using Boolean algebra and logic gates to solve real-world engineering problems. CO-2: Apply knowledge of digital electronics to understand and interpret the behavior of various logic families and digital components, such as flip-flops, counters, and registers. CO-3: Develop the ability to design and implement combinational and sequential circuits using VHDL

Head
Department of
Electrical Engineering
Maharana University, Chittorgarh (Raj.)

			(VHSIC Hardware Description Language) or other hardware description languages. CO-4: Evaluate and troubleshoot digital circuits, including identifying and rectifying common errors and malfunctions in digital systems. CO-5: Understand the principles of synchronous and asynchronous digital systems, and apply them to design and analyze clocked sequential circuits for various applications, such as counters, shift registers, and state machines.
2.	PCC-EE208	**Electrical Machines – II**	CO-1: Demonstrate the ability to analyze and interpret the operating principles, characteristics, and performance parameters of various types of electrical machines, including DC machines, induction machines, and synchronous machines. CO-2: Apply appropriate mathematical models and techniques to solve problems related to electrical machines, such as determining machine parameters, analyzing machine performance, and calculating efficiency and losses. CO-3: Design and implement electrical machine control strategies to achieve desired performance objectives, including speed control, torque control, and power factor correction, using suitable control techniques and devices. CO-4: Evaluate the suitability of different types of electrical machines for specific applications, considering factors such as efficiency, power factor, size, cost, and environmental impact. CO-5: Apply knowledge of electrical machine design principles to design and optimize electrical machines for specific requirements, considering factors such as power output, efficiency, size, and cost, while adhering to relevant industry standards and safety guidelines.
3.	PCC-EE209	**Electrical Measurement & measuring Instrument**	CO-1: Analyze the principles of electrical measurement and measuring instruments to accurately measure electrical quantities in various electrical systems. CO-2: Apply knowledge of different measurement techniques and instruments to perform accurate measurements of voltage, current, resistance, power, and energy in electrical circuits and systems. CO-3: Demonstrate proficiency in the selection and proper use of measuring instruments and equipment, including multimeters, oscilloscopes, wattmeters, and energy meters, for electrical measurement tasks. CO-4: Evaluate and interpret measurement data, including uncertainties and errors, to draw meaningful

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			conclusions and make informed decisions regarding electrical systems and their performance. CO-5: Design and implement measurement setups and experiments to gather data, analyze electrical parameters, and validate theoretical concepts related to electrical measurement and measuring instruments.
4.	PCC-EE210	Electromagnetic Field Theory	CO-1: Analyze and apply the fundamental principles of electromagnetic field theory to solve engineering problems in the domain of electrical engineering. CO-2: Demonstrate a comprehensive understanding of the laws and equations governing electromagnetic fields and their applications in various electrical devices and systems. CO-3: Design and analyze electromagnetic systems and components using mathematical modeling, simulation tools, and advanced software to meet specific requirements and performance criteria. CO-4: Evaluate and interpret the behavior of electromagnetic fields and their interactions with materials, including the propagation, reflection, and transmission of electromagnetic waves in different mediums. CO-5: Apply the concepts of electromagnetic field theory to the design, optimization, and troubleshooting of electrical circuits, antennas, and other electromagnetic devices, considering factors such as efficiency, electromagnetic interference, and safety.
5.	PCC-EE211	Signal & System	CO-1: Apply mathematical tools and techniques to analyze and model continuous and discrete-time signals and systems. CO-2: Design and implement signal processing systems using appropriate methodologies and tools. CO-3: Analyze and interpret the behavior of signals and systems in both time and frequency domains. CO-4: Evaluate and compare different signal processing techniques for various applications in electrical engineering. CO-5: Apply knowledge of signals and systems to solve real-world engineering problems in areas such as communications, control systems, and signal processing.
6.	PCC- EE212	Digital Electronics Lab	CO-1: Apply fundamental principles of digital electronics to design and analyze combinational and sequential circuits. CO-2: Demonstrate proficiency in using various electronic components and equipment to construct, test, and troubleshoot digital circuits. CO-3: Develop skills in designing and implementing

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			digital systems using hardware description languages and programmable logic devices. CO-4: Analyze and evaluate the performance of digital circuits in terms of speed, power consumption, and reliability. CO-5: Collaborate effectively in a team to solve complex digital electronics problems and present solutions in a clear and concise manner. CO-5: Apply knowledge of signals and systems to solve real-world engineering problems in areas such as communications, control systems, and signal processing.
7.	**PCC- EE213**	**Electrical Machines Lab–II**	CO-1: Apply principles of electrical machine operation to analyze and predict the performance of various electrical machines. CO-2: Design and conduct experiments to evaluate the characteristics and performance of electrical machines, including DC machines, synchronous machines, and induction machines. CO-3: Utilize various testing methods and equipment to measure key parameters of electrical machines, such as voltage, current, power, torque, and efficiency. CO-4: Analyze and interpret experimental data obtained from electrical machine tests to determine the performance, efficiency, and operating characteristics of the machines. CO-5: Develop skills in troubleshooting and diagnosing electrical machine faults, and propose appropriate remedial measures to ensure optimal machine performance and reliability.
8.	**PCC- EE214**	**Electrical Measurement & measuring Instrument Lab**	CO-1: Apply knowledge of electrical measurement principles and techniques to design and conduct experiments using various measuring instruments. CO-2: Analyze and interpret data obtained from electrical measurement experiments, and draw meaningful conclusions about the behavior and characteristics of electrical circuits and devices. CO-3: Demonstrate proficiency in the operation, calibration, and troubleshooting of a wide range of electrical measuring instruments, such as voltmeters, ammeters, watt meters, and oscilloscopes. CO-4: Develop skills in the measurement of electrical quantities, including voltage, current, power, and energy, and understand the significance of accurate measurements in the field of electrical engineering. CO-5: Apply principles of measurement uncertainty analysis to evaluate and quantify the accuracy and reliability of electrical measurements, and assess the

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			impact of measurement errors on experimental results and engineering designs.
9.	H-102	Universal Human Values 2: Understanding Harmony	CO-1: Demonstrate an awareness of the principles and significance of promoting harmony in diverse cultural, social, and professional contexts. CO-2: Analyze and evaluate ethical and moral dilemmas arising in various domains of life and propose solutions that foster harmonious relationships among individuals and communities. CO-3: Apply critical thinking skills to examine the interconnections between different belief systems, cultural practices, and value frameworks, and appreciate the importance of respecting and valuing diversity in promoting harmony. CO-4: Examine and assess the impact of technology and globalization on human values and develop strategies to navigate ethical challenges in a way that upholds harmony in society. CO-5: Communicate effectively, both orally and in writing, about the importance of universal human values and their role in fostering harmony, and demonstrate the ability to engage in constructive dialogue and collaboration with individuals from diverse backgrounds.

Year & Sem.:- 3rd Years& 5th Sem

S.No.	Course Code	Name of Subject	Course Outcomes
1.	PCC-EE301	Control Systems	CO-1: Analyze and model dynamic systems: Students will be able to analyze the behavior of control systems and develop mathematical models to describe their dynamics, considering factors such as transfer functions, time response, and frequency response. CO-2: Design and implement control systems: Students will be capable of designing control systems to meet specific requirements and implementing them using appropriate hardware or software tools. They will demonstrate proficiency in selecting appropriate controllers, compensators, and sensors, as well as designing feedback loops. CO-3: Evaluate stability and performance of control systems: Students will be able to evaluate the stability and performance characteristics of control systems through techniques such as root locus analysis, Nyquist stability criterion, and Bode plots. They will apply these analyses to optimize the stability and performance of control systems. CO-4: Apply control system theory to practical applications: Students will be able to apply control system theory to real-world applications in electrical engineering, such as power systems, robotics, and

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			industrial automation. They will demonstrate an understanding of the challenges and considerations involved in applying control systems to practical scenarios. CO-5: Critically assess control system performance and propose improvements: Students will be able to critically assess the performance of control systems, identify limitations or areas for improvement, and propose appropriate modifications or enhancements. They will demonstrate the ability to troubleshoot control system issues and optimize system performance based on analytical and experimental techniques.
2.	PCC-EE302	Microprocessors	CO-1: Analyze the architecture and functioning of microprocessors to demonstrate a comprehensive understanding of their operation and components. CO-2: Design and implement assembly language programs using microprocessors to solve real-world problems and demonstrate proficiency in programming techniques. CO-3: Evaluate and troubleshoot microprocessor-based systems to identify and rectify faults, ensuring proper functionality and reliability. CO-4: Apply knowledge of microprocessors to design and develop embedded systems, integrating hardware and software components effectively. CO-5: Critically assess emerging trends and advancements in microprocessor technology, demonstrating the ability to adapt and stay updated with industry developments.
3.	PCC-EE303	Power System-I (Apparatus and Modelling)	CO-1: Analyze and interpret the behavior of different power system apparatus, such as transformers, generators, and transmission lines, through mathematical modeling and simulation techniques. CO-2: Design and evaluate the performance of various power system components, including transformers, generators, and transmission lines, by applying relevant principles, standards, and safety considerations. CO-3: Apply knowledge of power system apparatus and their modeling to solve complex engineering problems related to power generation, transmission, and distribution, considering factors such as load flow, fault analysis, and system stability. CO-4: Demonstrate proficiency in utilizing software tools, such as MATLAB or PSCAD, for modeling and simulation of power system apparatus, and effectively interpret and communicate the results. CO-5: Evaluate the impact of various factors, such as

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			load characteristics, voltage regulation, and system losses, on the performance and efficiency of power system apparatus, and propose appropriate solutions for optimization and improvement.
4.	PEC-EEL301	**Wind and Solar Energy Systems**	CO-1: Analyze and evaluate the fundamental principles of wind and solar energy systems in terms of their conversion, generation, and integration into the electrical grid. CO-2: Design and optimize efficient wind and solar energy systems by applying engineering principles, considering factors such as site selection, equipment selection, and system layout. CO-3: Apply mathematical modeling and simulation techniques to predict and analyze the performance of wind and solar energy systems under various operating conditions, including changes in environmental factors. CO-4: Evaluate the economic feasibility and environmental impact of wind and solar energy systems, considering factors such as cost analysis, life cycle assessment, and integration with existing power infrastructure. CO-5: Demonstrate proficiency in the installation, operation, and maintenance of wind and solar energy systems, including troubleshooting common issues and ensuring compliance with safety standards and regulations.
5.	PEC-EEL302	**Line-Commutated and Active PWM**	CO-1: Analyze and compare the operation principles of line-commutated and active pulse width modulation (PWM) techniques in power electronic systems. CO-2: Apply mathematical models and control strategies to design and implement line-commutated and active PWM converters for various applications in electrical engineering. CO-3: Evaluate the performance characteristics, such as efficiency, power factor, and total harmonic distortion, of line-commutated and active PWM converters under different operating conditions. CO-4: Investigate and troubleshoot common issues and challenges associated with line-commutated and active PWM converters, and propose appropriate solutions to improve their performance and reliability. CO-5: Assess the impact of line-commutated and active PWM techniques on power quality, harmonics mitigation, and integration of renewable energy sources in electrical power systems, and suggest methods for their optimization.
			CO1 Understand the characteristics of dc motors and induction motors.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

