

M.S. Ramaiah University of Applied Sciences

New BEL Road, MSR Nagar, Bangalore – 560054



**RAMAIAH
UNIVERSITY**
OF APPLIED SCIENCES

PO, PSO, PEO & CO

Programme: M.Tech. in Power Electronics and Drives

Programme Code: 117

Programme Outcome (PO)

Programme Specific Outcome (PSO)

Program Educational Objectives (PEO)

Course Outcomes (CO)

Dean
Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore-560058

Registrar
M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

PO, PSO, PEO & CO

Faculty of Engineering and Technology (FET)

Programme Name: M.Tech. (Power Electronics & Drives)

Programme Outcomes (POs)

M.Tech. graduates will be able to:

- PO 1. Explicate the operation of power electronic converters, electric machines and variable speed drives
- PO 2. Analyze, model, design, and develop power converter based energy conversion systems
- PO 3. Design, simulate and synthesis controllers for PED systems using simulation tools
- PO 4. Implement, test and validate designed power electronic converters and drives
- PO 5. Analyze Electromagnetic interference and compatibility issues in power electronic converters
- PO 6. Develop competency to test and validate power electronic systems for real-time application
- PO 7. Pursue opportunities and build a career in industries.

Programme Specific Outcomes (PSOs)

The programme specific outcomes are listed under four headings:

1. Knowledge and Understanding
2. Cognitive skills
3. Practical skills and
4. Capability/Transferable skills

Knowledge and Understanding: After undergoing this programme, a student will be able to:

- PSO1: Explain various power electronic converter topologies
- PSO2: Describe various design aspects of power electronic drive systems
- PSO3: Describe the importance of electromagnetic compatibility in power electronic systems
- PSO4: Explain the power system for aerospace, marine and automotive applications

Cognitive Skills: After undergoing this programme, a student will be able to:

- PSO5: Design and analyze various topologies for electric drives
- PSO6: Arrive at design specifications of solar and wind energy conversion systems
- PSO7: Apply finite element analysis to a given electric drive system
- PSO8: Model and analyze power electronic systems used in smart grid

Practical Skills: After undergoing this programme, a student will be able to:

PO, PSO, PEO & CO



PSO9: Use software tools for simulation of motors and drives

PSO10: Use finite element tools to design and analyze electrical drives

PSO11: Critical analysis for the choice of power semiconductor devices for an application

PSO12: Test the performance of designed power converters for a given application

Capability Skills / Transferrable Skills: After undergoing the programme, a student will be able to:

PSO13: Manage information, develop technical reports and make presentations

PSO14: Build, Manage and Lead a team to successfully complete a project and communicate across teams and organizations to achieve professional objectives

PSO15: Work under various constraints to meet project targets

PSO16: Adopt to the chosen profession by continuously upgrading his/her knowledge and understanding through Life-long Learning philosophy

Course Outcomes (COs)

Course Title & Code: Modern Power Semiconductor Devices (19PEC501)

After the successful completion of this course, the student will be able to:

- CO-1. Discuss the operation, characteristics and application of modern power semiconductor devices
- CO-2. Discuss thermal management of power semiconductor devices
- CO-3. Choose an appropriate power semiconductor device for a given application
- CO-4. Design and analyse the firing and protection circuit for a given power semiconductor device
- CO-5. Design the heat sink for a given power semiconductor device
- CO-6. Discuss the operation, characteristics and application of modern power semiconductor devices

Course Outcomes (COs)

Course Title & Code: Electric Drive Systems (19PEC502)

After the successful completion of this course, the student will be able to:

- CO-1. Elucidate electric drive characteristics and various sensors
- CO-2. Explicate electric drive components with specifications and their transient behavior
- CO-3. Analyze motor characteristics and associated expressions in designing electric drives
- CO-4. Model electric drive based on its static and dynamic behavior
- CO-5. Design motor drive system for a given application


Dean
Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore-560058

PO, PSO, PEO & CO



Course Outcomes (COs)

Course Title & Code: Power Converter Analysis and Design (19PEC503)

After the successful completion of this course, the student will be able to:

- CO-1. Discuss the operation of modern power converters
- CO-2. Discuss and analyze the various PWM techniques for power converters
- CO-3. Design and analyze DC and AC power supplies for various applications
- CO-4. Develop an appropriate power converter for a given application
- CO-5. Model and analyze multilevel inverters for industrial applications
- CO-6. Model, simulate and analyze power electronic systems using standard software tools

Course Outcomes (COs)

Course Title & Code: Power Electronic Control of Drives (19PEC504)

After the successful completion of this course, the student will be able to:

- CO-1. Explicate various speed control methods of AC and DC motors
- CO-2. Elucidate various methods of controlling induction motor drives, SRM and BLDC
- CO-3. Discuss closed loop control of various AC and DC drives
- CO-4. Discuss scalar controlled induction motor drives
- CO-5. Model and analyze various power electronic converters used in AC and DC drives
- CO-6. Use standard software tool to model, simulate and analyze various speed control methodologies

Course Outcomes (COs)

Course Title & Code: Research methodology and IPR (19FET508A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the value, scope, relevance and mandatory steps of research as well as principles of effective research, Nature of Intellectual Property
- CO-2. Discuss the guidelines to progress from the choice of broad field of research to specific topic of research, patent rights, process of patenting at National and International level, New Developments in IPR
- CO-3. Demonstrate the application and utility of the Systematic approach and out of box thinking concepts for research to be effective
- CO-4. Adapt, Analyse and prepare well-structured research proposal and research paper invoking clearly outlined principles


Dean
Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore - 560058



Course Outcomes (COs)

Course Title & Code: Professional Communication (19FET509A)

After the successful completion of this course, the student will be able to:

- CO-1. Compose effective written business communication
- CO-2. Practice the techniques of presentation

Course Outcomes (COs)

Course Title & Code: Power Electronics in Renewable Energy Systems (19PEC505)

After the successful completion of this course, the student will be able to:

- CO-1. N/A

Course Outcomes (COs)

Course Title & Code: Finite Element Analysis of Electric Drives (19PEC506)

After the successful completion of this course, the student will be able to:

- CO-1. N/A

Course Outcomes (COs)

Course Title & Code: Value Education (19FET510A)

After the successful completion of this course, the student will be able to:

- CO-1. Discuss the role of Values and Ethics in Self-Development
- CO-2. Appreciate the importance of Universal Brotherhood

Course Outcomes (COs)

Course Title & Code: Digital Control of Power Electronic Systems (19PEE511)

After the successful completion of this course, the student will be able to:

- CO-1. Explicate various digital control techniques used in power electronic converters
- CO-2. Discuss VSI and CSI controllers used in power electronic systems
- CO-3. Analyze various architectures for digital control of distributed generation systems
- CO-4. Model different current controllers for power electronic applications
- CO-5. Design and analyse digital controllers for a power electronic system using standard software



Dean

Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore-560058

PO, PSO, PEO & CO



Course Outcomes (COs)

Course Title & Code: Power Quality (19PEE512)

After the successful completion of this course, the student will be able to:

- CO-1. Elucidate various power quality issues and effect of harmonics on power system components
- CO-2. Discuss sources of electromagnetic interference and various harmonic mitigation techniques
- CO-3. Analyze effect of various power quality issues and choose appropriate power quality conditioner to improve the reliability of the system
- CO-4. Discuss various harmonic filtering techniques and Electromagnetic compatibility enhancement techniques
- CO-5. Simulate various power quality conditioners for a given application using a standard software tool.

Course Outcomes (COs)

Course Title & Code: Power Systems for Aerospace, Marine and Automotive Applications (19PEE513)

After the successful completion of this course, the student will be able to:

- CO-1. Elucidate power generation scheme, types of propulsion, energy conversion in ships, aircrafts and automobiles
- CO-2. Illustrate power distribution system, various drives in aircrafts, ships, propeller and automobiles
- CO-3. Develop power converter control strategies for aerospace, automobile and marine applications
- CO-4. Model and analyze power converter circuits for energy storage system in aerospace, marine and automotive applications
- CO-5. Simulate the individual components used in drives with power converter circuit for aerospace, marine and automotive applications using standard software tool

Course Outcomes (COs)