6.	PEC-EEL303	Electrical Drives	CO2 Understand the Chopper fed DC Drives, Multi-quadrant DC drive, Closed-loop control of DC Drive CO2 Understand the principles of speed-control of dc motors and induction motors. CO3 Understand the power electronic converters used for dc motor and induction motor speed control. CO5 Understand the Concept of Scalar control or constant V/f control of induction motor. CO-1: Analyze and design electrical drive systems by applying principles of electromechanical energy conversion, control theory, and power electronics. CO-2: Evaluate the performance characteristics of different types of electrical drives, including DC drives, induction motor drives, synchronous motor drives, and stepper motor drives. CO-3: Apply knowledge of power electronic devices and converters to design and implement efficient and reliable electrical drive systems. CO-4: Demonstrate proficiency in selecting and implementing appropriate control strategies for electrical drive systems, considering factors such as speed control, torque control, and position control. CO-5: Evaluate and troubleshoot electrical drive systems, identifying and rectifying faults related to power electronics, motor control, and mechanical components.
7.	PEC-EEL304	Electrical and Hybrid Vehicles	CO-1: Analyze the principles and working mechanisms of electrical and hybrid vehicles, including their power systems, energy storage technologies, and control strategies. CO-2: Evaluate the performance characteristics and limitations of electrical and hybrid vehicle components, such as electric motors, power electronics, batteries, and regenerative braking systems. CO-3: Design and optimize electrical and hybrid vehicle systems, considering factors such as energy efficiency, power delivery, vehicle dynamics, and environmental impact. CO-4: Apply theoretical knowledge and practical skills to diagnose and troubleshoot electrical and hybrid vehicle systems, including electrical circuits, control systems, and vehicle charging infrastructure. CO-5: Evaluate the safety aspects and regulatory requirements associated with electrical and hybrid vehicles, and propose appropriate measures to ensure the safe operation and maintenance of these vehicles in compliance with industry standards.
			CO-1: Demonstrate a comprehensive understanding of

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

8.	PEC-EEL305	Electrical Machine Design	the principles and theories governing electrical machine design, including the magnetic circuit, energy conversion, and operating characteristics. CO-2: Apply analytical and computational methods to design and analyze various electrical machines, such as transformers, DC machines, and AC machines, considering factors such as efficiency, power factor, and performance requirements. CO-3: Design and optimize electrical machine components, such as cores, windings, insulation systems, and cooling arrangements, while considering constraints related to size, cost, and environmental impact. CO-4: Develop the ability to select appropriate materials and manufacturing processes for electrical machine components, taking into account factors such as magnetic properties, thermal characteristics, and mechanical strength. CO-5: Evaluate and compare different electrical machine designs based on criteria such as efficiency, reliability, and performance under various operating conditions, and propose modifications or improvements to meet specific application requirements.
	PCC EE 304	Power & Control Systems Lab	CO-1: Design and analyze power systems components: Students will be able to design and analyze various components of power and control systems, including transformers, generators, transmission lines, and protection devices. CO-2: Implement control strategies for power systems: Students will be able to implement control strategies for power systems, including voltage regulation, power factor correction, and load balancing, using appropriate hardware and software tools. CO-3: Troubleshoot and diagnose faults in power systems: Students will develop the skills to troubleshoot and diagnose faults in power systems, including identifying and rectifying issues related to power generation, distribution, and utilization. CO-4: Perform experiments to measure and analyze power system parameters: Students will be proficient in performing experiments to measure and analyze various parameters in power systems, such as voltage, current, power factor, and harmonics, using modern measuring instruments and software tools. CO-5: Demonstrate safety practices in power and control systems: Students will understand and practice safety protocols while working with power and

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			control systems, ensuring the protection of equipment, personnel, and the environment. They will be able to identify potential hazards and take appropriate precautions to prevent accidents and mishaps
9.	**HSMC301 (OEL II)**	**Humanities I (Effective Technical Communication)**	CO-1: Demonstrate proficiency in written communication by producing clear, concise, and well-structured technical documents relevant to the field of electrical engineering. CO-2: Apply effective oral communication skills to effectively present technical information in a clear and organized manner, while employing appropriate visual aids and speaking techniques. CO-3: Develop critical thinking and analytical skills to evaluate and interpret technical information from various sources, including academic literature, industry reports, and research papers, to support effective communication in the field of electrical engineering. CO-4: Employ appropriate professional and ethical practices in technical communication, including proper citation and attribution of sources, adherence to intellectual property rights, and adherence to ethical guidelines for information dissemination. CO-5: Collaborate effectively in multidisciplinary teams to analyze complex technical problems and develop cohesive and coherent written and oral reports, fostering effective communication and teamwork skills essential for the field of electrical engineering.
10.	**PROJ- EE 301**	**Minor Project/ Seminar/Summer Internship**	CO-1: Apply theoretical knowledge of electrical engineering to real-world scenarios encountered during the summer internship. CO-2: Demonstrate competency in utilizing industry-standard equipment, tools, and software relevant to electrical engineering during the summer internship. CO-3: Collaborate effectively with professionals from diverse backgrounds, communicating and contributing to the success of projects during the summer internship. CO-4: Analyze and troubleshoot electrical systems and components encountered during the summer internship, identifying and implementing appropriate solutions. CO-5: Exhibit professional conduct, ethical behavior, and a commitment to safety practices while working on electrical engineering projects during the summer internship.

Year & Sem.:- 3rd Years& 6th Sem

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

S.No.	Course Code	Name of Subject	Course Outcomes
1.	PCC- EE305	Power Electronics	CO-1: Design and analyze power systems components: Students will be able to design and analyze various components of power and control systems, including transformers, generators, transmission lines, and protection devices. CO-2: Implement control strategies for power systems: Students will be able to implement control strategies for power systems, including voltage regulation, power factor correction, and load balancing, using appropriate hardware and software tools. CO-3: Troubleshoot and diagnose faults in power systems: Students will develop the skills to troubleshoot and diagnose faults in power systems, including identifying and rectifying issues related to power generation, distribution, and utilization. CO-4: Perform experiments to measure and analyze power system parameters: Students will be proficient in performing experiments to measure and analyze various parameters in power systems, such as voltage, current, power factor, and harmonics, using modern measuring instruments and software tools. CO-5: Demonstrate safety practices in power and control systems: Students will understand and practice safety protocols while working with power and control systems, ensuring the protection of equipment, personnel, and the environment. They will be able to identify potential hazards and take appropriate precautions to prevent accidents and mishaps.
2.	PEC-EEL306	Power System-II	CO-1: Analyze and evaluate the steady-state operation of power systems, including transmission lines, transformers, and synchronous generators. CO-2: Design and assess the performance of power system components such as transmission lines, transformers, and generators, considering factors such as power losses, voltage regulation, and reactive power compensation. CO-3: Understand and apply various techniques for power flow analysis in power systems, including the Gauss-Seidel and Newton-Raphson methods, to determine voltage magnitudes, phase angles, and power flows in transmission networks. CO-4: Evaluate and design protection schemes for power systems, including the selection and coordination of protective devices, to ensure the reliable operation of electrical networks and prevent damage to equipment. CO-5: Analyze and design compensation systems for power systems, including reactive power control,

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			voltage control, and power factor correction, to improve system stability, voltage regulation, and overall power quality.
3.	PEC-EEL307	Power System Protection	CO-1: Analyze and apply fundamental concepts of power system protection to identify and mitigate faults and disturbances in electrical power systems. CO-2: Design and evaluate protective relaying schemes for power system components, including generators, transformers, transmission lines, and distribution systems, with an emphasis on fault detection and isolation. CO-3: Understand and interpret relay coordination principles and techniques to ensure proper selectivity, sensitivity, and reliability of protective devices in power systems. CO-4: Apply knowledge of protective device settings and coordination to develop effective protection schemes that minimize equipment damage, system downtime, and ensure personnel safety during fault conditions. CO-5: Evaluate the performance of power system protection schemes by analyzing fault records, conducting simulation studies, and using relevant software tools to optimize system reliability and minimize false trips.
4.	PEC-EEL308	HVDC Transmission Systems	CO-1: Describe the principles and operation of HVDC (High Voltage Direct Current) transmission systems in terms of power transmission, control, and conversion. CO-2: Analyze the various components and configurations of HVDC transmission systems, including converters, transformers, transmission lines, and control systems. CO-3: Apply mathematical and computational techniques to model and simulate HVDC transmission systems, including converter control strategies and power flow analysis. CO-4: Evaluate the performance and efficiency of HVDC transmission systems by analyzing factors such as power losses, voltage stability, and harmonic distortion. CO-5: Design and propose solutions for HVDC transmission systems, considering factors such as system reliability, fault protection, and integration with AC (Alternating Current) transmission networks..
			CO-1: Analyze power quality issues and their impact on electrical systems, and propose appropriate solutions using various power quality improvement techniques. CO-2: Evaluate the principles, characteristics, and

5.	PEC-EEL309	**Power Quality and FACTS**	applications of Flexible AC Transmission Systems (FACTS) devices, and design effective control strategies for enhancing power system stability and reliability. CO-3: Apply mathematical modeling and simulation techniques to analyze and optimize the performance of FACTS devices, and recommend suitable FACTS devices for specific power system scenarios. CO-4: Assess the operation and performance of various power quality monitoring instruments and equipment, and employ them to measure, analyze, and diagnose power quality disturbances in electrical systems. CO-5: Design and implement strategies for the mitigation of power quality issues, including voltage sags, harmonics, flicker, and unbalanced loads, through the utilization of FACTS devices and other relevant power quality improvement techniques.
6.	PEC-EEL310	**High Voltage Engineering**	CO-1: Apply fundamental principles of high voltage engineering to analyze and design electrical systems operating at high voltages. CO-2: Evaluate the characteristics and behavior of high voltage insulation materials and their suitability for various electrical applications. CO-3: Design and implement appropriate safety measures and protective devices for high voltage systems to ensure the well-being of personnel and equipment. CO-4: Analyze and mitigate the effects of electrical surges, faults, and transients in high voltage systems to enhance system reliability and performance. CO-5: Investigate and assess the performance of high voltage equipment, such as transformers and circuit breakers, and propose measures for improving their efficiency and longevity.
7.	OEC-301	**Soft Skills and Interpersonal Communication**	
8.	OEC-302	**ICT for Development**	
9.	OEC-303	**Human Resource Development and Organizational Behavior**	
10.	MC-II	**Essence of Indian Knowledge Tradition**	CO-1: Analyze the foundational principles and concepts of Indian knowledge tradition and its relevance to the field of electrical engineering. CO-2: Evaluate the influence of Indian knowledge tradition on the development of electrical engineering theories, methodologies, and practices. CO-3: Apply the principles of Indian knowledge tradition to critically assess and solve complex problems in electrical engineering.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			CO-4: Develop a deep understanding of the ethical and sustainable implications of electrical engineering practices within the context of Indian knowledge tradition. CO-5: Demonstrate effective communication skills in presenting and discussing the integration of Indian knowledge tradition with modern electrical engineering advancements.
11.	PROJ-EE 302	Project-II(Major Project)	CO-1: Demonstrate comprehensive knowledge of electrical engineering principles, theories, and techniques to analyze and solve complex problems in the field of electrical engineering. CO-2: Design, develop, and implement innovative and practical electrical engineering projects by applying theoretical concepts and practical skills acquired during the B.Tech program. CO-3: Apply engineering tools, software, and equipment to simulate, model, and analyze electrical systems, ensuring adherence to industry standards and guidelines. CO-4: Collaborate effectively in multidisciplinary teams to plan, execute, and manage major electrical engineering projects, considering technical, economic, environmental, and social aspects. CO-5: Communicate project findings, design considerations, and technical solutions clearly and professionally through written reports, oral presentations, and visual aids, demonstrating effective communication skills in both technical and non-technical contexts.

Year & Sem.:- 3rd Years& 7th Sem

S.No.	Course Code	Name of Subject	Course Outcomes
1.	PEC-EEL 401	Industrial Electrical Systems	CO-1: Analyze and interpret the fundamental principles and concepts of industrial electrical systems. CO-2: Apply knowledge of electrical circuits, components, and equipment to design and troubleshoot industrial electrical systems. CO-3: Evaluate the safety protocols, regulations, and standards related to industrial electrical systems and ensure compliance. CO-4: Design and implement effective electrical control systems for industrial applications, considering efficiency, reliability, and cost-effectiveness. CO-5: Employ appropriate testing and measurement techniques to assess the performance and functionality of industrial electrical systems and propose improvements.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

2.	PEC-EEL 402	Power System Dynamics and Control	CO-1: Analyze and model the dynamic behavior of power systems, including synchronous machines, transmission lines, and interconnected networks. CO-2: Apply control techniques to mitigate power system stability issues, such as transient stability, small-signal stability, and voltage stability. CO-3: Design and implement various control strategies for power system stability enhancement, including excitation control, governor control, and automatic voltage regulation. CO-4: Evaluate the performance of power system stability control schemes using simulation tools, and propose appropriate modifications or improvements based on the analysis results. CO-5: Assess the impact of renewable energy integration and other emerging technologies on power system dynamics and control, and propose effective strategies to ensure reliable and secure operation of the power grid.
3.	PEC-EEL 403	Digital Control Systems	CO-1: Analyze and model the dynamic behavior of power systems, including synchronous machines, transmission lines, and interconnected networks. CO-2: Apply control techniques to mitigate power system stability issues, such as transient stability, small-signal stability, and voltage stability. CO-3: Design and implement various control strategies for power system stability enhancement, including excitation control, governor control, and automatic voltage regulation. CO-4: Evaluate the performance of power system stability control schemes using simulation tools, and propose appropriate modifications or improvements based on the analysis results. CO-5: Assess the impact of renewable energy integration and other emerging technologies on power system dynamics and control, and propose effective strategies to ensure reliable and secure operation of the power grid.
4.	PEC-EEL 404	Computer Architecture	CO-1: Analyze and evaluate the fundamental components and principles of computer architecture, including instruction set design, memory organization, and input/output systems. CO-2: Apply knowledge of computer architecture to design and optimize efficient and reliable computer systems, considering factors such as performance, power consumption, and cost. CO-3: Evaluate and compare different instruction-level parallelism techniques, pipeline structures, and memory hierarchies to enhance the overall

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			performance of computer systems. CO-4: Design and develop computer arithmetic units, including arithmetic logic units (ALUs), floating-point units (FPUs), and multiplier/divider units, using appropriate algorithms and hardware implementation techniques. CO-5: Analyze and troubleshoot the performance bottlenecks in computer systems by identifying and optimizing critical paths, cache utilization, and branch prediction mechanisms, employing quantitative evaluation and simulation methods.
5.	**PEC-EEL 405**	**Electromagnetic waves**	CO-1: Analyze the fundamental concepts and properties of electromagnetic waves, including their generation, propagation, and interaction with different materials. CO-2: Apply mathematical techniques, such as Maxwell's equations, to solve problems related to electromagnetic waves, including wave propagation, reflection, refraction, and diffraction. CO-3: Design and analyze various types of antennas and transmission lines, considering factors like impedance matching, radiation patterns, and signal propagation characteristics. CO-4: Understand the principles and operation of different electromagnetic wave-based devices and systems, such as microwave circuits, waveguides, and microwave communication systems. CO-5: Evaluate and interpret experimental data related to electromagnetic waves through laboratory experiments, measurements, and simulations, and effectively communicate the results through technical reports and presentations.
6.	**PEC-EEL 406**	**Computational Electromagnetics**	CO-1: Apply numerical methods and computational techniques to solve complex electromagnetic problems, demonstrating proficiency in the use of software tools commonly employed in computational electromagnetics. CO-2: Analyze and model electromagnetic wave propagation in different media, demonstrating an understanding of the fundamental principles and equations of electromagnetics and their application in computational simulations. CO-3: Design and optimize electromagnetic structures and devices using computational methods, taking into account factors such as material properties, boundary conditions, and electromagnetic field characteristics. CO-4: Evaluate the performance and characteristics of antennas, microwave circuits, and electromagnetic systems through computational simulations, and

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			effectively communicate the results and findings to technical and non-technical audiences. CO-5: Apply advanced computational techniques to solve challenging problems in electromagnetics, including topics such as scattering, electromagnetic compatibility, and electromagnetic radiation, and propose innovative solutions based on computational analysis and simulations.
7.	**PEC-EEL 407**	**Control Systems Design**	CO-1: Apply mathematical models and principles to analyze and design control systems in electrical engineering, demonstrating proficiency in the use of Laplace transforms, transfer functions, and block diagrams. CO-2: Design and implement compensators, controllers, and observers for control systems, utilizing techniques such as root locus analysis, frequency response analysis, and state-space methods. CO-3: Evaluate the stability and performance of control systems through the application of control system design principles, including analysis of transient response, steady-state error, and frequency response characteristics. CO-4: Integrate control system components, such as sensors, actuators, and feedback loops, into practical electrical engineering systems, considering factors such as noise, disturbances, and robustness. CO-5: Employ simulation and software tools to model, analyze, and simulate control systems, interpreting and validating the results to make informed design decisions and optimize system performance.
8.	**PEC-EEL 408**	**Electrical Energy Conservation and Auditing**	CO-1: Analyze and evaluate energy consumption patterns in various electrical systems and devices, and identify potential areas for energy conservation. CO-2: Apply knowledge of electrical energy conservation techniques to design and implement energy-efficient systems, ensuring optimal use of electrical resources. CO-3: Conduct energy audits to assess the energy performance of electrical systems, identify energy-saving opportunities, and propose effective strategies for energy conservation. CO-4: Employ relevant tools and techniques to measure and monitor energy consumption, analyze data, and make informed decisions for achieving energy efficiency goals. CO-5: Develop comprehensive energy management plans and policies for organizations, considering factors such as energy regulations, cost-effectiveness, and environmental sustainability, to promote

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			responsible electrical energy usage.
9.	PEC-EEL 409	Advanced Electric Drives	CO-1: Analyze and evaluate the principles of advanced electric drives to design and develop efficient and reliable electrical systems. CO-2: Apply mathematical modeling techniques and control strategies to design, simulate, and optimize advanced electric drive systems. CO-3: Design and implement power electronic converters for various types of advanced electric drives, considering factors such as efficiency, power quality, and system integration. CO-4: Evaluate and select appropriate motor types and drive topologies based on specific application requirements, considering factors such as torque-speed characteristics, efficiency, and cost-effectiveness. CO-5: Demonstrate proficiency in troubleshooting, maintenance, and performance evaluation of advanced electric drives, utilizing diagnostic tools and techniques to ensure optimal system performance and reliability.
10.	OEC-401	Cyber Law and Ethics	
11.	OEC-402	Introduction to Philosophical Thoughts	
12.	OEC-403	Comparative Study of Literature	
13.	OEC-404	Indian Music System	
14.	OEC-405	History of Science & Engineering	
15.	OEC-406	Introduction to Art and Aesthetics	
16.	MC-III	Constitution of India	CO-1: Analyze the fundamental principles and key provisions of the Constitution of India, including its preamble, fundamental rights, directive principles of state policy, and fundamental duties, to gain a comprehensive understanding of the constitutional framework. CO-2: Evaluate the significance of the constitutional provisions pertaining to the governance structure of India, including the separation of powers, federalism, and the roles and responsibilities of different constitutional bodies, such as the President, Prime Minister, Parliament, and Judiciary. CO-3: Critically examine the constitutional safeguards for protecting individual rights and liberties, and assess the mechanisms available for citizens to seek redressal in case of violations, promoting a deep understanding of the legal and social implications of these provisions. CO-4: Analyze the constitutional framework for social justice, inclusivity, and affirmative action, exploring the provisions related to reservation policies, protection of marginalized communities, and the promotion of equality, with an emphasis on their relevance in contemporary society. CO-5: Apply the knowledge of the Constitution of India to analyze and interpret legal cases, legislations, and