Course Title & Code: Smart Grid Technologies (19PEE514)

After the successful completion of this course, the student will be able to:

- CO-1. Elucidate the need for Smart Grid and their features in the context of Indian grid
- CO-2. Explicate the operation and importance of PMUs, PDCs, WAMS, voltage and frequency control in micro grids
- CO-3. Discuss the role of automation in distributed generation
- CO-4. Develop and analyze various algorithms for the smart grid/distributed generation
- CO-5. Model and analyze appropriate power quality conditioners to improve the performance of the smart grid


Dean
Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore-560058 PO, PSO, PEO & CO



Course Outcomes (COs)

Course Title & Code: Electric Drive Vehicle Engineering (19PEE521)

After the successful completion of this course, the student will be able to:

- CO-1. Explicate vehicle electrification and conventional vehicle power trains
- CO-2. Elucidate various electric drive control techniques and hybrid electric power trains
- CO-3. Discuss charging infrastructure for EV and PHEV powered by grid and Renewable Energy system
- CO-4. Modelling of DSP controllers for electric vehicles
- CO-5. Model and synthesize vehicle drive systems using standard software tool

Course Outcomes (COs)

Course Title & Code: Energy Storage Systems (19PEE522)

After the successful completion of this course, the student will be able to:

- CO-1. Explicate construction and working principle of various types of energy storage devices
- CO-2. Discuss the various technical specifications of energy storage technologies
- CO-3. Elucidate the electrical performance and safety aspects of batteries
- CO-4. Analyze the characteristics and performance of various energy storage systems for Electrical Vehicle
- CO-5. Estimate the storage sizing and state parameters for various batteries

Course Outcomes (COs)

Course Title & Code: Embedded Systems for EV (19PEE523)

After the successful completion of this course, the student will be able to:

- CO-1. Understand basics of embedded systems and vehicle domains
- CO-2. Explain architecture of ARM and concepts of their programming
- CO-3. Discuss embedded system requirements, software and communication
- CO-4. Program the real time embedded system, execute and verify its functionality.
- CO-5. Analyze various examples of embedded systems based on ARM processor
- CO-6. Realize the functionalities of various intelligent vehicular techniques used in electric vehicles

Course Outcomes (COs)

Course Title & Code: Intelligent Control Systems in Electric Vehicles (19PEE524)

After the successful completion of this course, the student will be able to:

- CO-1. Elucidate the functions of control system in electric vehicles
- CO-2. Discuss various types of control units and their control strategies in electric vehicles



Dean
Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore-560058

PO, PSO, PEO & CO



- CO-3. Identify, evaluate and choose appropriate membership functions and fuzzy rule base for a given application
- CO-4. Develop a schematic diagram for design of Fuzzy Logic Controllers (FLC)
- CO-5. Analyze adaptive control theories, their properties, and applications to autonomous vehicles
- CO-6. Model, simulate and analyze fuzzy logic controller for EV

Course Outcomes (COs)

Course Title & Code: Internship (19PEP521A)

After the successful completion of this course, the student will be able to:

- CO-1. N/A

Course Outcomes (COs)

Course Title & Code: Group Project (19PEP5522A)

After the successful completion of this course, the student will be able to:

- CO-1. Define aim and objectives of the chosen project idea and explain its applications
- CO-2. Arrive at various technical specifications to be targeted while executing the project
- CO-3. Specify the methodologies/procedure/methods for the design and implementation of the project
- CO-4. Demonstrate /present a prototype of the implemented project
- CO-5. Work as team, develop leadership and project management skills

Course Outcomes (COs)

Course Title & Code: Dissertation and Publication (19PEP523A)

After the successful completion of this course, the student will be able to:

- CO-1. Critically review scholarly literature collected from various sources for the project purpose and formulate a research problem
- CO-2. Prepare and present a research proposal
- CO-3. Conduct research to achieve research objectives
- CO-4. Propose new ideas/methodologies or procedures for further improvement of the research undertaken
- CO-5. Create research document and write research papers for publications
- CO-6. Defend the research findings in front of scholarly audience


 Dean
 Faculty of Engineering and Technology
 M.S. Ramaiah University of Applied Sciences ***
 Bangalore-560058