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			government policies, enabling informed decision-making and participation in civic and public affairs, as well as fostering a sense of responsibility towards upholding the democratic values enshrined in the Constitution.
17.	**PROJ-EE-401**	**Short Term Training (21-45 Days)/ Project-III**	CO-1: Analyze and interpret electrical circuit diagrams, demonstrating the ability to identify different components and their interconnections accurately. CO-2: Apply theoretical concepts of electrical engineering to solve practical problems related to power distribution, electrical machines, and control systems effectively. CO-3: Design and implement basic electrical circuits, including power systems, electrical machines, and control circuits, using appropriate tools and techniques. CO-4: Evaluate the performance of electrical systems through experimental testing, data analysis, and interpretation, employing relevant instrumentation and measurement techniques. CO-5: Demonstrate knowledge and understanding of safety guidelines and regulations in electrical engineering, including the ability to identify potential hazards and implement appropriate safety measures in electrical installations and maintenance procedures.
Year & Sem.:- 4thYears& 8thSem			
1.	**PROJ-EE-402**	**Industrial Internship/Project-IV**	CO-1: Apply theoretical knowledge and engineering principles acquired during the B.Tech Electrical Engineering program to real-world industrial scenarios encountered during the 6th month industrial internship. CO-2: Demonstrate proficiency in operating and troubleshooting electrical equipment and systems commonly used in industrial settings, including generators, transformers, motors, control panels, and distribution systems. CO-3: Analyze and interpret technical drawings, schematics, and diagrams related to electrical installations and systems, and effectively implement them in practical industrial applications. CO-4: Employ effective communication and teamwork skills to collaborate with colleagues, supervisors, and industry professionals, contributing positively to the work environment and achieving project objectives. CO-5: Exhibit professionalism, ethical behavior, and a commitment to safety regulations in the workplace, adhering to industry standards and guidelines while working on electrical engineering projects during the 6th month industrial internship.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

Mewar University, Gangrar, Chittorgarh

Department of Electrical Engineering

Course: - M.Tech (Power System Engineering)

Course Outcomes

Sr. No.	Course Code	Course Title	Course Outcomes
FIRST SEMESTER			
1	PSE-411	ADVANCED POWER SYSTEM ANALYSIS	CO-1: Analyze and evaluate the steady-state behavior of advanced power systems, considering factors such as load flow, voltage stability, and power loss calculations. CO-2: Apply advanced mathematical techniques, optimization algorithms, and simulation tools to analyze and solve complex power system problems related to transient stability, fault analysis, and dynamic behavior. CO-3: Design and implement control strategies for enhancing the performance and stability of power systems, considering factors such as load balancing, frequency control, and reactive power compensation. CO-4: Evaluate the impact of renewable energy integration on power system operation, including grid integration challenges, power quality issues, and the design of suitable control strategies for efficient and reliable integration. CO-5: Critically assess and analyze the economic and environmental aspects of power system operation, including the evaluation of market deregulation, energy pricing, and the development of sustainable energy policies for optimal power system management.
2	PSE-412	POWER SYSTEM DYNAMICS & STABILITY	CO-1: Analyze and model the dynamic behavior of power systems, including synchronous machines, transmission lines, and power electronic devices, to predict system stability and performance under various operating conditions. CO-2: Evaluate the impact of disturbances, such as faults and load fluctuations, on power system dynamics, and apply appropriate control strategies to mitigate their effects and maintain system stability. CO-3: Design and implement advanced techniques for power system stability analysis, including small-signal stability analysis, transient stability analysis, and voltage stability analysis, using numerical methods and simulation

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			tools. CO-4: Apply optimization techniques and control strategies to enhance power system stability and maximize the utilization of available resources, considering factors such as system constraints, renewable energy integration, and economic operation. CO-5: Critically assess the performance of power system stabilizers, FACTS devices, and other control measures, and propose improvements or modifications to enhance system stability and reliability, taking into account emerging technologies and industry standards.
3	**PSE-413**	POWER SYSTEM OPERATION & CONTROL	CO-1: Analyze and evaluate the operation and control of power systems, considering factors such as load demand, generation capacity, and transmission constraints. CO-2: Design and implement effective strategies for the economic dispatch of power generation resources, aiming to optimize power system operation while meeting the demand and considering environmental and regulatory constraints. CO-3: Demonstrate proficiency in utilizing advanced tools and techniques for power system monitoring, control, and stability analysis, including state estimation, load flow analysis, and voltage control. CO-4: Apply knowledge of power system operation and control to identify and mitigate potential issues such as voltage fluctuations, frequency deviations, and system disturbances, ensuring the reliability and security of power supply. CO-5: Critically evaluate and propose innovative solutions for power system operation and control challenges, taking into account emerging technologies, renewable energy integration, and the evolving regulatory environment.
4	**PSE-414**	POWER QUALITY	CO-1: Analyze and evaluate power quality issues in electrical systems, including voltage sags, swells, harmonics, and interruptions. CO-2: Design and implement effective solutions to mitigate power quality problems in power systems, ensuring compliance with relevant standards and regulations. CO-3: Apply advanced measurement techniques and tools to monitor and assess power quality parameters, such as voltage and current harmonics, power factor, and flicker. CO-4: Investigate and diagnose power quality disturbances using appropriate diagnostic tools and methodologies, and propose suitable corrective measures. CO-5: Develop comprehensive strategies for the prevention and mitigation of power quality issues, considering the impact on system stability, reliability, and efficiency.
5	**PSE-511**	ELECTIVE-I TRANSIENT IN POWER	CO-1: Analyze the transient phenomena occurring in power systems, such as fault conditions, switching operations, and load variations, to predict system behavior and design

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

		SYSTEMS	effective protection schemes. CO-2: Apply appropriate mathematical models and simulation techniques to analyze and evaluate transient stability, voltage stability, and dynamic response of power systems under different operating conditions. CO-3: Design and implement effective strategies for mitigating transient disturbances and enhancing the stability of power systems, including the selection and coordination of protective devices, control schemes, and voltage support measures. CO-4: Evaluate the impact of transient events on power system components, including generators, transformers, transmission lines, and loads, and propose suitable measures to ensure their reliable and efficient operation. CO-5: Demonstrate an understanding of the role of advanced technologies, such as FACTS devices, energy storage systems, and wide-area monitoring systems, in managing transient disturbances and enhancing the overall performance of power systems.
6	**PSE-512**	ELECTIVE-II SYSTEMS THEORY	CO-1: Analyze and evaluate complex power systems using systems theory principles, models, and methodologies to identify interdependencies and interactions among various system components. CO-2: Apply systems thinking to design, develop, and optimize power system models and solutions that effectively integrate renewable energy sources, ensuring reliable and sustainable power generation. CO-3: Employ system dynamics modeling techniques to predict and analyze the behavior of power systems under different operating conditions, disturbances, and contingencies, enabling effective system control and management. CO-4: Apply advanced control strategies and optimization techniques derived from systems theory to enhance the stability, reliability, and efficiency of power systems, considering dynamic interactions among different control loops and system elements. CO-5: Develop comprehensive risk assessment frameworks based on systems theory to identify vulnerabilities, evaluate potential threats, and design robust strategies for mitigating risks in power system operations, ensuring the security and resilience of the overall power infrastructure.
7	**PSE-513**	ELECTIVE-III POWER SYSTEMS PLANNING	CO-1: Apply advanced mathematical and computational techniques to analyze and model power systems for effective planning and operation. CO-2: Evaluate the reliability and security of power systems through the application of advanced planning tools and methodologies, considering factors such as load demand, generation capacity, and network constraints.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			CO-3: Design and implement optimized power system expansion plans, considering the integration of renewable energy sources, economic factors, environmental impact, and regulatory requirements. CO-4: Analyze and assess the impact of emerging technologies, such as smart grids and energy storage systems, on power system planning, and propose appropriate strategies for their integration. CO-5: Demonstrate a comprehensive understanding of power system planning principles, including transmission network planning, distribution system planning, and economic dispatch, and apply this knowledge to address real-world challenges in the power sector.
8	**PSE-415**	POWER SYSTEMS SIM. LAB-I	CO-1: Apply theoretical concepts of power system analysis and simulation to design and analyze power systems in the laboratory setting. CO-2: Develop proficiency in using industry-standard software tools for simulating power systems and perform various power flow, fault analysis, and transient stability studies. CO-3: Analyze and interpret simulation results to assess the performance and reliability of power systems under different operating conditions, and propose suitable solutions to enhance system stability and efficiency. CO-4: Design and implement protection schemes for power systems, considering various fault scenarios, and evaluate their effectiveness through simulation-based experiments. CO-5: Collaborate effectively in a team to solve complex power system engineering problems through laboratory experiments, including system modeling, simulation, and analysis, and present the findings professionally
SECOND SEMESTER			
9	**PSE-421**	EHV AC/DC TRANSMISSION	CO-1: Analyze the principles, components, and operation of EHV AC/DC transmission systems in the context of power system engineering. CO-2: Evaluate the performance and characteristics of EHV AC/DC transmission systems, including voltage and power control, line losses, and system stability. CO-3: Apply mathematical models and simulation techniques to design and optimize EHV AC/DC transmission systems for efficient power transfer and reliability. CO-4: Design and implement appropriate protection schemes for EHV AC/DC transmission systems to ensure safe operation and fault detection. CO-5: Critically evaluate the environmental impact and economic considerations associated with EHV AC/DC transmission systems, and propose sustainable and cost-

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			effective solutions.
10	**PSE-422**	POWER SYSTEM PROTECTION AND RELAYING	CO-1: Analyze and evaluate the principles and concepts of power system protection and relaying. CO-2: Apply knowledge of power system protection schemes to design, select, and coordinate appropriate relays and protective devices for various components of a power system. CO-3: Demonstrate proficiency in analyzing fault conditions and designing protection schemes to minimize equipment damage and ensure system stability. CO-4: Evaluate the performance of power system protection and relaying schemes using industry-standard testing and simulation tools. CO-5: Develop a comprehensive understanding of emerging trends and technologies in power system protection and relaying, and assess their impact on the design and operation of modern power systems.
11	**PSE-423**	FLEXIBLE AC TRANSMISSION SYSTEMS	CO-1: Identify and analyze various components and configurations of Flexible AC Transmission Systems (FACTS), including static compensators, series compensators, and shunt compensators. CO-2: Evaluate the principles and operational characteristics of different FACTS devices, such as Thyristor-Controlled Series Capacitors (TCSC), Static Synchronous Series Compensators (SSSC), and Unified Power Flow Controllers (UPFC). CO-3: Apply mathematical models and control strategies to design and optimize FACTS devices for power system stability enhancement, voltage control, and power flow regulation. CO-4: Analyze the impact of FACTS devices on power system performance, including transmission line losses reduction, voltage profile improvement, and enhancement of transient stability and damping oscillations. CO-5: Design and simulate FACTS controllers using advanced power system analysis software, and interpret simulation results to assess the effectiveness of FACTS devices in improving power system operation and reliability.
12	**PSE-424**	DISTRIBUTED POWER GENERATION	CO-1: Demonstrate an in-depth understanding of the concepts and principles related to distributed power generation systems in the context of power system engineering. CO-2: Apply theoretical knowledge to analyze and design distributed power generation systems, considering factors such as renewable energy integration, energy storage, and grid integration. CO-3: Evaluate and compare various technologies and components used in distributed power generation, including

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			photovoltaic systems, wind turbines, fuel cells, and micro-turbines, to determine their suitability for specific applications. CO-4: Analyze the impact of distributed power generation on the overall power system, considering aspects such as power quality, stability, reliability, and economic feasibility. CO-5: Develop solutions and strategies for addressing challenges associated with distributed power generation, such as grid interconnection, system protection, energy management, and policy regulations, considering sustainability and environmental considerations.
13	**PSE-521**	ELECTIVE-I POWER APPARATUS AND MACHINES	CO-1: Analyze the principles, characteristics, and operational parameters of power apparatus and machines used in electrical power systems. CO-2: Evaluate the performance of power apparatus and machines, including transformers, generators, motors, and other electrical devices, in terms of efficiency, reliability, and safety. CO-3: Design and select appropriate power apparatus and machines for specific applications in power systems, considering factors such as load requirements, voltage levels, and system constraints. CO-4: Apply advanced techniques and tools for modeling, simulation, and control of power apparatus and machines, aiming to optimize their performance and enhance system stability. CO-5: Investigate and troubleshoot power apparatus and machines in case of faults or malfunctions, employing diagnostic methods and repair techniques to ensure efficient and reliable operation of electrical power systems.
14	**PSE-522**	ELECTIVE-II ADVANCED ELECTRICAL DRIVES	CO-1: Apply advanced knowledge of electrical drives to analyze and design efficient power electronic systems for various applications in power system engineering. CO-2: Evaluate and select appropriate control strategies and algorithms for advanced electrical drives, considering factors such as performance, efficiency, and stability. CO-3: Analyze and optimize the performance of advanced electrical drives through the application of advanced modeling, simulation, and analysis techniques. CO-4: Design and implement advanced protection schemes for electrical drives, ensuring safe and reliable operation in diverse operating conditions. CO-5: Investigate and propose innovative solutions to address challenges and emerging trends in advanced electrical drives, considering factors such as sustainability, energy efficiency, and integration with renewable energy sources
15	**PSE-523**	ELECTIVE-III	CO-1: Demonstrate an in-depth understanding of the

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

		POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS	fundamental concepts and principles of power electronics as applied to renewable energy systems. CO-2: Analyze and evaluate the performance and characteristics of various power electronic devices used in renewable energy systems, such as inverters, converters, and power semiconductor devices. CO-3: Design and develop efficient power electronic circuits for controlling and regulating renewable energy sources, including solar photovoltaic systems, wind turbines, and energy storage systems. CO-4: Apply advanced control techniques to improve the efficiency and reliability of power electronic systems in renewable energy applications, considering factors such as power quality, grid integration, and energy management. CO-5: Evaluate the economic and environmental impacts of integrating power electronics into renewable energy systems, and propose innovative solutions to optimize the overall performance and sustainability of such systems.
16	**PSE-425**	POWER SYSTEMS SIM. LAB- II	CO-1: Analyze and interpret data obtained from power systems simulation experiments to evaluate system stability and performance. CO-2: Apply advanced software tools and techniques to model, simulate, and analyze power system components, including generators, transmission lines, and transformers. CO-3: Design and optimize power system protection schemes using simulation tools to ensure safe and reliable operation of electrical networks. CO-4: Develop and implement control strategies for power system stability enhancement, voltage regulation, and reactive power compensation through simulation-based experiments. CO-5: Demonstrate proficiency in identifying and troubleshooting power system issues by conducting simulated tests, diagnosing faults, and proposing appropriate solutions.
THIRD SEMESTER			
15	**PSE-431**	SPECIAL TOPICS IN POWER SYSTEM	CO-1: Analyze and evaluate advanced power system components, such as transformers, generators, transmission lines, and protection systems, in the context of special topics in power systems. CO-2: Apply advanced knowledge of power system stability and control to analyze and design solutions for complex power system problems, considering special topics in power systems. CO-3: Demonstrate an understanding of emerging trends and technologies in power systems, including special topics such as renewable energy integration, smart grids, and power system optimization. CO-4: Develop the ability to critically assess and select

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

		PROJECT	develop innovative solutions, considering technical, economic, and environmental aspects. CO-2: Design and implement a minor power system project, utilizing advanced techniques and tools, to address real-world challenges in the field of power system engineering. CO-3: Apply knowledge of power system analysis, control, and protection to identify potential issues and implement appropriate measures for enhancing system reliability and stability. CO-4: Demonstrate effective project management skills, including planning, scheduling, and resource allocation, while executing a minor power system project. CO-5: Communicate research findings and project outcomes effectively through comprehensive technical reports and presentations, adhering to professional standards and guidelines in the field of power system engineering.
FOURTH SEMESTER			
19	**PSE - 441**	Dissertation	CO-1: Analyze and critically evaluate the existing literature and research in the field of power system engineering, demonstrating a comprehensive understanding of the key concepts, theories, and methodologies. CO-2: Design and implement an original research study or project in the area of power system engineering, utilizing appropriate tools, techniques, and methodologies to address a specific research problem or objective. CO-3: Demonstrate advanced skills in data collection, analysis, and interpretation, using appropriate statistical and computational methods to draw meaningful conclusions and support research findings in the field of power system engineering. CO-4: Communicate research findings effectively through well-structured and logically organized written reports, presenting the methodology, results, and conclusions in a clear and concise manner, adhering to appropriate academic and professional standards. CO-5: Exhibit ethical and professional behavior in conducting research, displaying awareness of relevant legal and ethical considerations in power system engineering, and demonstrating the ability to work independently and collaboratively in a research setting.

Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

Mewar University, Gangrar, Chittorgarh

Department of Electrical Engineering

Course: - M.Tech (Renewable Energy)

Course Outcomes

Sr. No.	Course Code	Course Title	Course Outcomes
First Semester			
1	**RE-411**	ENERGY ECONOMICS: THEORY AND PRACTICE	CO-1: Analyze the fundamental principles of energy economics and its application in the renewable energy sector. CO-2: Evaluate the economic feasibility of renewable energy projects by applying cost-benefit analysis and financial modeling techniques. CO-3: Apply economic theories and concepts to assess the impact of government policies, regulations, and incentives on renewable energy markets. CO-4: Develop strategies for effective energy resource management, considering factors such as energy pricing, supply-demand dynamics, and market competition. CO-5: Design and execute comprehensive energy market analysis to identify trends, opportunities, and risks in the renewable energy sector, and propose appropriate strategies for sustainable development..
2	**RE-412**	FLUID MECHANICS & TURBO MACHINERY	CO-1: Apply principles of fluid mechanics to analyze and solve complex engineering problems related to renewable energy systems and turbo machinery. CO-2: Design and optimize various types of turbo

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			machinery, including pumps, turbines, and compressors, for efficient and sustainable energy conversion in renewable energy applications. CO-3: Evaluate and analyze the performance of fluid flow systems, such as pipes, channels, and nozzles, and apply appropriate engineering techniques to enhance their efficiency and reliability in the context of renewable energy. CO-4: Demonstrate proficiency in the use of computational tools and software to simulate and model fluid flow phenomena, enabling accurate prediction and analysis of fluid mechanics and turbo machinery behavior in renewable energy systems. CO-5: Investigate and propose innovative solutions for addressing challenges and optimizing the performance of fluid mechanics and turbo machinery in the field of renewable energy, taking into account factors such as sustainability, environmental impact, and economic feasibility.
3	**RE-413**	POWER SYSTEM ENGINEERING	CO-1: Analyze and evaluate the fundamental concepts and principles of power system engineering in the context of renewable energy sources. CO-2: Apply advanced knowledge of power system components, including generators, transformers, transmission lines, and distribution systems, to design and analyze renewable energy-based power systems. CO-3: Develop skills in conducting power flow analysis, fault analysis, and stability analysis for renewable energy-based power systems, and propose effective mitigation strategies for system improvement. CO-4: Design and implement control strategies for optimizing power generation, transmission, and distribution in renewable energy-based power

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			systems, considering factors such as load balancing, frequency control, and voltage regulation. CO-5: Evaluate the economic, environmental, and social aspects of renewable energy-based power systems and propose sustainable solutions for the integration of renewable energy sources into the existing power grid.
4	**RE-414**	RENEWABLE ENERGY RESOURCE CHARACTERISTICS & CONSERVATION TECHNOLOGIES	CO-1: Analyze the characteristics of various renewable energy resources, such as solar, wind, hydro, biomass, and geothermal, in terms of availability, efficiency, environmental impact, and technological requirements. CO-2: Evaluate and compare different conservation technologies employed in the renewable energy sector, including energy storage systems, smart grids, demand-side management, and energy efficiency measures. CO-3: Apply mathematical models and simulation tools to assess the performance and optimization of renewable energy systems, taking into account factors such as energy production, cost-effectiveness, and grid integration. CO-4: Design and develop sustainable energy solutions by integrating renewable energy resources with existing energy infrastructure, considering factors such as scalability, reliability, and environmental sustainability. CO-5: Evaluate the economic, social, and environmental impacts of renewable energy utilization and conservation technologies, and propose strategies for policy formulation and implementation to promote the adoption of renewable energy resources at a regional or national level.
5	**RE-511**	ELECTIVE-I WIND POWER GENERATION	CO-1: Demonstrate a comprehensive understanding of the principles and concepts of wind power generation, including the technology,

Head
Department of
Electrical Engineering
Bijoliya University, Chittorgarh (Raj.)

			components, and working principles of wind turbines. CO-2: Apply engineering knowledge and analytical skills to design and optimize wind power systems, considering factors such as wind resource assessment, turbine selection, layout optimization, and integration with the electrical grid. CO-3: Evaluate the environmental and socio-economic impacts of wind power generation, including the assessment of noise, visual impacts, wildlife interactions, and the analysis of the economic viability and benefits of wind energy projects. CO-4: Analyze the operational performance of wind farms, including the monitoring of wind turbine performance, identification of operational issues, and implementation of maintenance strategies to maximize energy production and minimize downtime. CO-5: Demonstrate the ability to critically evaluate and communicate the challenges and opportunities in wind power generation, including the integration of wind energy into the existing energy infrastructure, policy frameworks, and the role of wind power in achieving sustainable and renewable energy goals.
6	**RE-512**	ELECTIVE-II RENEWABLE ENERGY AND FOSSIL FUELS BASED THERMAL POWER GENERATION	CO-1: Evaluate the fundamental concepts and principles of renewable energy and fossil fuels based thermal power generation, including their environmental impacts and sustainability considerations. CO-2: Analyze and compare the various types of renewable energy sources and fossil fuels used in thermal power generation, assessing their availability, efficiency, and technological advancements. CO-3: Design and optimize thermal power

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			generation systems using renewable energy sources and fossil fuels, considering factors such as power output, economic feasibility, and environmental impact. CO-4: Apply advanced modeling and simulation techniques to assess the performance and operational characteristics of renewable energy and fossil fuel-based thermal power plants, enabling informed decision-making in plant design and operation. CO-5: Develop innovative strategies for integrating renewable energy sources with existing thermal power generation systems, aiming to enhance overall efficiency, reduce greenhouse gas emissions, and achieve a sustainable energy mix.
7	**RE-513**	ELECTIVE-III STATISTICS FOR ENGINEERS	CO-1: Apply statistical methods and techniques to analyze data sets related to renewable energy systems and processes. CO-2: Design and conduct experiments, as well as collect, analyze, and interpret data using appropriate statistical tools and software for engineering applications in the field of renewable energy. CO-3: Evaluate and select appropriate statistical models and techniques for analyzing and predicting the performance of renewable energy systems, including reliability, efficiency, and resource assessment. CO-4: Communicate effectively, both orally and in writing, the results of statistical analysis and interpretation of data in the context of renewable energy engineering, taking into account the needs of diverse stakeholders. CO-5: Demonstrate a critical understanding of the ethical considerations and limitations associated with the use of statistics in renewable energy engineering, and apply appropriate statistical

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			methods to address these considerations in decision-making processes.
8.	**RE-415**	POWER SYSTEM LAB	CO-1: Apply theoretical knowledge to analyze and solve practical problems related to power system components and renewable energy systems in the laboratory setting. CO-2: Design and implement experiments to measure and analyze the performance of various power system components, such as transformers, generators, and transmission lines, in order to understand their behavior and characteristics. CO-3: Utilize software tools and simulation packages to model and simulate power systems, including renewable energy integration, and evaluate their performance and stability under different operating conditions. CO-4: Demonstrate proficiency in the operation and control of renewable energy systems, including photovoltaic systems, wind turbines, and energy storage systems, and analyze their performance and efficiency through practical experiments. CO-5: Collaborate effectively in a team environment to plan, execute, and document laboratory experiments, and communicate the results through comprehensive technical reports, presentations, and discussions, demonstrating professional and ethical conduct.
SECOND SEMESTER			
8	**RE-421**	APPLIED MATHEMATICS FOR THERMAL ENGINEERS	CO-1: Apply mathematical principles and techniques to analyze and model various thermal engineering systems encountered in renewable energy technologies. CO-2: Develop proficiency in using mathematical tools to solve complex equations and problems related to thermodynamics, heat transfer, and fluid dynamics in renewable energy applications. CO-3: Demonstrate the ability to employ

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			mathematical methods and computational tools for optimization and numerical simulations in thermal engineering designs for renewable energy systems. CO-4: Apply mathematical modeling and analysis techniques to evaluate the performance, efficiency, and sustainability of renewable energy systems, taking into account thermodynamic principles and relevant physical parameters. CO-5: Analyze and interpret mathematical models and data to make informed decisions and recommendations regarding the design, operation, and improvement of thermal engineering systems in the renewable energy sector.
9	**RE-422**	ENERGY POLICIES FOR SUSTAINABLE DEVELOPMENT	CO-1: Analyze and evaluate existing energy policies and their impact on sustainable development in the context of renewable energy sources. CO-2: Apply theoretical frameworks and models to assess the effectiveness of energy policies for promoting sustainable development in the renewable energy sector. CO-3: Develop strategies for designing and implementing energy policies that align with the principles of sustainable development and support the transition to renewable energy systems. CO-4: Critically assess the socio-economic and environmental implications of energy policies and propose measures to address potential challenges and maximize positive outcomes for sustainable development. CO-5: Synthesize and communicate research findings and policy recommendations related to energy policies for sustainable development effectively, both in written and oral forms, to diverse stakeholders in the renewable energy sector.
10	**RE-423**	RENEWABLE	CO-1: Analyze the fundamental principles and

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

		ENERGY SYSTEMS	technologies of renewable energy systems, including solar, wind, biomass, hydropower, and geothermal energy, in order to develop a comprehensive understanding of their operation and potential. CO-2: Evaluate the design and performance of renewable energy systems, considering factors such as efficiency, reliability, and environmental impact, to make informed decisions regarding their implementation in diverse energy scenarios. CO-3: Apply mathematical modeling, simulation techniques, and software tools to analyze and optimize renewable energy systems, enabling the prediction of their performance, integration into the grid, and assessment of their economic feasibility. CO-4: Design and develop innovative solutions for the integration of renewable energy systems into existing infrastructure, taking into account grid compatibility, energy storage technologies, and the management of intermittent energy sources. CO-5: Assess the socio-economic and policy aspects related to renewable energy systems, including the identification of barriers and opportunities, and propose strategies to promote their wider adoption and contribute to sustainable development goals.
11	**RE-424**	COMPUTATIONAL FLUID DYNAMICS	CO-1: Apply the principles and numerical methods of computational fluid dynamics (CFD) to analyze and simulate fluid flow phenomena in renewable energy systems. CO-2: Design and optimize renewable energy systems using CFD techniques, considering various factors such as fluid dynamics, heat transfer, and mass transport. CO-3: Evaluate the performance and efficiency of renewable energy devices and systems through

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			CFD simulations, and propose improvements based on the analysis. CO-4: Demonstrate proficiency in using CFD software packages to model and simulate complex fluid flow problems encountered in renewable energy applications. CO-5: Communicate effectively through written reports and oral presentations, presenting CFD results, analysis, and recommendations related to renewable energy systems.
12	**RE-521**	ELECTIVE-I ADVANCED ENERGY CONVERSION SYSTEMS	CO-1: Analyze and evaluate the various advanced energy conversion systems used in renewable energy applications, including solar, wind, hydro, biomass, and geothermal energy. CO-2: Design and optimize advanced energy conversion systems for efficient and sustainable energy utilization, considering factors such as energy conversion efficiency, environmental impact, and economic feasibility. CO-3: Apply advanced modeling and simulation techniques to analyze the performance and operation of different energy conversion systems, taking into account system integration, control strategies, and grid compatibility. CO-4: Critically assess the challenges and limitations associated with advanced energy conversion systems, and propose innovative solutions to enhance their overall performance, reliability, and scalability. CO-5: Demonstrate proficiency in evaluating and selecting appropriate energy conversion technologies for specific renewable energy projects, considering factors such as resource availability, geographical considerations, and project requirements, while ensuring compliance with relevant regulations and standards.
13	**RE-522**	ELECTIVE-II	CO-1: Evaluate the fundamental principles and components of hydropower systems and fuel-

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

		HYDROPOWER SYSTEMSFUEL BASED THERMAL POWER GENERATION	based thermal power generation in the context of renewable energy. CO-2: Analyze the design and operation of hydropower systems and fuel-based thermal power plants, considering efficiency, environmental impact, and sustainable energy production. CO-3: Apply engineering knowledge and techniques to assess the performance and efficiency of hydropower systems and fuel-based thermal power plants, and propose improvements for optimal energy generation. CO-4: Investigate the integration of hydropower systems and fuel-based thermal power generation with other renewable energy sources, such as solar and wind, to achieve a more comprehensive and sustainable energy mix. CO-5: Develop the ability to critically analyze the economic, social, and environmental implications of hydropower systems and fuel-based thermal power generation, and propose strategies for maximizing energy generation while minimizing adverse effects on ecosystems and communities.
14	**RE-523**	ELECTIVE-III ADVANCED SOLAR THERMAL AND PV SYSTEMS	CO-1: Apply advanced principles and concepts of solar thermal and photovoltaic (PV) systems to design and analyze efficient and sustainable energy solutions. CO-2: Evaluate the performance and efficiency of various solar thermal and PV systems using advanced analytical and computational tools. CO-3: Demonstrate proficiency in the selection, design, and integration of advanced solar thermal and PV systems for specific applications, considering factors such as climate conditions, load requirements, and economic feasibility. CO-4: Critically analyze the challenges and limitations associated with advanced solar thermal and PV systems and propose innovative solutions

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			to improve their performance, reliability, and cost-effectiveness. CO-5: Communicate effectively and collaborate with multidisciplinary teams to plan, implement, and manage advanced solar thermal and PV projects, considering environmental, social, and economic aspects of renewable energy integration.
15	**RE-425**	ENERGY SYSTEMS LAB	CO-1: Analyze and evaluate the performance of various renewable energy systems, including solar photovoltaic, wind, and biomass, through practical experiments conducted in the laboratory. CO-2: Design and optimize renewable energy systems by applying theoretical concepts and experimental results obtained in the energy systems lab. CO-3: Develop the skills to operate and maintain different types of renewable energy systems, ensuring their efficient and reliable functioning in real-world scenarios. CO-4: Apply problem-solving techniques to identify and troubleshoot issues related to renewable energy systems, employing practical knowledge gained from hands-on experiments and measurements in the energy systems lab. CO-5: Communicate experimental findings and results effectively through comprehensive laboratory reports, demonstrating the ability to analyze data, draw conclusions, and propose recommendations for improving renewable energy system performance.
THIRD SEMESTER			
15	**RE-431**	ENERGY MODELING, ECONOMICS AND PROJECT MANAGEMENT	CO-1: Apply advanced energy modeling techniques to analyze and evaluate the performance of renewable energy systems. CO-2: Analyze the economic viability of renewable energy projects by considering factors such as cost analysis, financial feasibility, and

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			return on investment. CO-3: Develop project management skills to effectively plan, execute, and monitor renewable energy projects, considering aspects such as resource allocation, scheduling, and risk management. CO-4: Evaluate the environmental impact of renewable energy projects through the application of life cycle assessment methodologies and sustainable development principles. CO-5: Demonstrate proficiency in using software tools and simulation models for energy modeling, economic analysis, and project management in the context of renewable energy systems.
16	**RE-432**	DESIGN AND ANALYSIS OF ENERGY SYSTEM	CO-1: Apply fundamental principles of thermodynamics, fluid mechanics, and heat transfer to analyze and design energy systems, with a focus on renewable energy technologies. CO-2: Demonstrate proficiency in designing and evaluating the performance of various renewable energy systems, such as solar photovoltaic systems, wind turbines, biomass conversion processes, and geothermal systems. CO-3: Analyze and optimize the efficiency of energy conversion processes in renewable energy systems, considering factors such as energy losses, system integration, and the selection of appropriate components. CO-4: Evaluate the environmental impact of different energy systems, including life cycle assessment, carbon footprint analysis, and mitigation strategies, to make informed decisions regarding sustainable energy solutions. CO-5: Apply advanced modeling and simulation techniques to assess the feasibility and performance of renewable energy systems, including the use of computer-aided design tools and data analysis methods for system optimization

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			and performance prediction.
17	**RE - 433**	SEMINAR	CO-1: Demonstrate a comprehensive understanding of renewable energy technologies and their applications through the successful completion of research-based seminar presentations. CO-2: Analyze and evaluate the environmental, social, and economic implications of various renewable energy systems and propose sustainable solutions in seminar discussions. CO-3: Apply critical thinking and problem-solving skills to identify and address challenges related to renewable energy implementation, as demonstrated through seminar projects and case studies. CO-4: Develop effective communication skills to present seminar findings, ideas, and recommendations to both technical and non-technical audiences in a clear and concise manner. CO-5: Display a deep awareness of ethical considerations and regulatory frameworks related to renewable energy development and effectively integrate them into seminar discussions and project proposals.
18	**RE- 434**	MINOR PROJECT	CO-1: Analyze and evaluate the feasibility of renewable energy projects by applying knowledge of renewable energy technologies, economic viability, and environmental impact assessment. CO-2: Design and develop innovative solutions for renewable energy systems by integrating principles of engineering, technology, and sustainable development. CO-3: Apply advanced research methodologies and tools to investigate and solve complex problems related to renewable energy, considering various factors such as resource availability, system performance, and grid integration.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			CO-4: Demonstrate effective project management skills by planning, executing, and monitoring renewable energy projects, considering technical, financial, and regulatory aspects. CO-5: Communicate technical information effectively through oral presentations, written reports, and visual aids, demonstrating the ability to convey renewable energy concepts, project outcomes, and recommendations to diverse stakeholders.
FOURTH SEMESTER			
19	**RE - 441**	DISSERTATION	CO-1: Analyze and evaluate the feasibility of renewable energy projects by applying knowledge of renewable energy technologies, economic viability, and environmental impact assessment. CO-2: Design and develop innovative solutions for renewable energy systems by integrating principles of engineering, technology, and sustainable development. CO-3: Apply advanced research methodologies and tools to investigate and solve complex problems related to renewable energy, considering various factors such as resource availability, system performance, and grid integration. CO-4: Demonstrate effective project management skills by planning, executing, and monitoring renewable energy projects, considering technical, financial, and regulatory aspects. CO-5: Communicate technical information effectively through oral presentations, written reports, and visual aids, demonstrating the ability to convey renewable energy concepts, project outcomes, and recommendations to diverse stakeholders.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

Mewar University, Gangrar, Chittorgarh

Department of Electrical Engineering

Course: - M.Tech (Power Electronics & Drives)

Course Outcomes

Sr. No.	Course Code	Course Title	Course Outcomes
First Semester			
1	**PED-101**	Power Conversion Techniques	CO-1: Apply principles of power electronics and drives to design and analyze power conversion systems for various applications. CO-2: Evaluate and select appropriate power conversion techniques for different power electronic devices, considering efficiency, performance, and reliability. CO-3: Develop the ability to model, simulate, and analyze power conversion circuits and systems using advanced simulation tools and software. CO-4: Design and implement control strategies for power conversion systems, considering factors such as stability, response time, and dynamic performance. CO-5: Demonstrate knowledge of emerging power conversion technologies and their potential applications in renewable energy systems and electric vehicle drives.

Head
Department of
Electric... neering
Mewar Uni...

2	**PED-102**	Industrial Control Techniques	CO-1: Analyze and evaluate the various industrial control techniques employed in power electronics and drives systems. CO-2: Design and implement advanced control strategies for industrial applications, considering factors such as system dynamics, stability, and performance requirements. CO-3: Apply mathematical modeling and simulation tools to analyze and optimize the performance of industrial control systems in power electronics and drives. CO-4: Develop solutions for real-world industrial control problems by integrating hardware components and software algorithms in power electronics and drives applications. CO-5: Demonstrate a comprehensive understanding of the principles, methodologies, and challenges associated with industrial control techniques in power electronics and drives, and propose innovative solutions for improving system efficiency and reliability.
3	**PED-103**	Electric Drives and Their Control	CO-1: Demonstrate an in-depth understanding of the principles, operation, and characteristics of electric drives, including various types of electric motors and their control techniques. CO-2: Analyze and design power electronic converters required for electric drive systems, considering factors such as voltage, current, and power ratings, to meet specific drive performance requirements. CO-3: Evaluate the dynamic behavior and performance of electric drive systems through mathematical modeling and simulation techniques, enabling the prediction and analysis of system response under different operating conditions. CO-4: Apply control strategies and algorithms for electric drives to achieve desired speed, torque,

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			and position control, considering factors such as motor characteristics, load dynamics, and system constraints. CO-5: Investigate and propose solutions to challenges related to electric drive system integration, such as power quality issues, electromagnetic compatibility, and energy efficiency, while considering the impact on the overall power system.
4	**PED-104**	Modelling and Analysis of Electrical Machines	CO-1: Apply mathematical modeling techniques to analyze the performance and behavior of electrical machines used in power electronics and drives systems. CO-2: Analyze and interpret the characteristics of various electrical machines, including DC machines, induction motors, synchronous machines, and their associated control strategies. CO-3: Design and simulate electrical machine systems using advanced software tools to evaluate their performance and optimize their efficiency for specific applications in power electronics and drives. CO-4: Evaluate and compare different methods for controlling electrical machines, including both conventional and advanced control techniques, and assess their impact on system stability, energy efficiency, and overall performance. CO-5: Conduct experiments and measurements on electrical machines, interpret the obtained data, and critically analyze the results to validate theoretical models and concepts in the field of power electronics and drives.
5	**PED-105**	ELECTIVE-I Advanced Semiconductor Devices	CO-1: Analyze the operating principles and characteristics of advanced semiconductor devices used in power electronics applications, such as Insulated Gate Bipolar Transistors (IGBTs), Metal-Oxide-Semiconductor Field-Effect Transistors (MOSFETs), and Silicon Carbide

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			(SiC) devices. CO-2: Design and model advanced semiconductor devices and circuits for power electronic systems, considering parameters such as voltage ratings, current ratings, switching characteristics, and thermal considerations. CO-3: Evaluate the performance and limitations of advanced semiconductor devices in various power electronic applications, including power converters, motor drives, renewable energy systems, and electric vehicle powertrains. CO-4: Investigate and propose solutions to mitigate the effects of parasitic elements in advanced semiconductor devices and optimize their performance in terms of switching speed, power dissipation, and efficiency. CO-5: Apply advanced semiconductor devices in the design and implementation of power electronic systems, demonstrating the ability to select appropriate devices based on application requirements, and evaluate system-level performance in terms of efficiency, reliability, and power quality.
6	**PED-106**	ELECTIVE-II Energy Storage Systems	Energy Storage Systems CO-1: Demonstrate comprehensive knowledge of various energy storage technologies utilized in power electronics and drives systems. CO-2: Analyze and evaluate the performance characteristics, advantages, and limitations of different energy storage systems in terms of energy density, efficiency, cycle life, and safety considerations. CO-3: Design and implement efficient and reliable energy storage solutions for power electronics and drives applications, considering specific requirements such as power capacity, voltage levels, and response time.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			CO-4: Apply advanced control techniques to manage the charging and discharging processes of energy storage systems, optimizing their performance and ensuring seamless integration with power electronics and drives systems. CO-5: Evaluate the economic and environmental impact of energy storage systems in power electronics and drives applications, and propose strategies for maximizing their utilization and sustainability in the context of power generation, distribution, and consumption.
7	**PED-107**	ELECTIVE-III Renewable Power Generation Techniques	CO-1: Demonstrate comprehensive knowledge and understanding of various renewable power generation techniques used in the field of power electronics and drives. CO-2: Analyze and evaluate the performance characteristics of different renewable power generation systems, including solar, wind, hydro, and biomass, considering factors such as efficiency, reliability, and environmental impact. CO-3: Apply appropriate mathematical models and simulation tools to design and optimize renewable power generation systems, taking into account system constraints, control strategies, and grid integration requirements. CO-4: Develop the ability to identify and troubleshoot common challenges and issues related to renewable power generation techniques, including power quality, intermittency, and grid stability, and propose effective solutions. CO-5: Design and implement advanced power electronics and drives solutions for efficient and reliable integration of renewable power generation systems with the electrical grid, ensuring optimal power flow, voltage regulation, and synchronization.
8.	**PED-108**	PowerElectronics Simulation Lab	CO-1: Analyze and simulate various power electronic circuits using software tools to gain an

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			understanding of their operation and performance characteristics. CO-2: Design and evaluate power electronic converters and control strategies through simulation, considering factors such as efficiency, power quality, and dynamic response. CO-3: Develop the ability to model and simulate different types of power semiconductor devices, including diodes, thyristors, MOSFETs, and IGBTs, to predict their behavior in power electronic circuits. CO-4: Assess the performance of power electronic systems in terms of steady-state and transient responses using simulation techniques, and propose suitable design modifications or control strategies to enhance their performance. CO-5: Apply simulation tools to investigate the impact of various factors, such as switching frequency, load variations, and component tolerances, on the performance and reliability of power electronic circuits and systems, and propose appropriate solutions to mitigate any issues that arise.
SECOND SEMESTER			
8	**PED-201**	DSP Based Electromechnical Motion Control	CO-1: Analyze and model electromechanical systems for motion control using digital signal processing (DSP) techniques in the context of power electronics and drives. CO-2: Design and implement DSP-based control algorithms to achieve accurate and efficient motion control in electromechanical systems. CO-3: Evaluate and optimize the performance of DSP-based electromechanical motion control systems through simulation and experimentation. CO-4: Integrate DSP algorithms with power electronic converters and motor drives to achieve seamless coordination and synchronization in

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			motion control applications. CO-5: Apply advanced signal processing techniques, such as filtering, noise reduction, and system identification, to enhance the performance and robustness of electromechanical motion control systems in real-world scenarios.
9	**PED-202**	Digital Control Systems	CO-1: Analyze the principles and mathematical models of digital control systems in the context of power electronics and drives, demonstrating a comprehensive understanding of their components and functionalities. CO-2: Design and implement digital control algorithms for power electronic converters and drives, employing appropriate computational techniques, simulation tools, and hardware platforms. CO-3: Evaluate the performance of digital control systems in power electronics and drives through systematic testing, data analysis, and interpretation, identifying and resolving any issues or limitations. CO-4: Apply advanced control strategies and optimization techniques to enhance the efficiency, stability, and dynamic response of power electronic systems, ensuring reliable and precise operation under varying operating conditions. CO-5: Integrate digital control systems with power electronic converters and drives, considering the hardware and software aspects, and effectively communicate the design choices and results through technical reports and presentations.
10	**PED-203**	Electric and Hybrid Vehicles	CO-1: Demonstrate a comprehensive understanding of the principles, technologies, and components associated with electric and hybrid vehicles. CO-2: Analyze the performance characteristics and operational aspects of electric and hybrid

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			vehicles, including powertrain systems, energy management strategies, and regenerative braking systems. CO-3: Apply knowledge of power electronics and drives to design, develop, and optimize power systems for electric and hybrid vehicles, considering factors such as efficiency, power density, and thermal management. CO-4: Evaluate the impact of electric and hybrid vehicles on the environment, energy consumption, and sustainability, and propose strategies for improving their overall efficiency and reducing their carbon footprint. CO-5: Communicate effectively and collaborate with multidisciplinary teams to address challenges related to electric and hybrid vehicles, and propose innovative solutions for improving their performance, reliability, and safety.
11	**PED-204**	Power Electronics Applications in Power Systems	CO-1: Apply knowledge of power electronics principles and concepts to analyze and design various power electronics applications in power systems, such as voltage converters, inverters, and rectifiers. CO-2: Evaluate the performance and operational characteristics of power electronic devices, including thyristors, power transistors, and IGBTs, in power systems to ensure efficient and reliable power conversion. CO-3: Design and implement advanced control strategies for power electronic converters and drives in power systems, considering factors such as load variations, harmonics, and power quality. CO-4: Analyze and mitigate the impact of power electronic converters on the overall power system, including considerations for power factor correction, grid integration, and harmonic distortion reduction. CO-5: Evaluate emerging trends and technologies

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			in power electronics applications for power systems, such as renewable energy integration, electric vehicle charging, and energy storage systems, and propose innovative solutions to address associated challenges.
12	**PED-205**	ELECTIVE-I Modelling, Simulation and control of power electronics systems	CO-1: Apply mathematical modeling techniques to analyze and simulate power electronics systems, including converters, inverters, and control systems. CO-2: Design and implement control strategies for power electronics systems using simulation tools, considering factors such as efficiency, stability, and response time. CO-3: Analyze and optimize the performance of power electronics systems through the application of control theory and simulation techniques. CO-4: Develop the ability to identify and troubleshoot issues in power electronics systems by analyzing simulation results and applying appropriate control strategies. CO-5: Evaluate the performance and reliability of power electronics systems by conducting simulation-based experiments and analyzing the obtained data.
13	**PED-206**	ELECTIVE-II Distributed Generation and Microgrids	CO-1: Demonstrate a comprehensive understanding of distributed generation systems and microgrids, including their components, operation principles, and integration techniques within the context of power electronics and drives. CO-2: Analyze the challenges and opportunities associated with distributed generation and microgrids, and evaluate their potential for enhancing the reliability, efficiency, and sustainability of power systems. CO-3: Design and optimize the control strategies and power electronics interfaces for distributed generation and microgrids, considering factors

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			such as power quality, grid integration, energy management, and fault detection and mitigation. CO-4: Apply advanced simulation and modeling techniques to assess the performance and behavior of distributed generation systems and microgrids, and interpret the results to make informed decisions regarding system design, operation, and optimization. CO-5: Evaluate the economic, environmental, and societal impacts of distributed generation and microgrid technologies, and propose strategies for their effective deployment and integration into existing power infrastructure, with a focus on achieving energy efficiency, renewable energy integration, and grid resilience.
14	**PED-207**	ELECTIVE-III Digital Simulation of Power Electronic Systems	CO-1: Analyze and model power electronic systems using digital simulation techniques. CO-2: Design and implement digital simulations of power electronic converters and control strategies. CO-3: Evaluate the performance and behavior of power electronic systems through digital simulation experiments. CO-4: Develop advanced simulation models for power electronic devices and components. CO-5: Apply digital simulation tools to optimize the design and operation of power electronic systems in terms of efficiency, reliability, and cost-effectiveness.
15	**PED-208**	Electric Drive and Control Lab	CO-1: Apply theoretical knowledge of electric drives and control systems to design, analyze, and simulate various motor drive configurations. CO-2: Demonstrate proficiency in implementing and troubleshooting different electric drive systems, including motor control techniques, power electronic converters, and associated

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			control algorithms. CO-3: Develop skills in selecting appropriate motor drive components, such as motors, power converters, and sensors, based on system requirements and performance specifications. CO-4: Conduct experiments in the laboratory to validate theoretical concepts related to electric drive and control systems, and effectively analyze and interpret experimental data. CO-5: Collaborate effectively in teams to design and implement practical projects involving electric drive systems, incorporating considerations of energy efficiency, system integration, and safety standards.
THIRD SEMESTER			
15	**PED-301**	Smart Grid Technologies & IOT	. CO-1: Evaluate the fundamental concepts and principles of smart grid technologies and IOT in the context of power electronics and drives. CO-2: Analyze the integration of renewable energy sources and energy storage systems within smart grid frameworks using IOT-based monitoring and control techniques. CO-3: Design and implement advanced communication protocols and networking architectures for efficient data transmission and management in smart grid systems with IOT-enabled devices. CO-4: Develop strategies for optimizing power flow, load balancing, and energy management in smart grid environments using IOT-based control algorithms and optimization techniques. CO-5: Critically assess the cybersecurity challenges and privacy issues associated with smart grid technologies and IOT, and propose effective solutions to ensure the integrity and confidentiality of power systems and data.
16	**PED-302**	Artificial Intelligence	CO-1: Demonstrate a comprehensive

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

		in Electrical Drives	understanding of the fundamental principles and concepts of artificial intelligence as applied to electrical drives in the field of power electronics. CO-2: Apply advanced AI techniques and algorithms to develop intelligent control strategies for optimizing the performance of electrical drives in various operating conditions. CO-3: Design and implement AI-based diagnostic and prognostic systems for fault detection, diagnosis, and predictive maintenance of electrical drives, enhancing their reliability and minimizing downtime. CO-4: Analyze and evaluate the impact of artificial intelligence on energy efficiency, power quality, and overall system performance in electrical drives, and propose effective strategies for improvement. CO-5: Conduct research and explore emerging trends in the field of artificial intelligence in electrical drives, fostering innovation and contributing to the advancement of the power electronics and drives industry.
17	**PED-303**	SEMINAR	CO-1: Demonstrate advanced knowledge and understanding of the theoretical concepts, principles, and applications of power electronics and drives in the field of M.Tech. CO-2: Analyze and evaluate the latest developments and emerging trends in power electronics and drives, and apply this knowledge to solve complex engineering problems in the industry. CO-3: Develop effective communication skills to present research findings, technical papers, and innovative ideas related to power electronics and drives in seminars and conferences.
18	**RE- 304**	MINOR PROJECT	CO-1: Design and develop a power electronics and drives minor project, applying appropriate methodologies and techniques to address the identified requirements and achieve the desired

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)

			outcomes. CO-2: Implement and test the power electronics and drives minor project, utilizing relevant software tools, hardware components, and experimental setups to validate the designed system and its performance. CO-3: Demonstrate effective project management skills, including planning, organizing, and coordinating tasks and resources, to ensure timely completion of the power electronics and drives minor project.
FOURTH SEMESTER			
19	**PED-401**	DISSERTATION	CO-1: Demonstrate comprehensive knowledge and understanding of advanced concepts, theories, and principles in the field of power electronics and drives through the successful completion of a dissertation project. CO-2: Develop and apply critical thinking skills to identify research problems, formulate research questions, and design appropriate methodologies for investigating and addressing power electronics and drives-related issues within the context of the dissertation. CO-3: Independently conduct in-depth literature reviews, analyze existing research, and synthesize relevant information to establish the theoretical framework and background for the dissertation study in the field of power electronics and drives. CO-4: Design and implement a systematic and rigorous research plan to collect, process, and analyze data pertaining to power electronics and drives, utilizing appropriate research methodologies, tools, and techniques. CO-5: Present well-structured, coherent, and substantiated arguments, supported by empirical evidence, in a comprehensive dissertation report that demonstrates the ability to communicate research findings, draw meaningful conclusions, and propose recommendations for future work in the area of power electronics and drives.

Head
Department of
Electrical Engineering
Mewar University, Chittorgarh (Raj.)