Department of Electrical and Electronics Engineering

Program: M.Tech - Power Electronics

Regulation: R19 **Course Outcomes** **No. of Courses: 34**

I-Sem	Course:Electrical Machines Modeling and Analysis
CO-1	Analyze the characteristics of different types of dc motors to design suitable controllers for Different applications
CO-2	Apply the knowledge of reference frame theory for ac machines to model the induction and Synchronous machines.
CO-3	Evaluate the steady state and transient behavior of induction and synchronous machines to propose the suitability of drives for different industrial applications
CO-4.	Analyze the behavior of induction machines using voltage and torque equations.
CO-5	Perform the steady state & transient analysis of electrical machines.

I-Sem	Course:Analysis of Power Electronic Converters
CO-1	Describe and analyze the operation of ac-dc converters
CO-2	Analyze the operation of power factor correction converters
CO-3	Analyze the operation of three phase inverters with pwm control
CO-4.	Study the principles of operation of multi- level inverters and their applications
CO-5	The role power electronics play in the improvement of energy usage efficiency and the applications of power electronics in emerging areas.

I-Sem	Course:Modern Control Theory
CO-1	Formulate and solve the state equations of dynamic systems, analyze controllability and Observability.
CO-2	Design a state feedback controller; design an observer
CO-3	Linearize a nonlinear system model; analyze non-linear systems through describing functions
CO-4	Determine the stability of a given system; generate a lyapunov function.
CO-5	Minimize a given functional, design an optimal feedback gain matrix.

I-Sem	Course:Power Quality and Custom Power Devices
CO-1	Identify the issues related to power quality in power systems
CO-2	Address the problems of transient and long duration voltage variations in power systems
CO-3	Analyze the effects of harmonics and study of different mitigation techniques

| CO-4 | Identify the importance of custom power devices and their applications. |
| CO-5 | Acquire knowledge on different compensation techniques to minimize power quality Disturbances. |

I-Sem	Course:Programmable Logic Controllers & Applications
CO-1	Understand the plcs and their i/o modules.
CO-2	Develop control algorithms to plc using ladder logic etc.
CO-3	Manage plc registers for effective utilization in different applications.
CO-4	Handle data functions and control of two axis and their axis robots with plc
CO-5	Design pid controller with plc.

I-Sem	Course:Artificial Intelligence Techniques
CO-1	Differentiate between algorithmic based methods and knowledge based methods.
CO-2	Use appropriate ai framework for solving power system problems.
CO-3	To design fuzzy logic controllers for power engineering applications
CO-4	Explain how to develop ai systems to meet business, organizational, and technology requirements.
CO-5	Implement ai frameworks and platforms to improve business, organizational, and technology outcomes.

I-Sem	Course: Advanced Power Systems Protection
CO-1	Know the classifications and applications of static relays
CO-2	Understand the application of comparators.
CO-3	Understand the static version of different types of relays
CO-4	Understand the numerical protection techniques
CO-5	Analyze and comment on technical research papers related to power system protection

I-Sem	Course: Renewable Energy Technologies
CO-1	Understand various general aspects of renewable energy systems.
CO-2	Analyze and design induction generator for power generation from wind.
CO-3	Design mppt controller for solar power utilization.
CO-4	Utilize fuel cell systems for power generation.

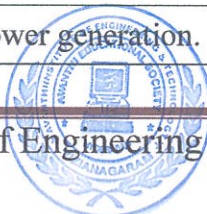# AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Approved by A.I.C.T.E., New Delhi, & Permanently Affiliated to J.N.T.U-GV, Vizianagaram)
NAAC "B++" Accredited Institute
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CO-5	Understand the applications of different renewable energy sources like ocean thermal, hydro, geothermal energy etc.
I-Sem	**Course: HVDC Transmission and Flexible AC Transmission Systems**
CO-1	Compare hvdc and ehvac transmission systems
CO-2	Analyze converter configurations used in hvdc and evaluate the performance metrics.
CO-3	Understand controllers for controlling the power flow through a dc link and compute filter Parameters.
CO-4	Apply impedance, phase angle and voltage control for real and reactive power flow in ac Transmission systems with facts controller.
CO-5	Analyze and select a suitable facts controller for a given power flow condition
I-Sem	**Course: Research Methodology and IPR**
CO-1	Formulate research problem.
CO-2	Analyze literature review and find research gaps to finalize research objectives.
CO-3	Identify the need of ethics in research.
CO-4	Identify the need of ipr of research projects for economic growth and social benefits.
CO-5	Apply basic data analytics techniques: probability distribution, linear regression, anova
I-Sem	**Course: Power Electronics Simulation Laboratory**
CO-1	Describe the operation and characteristics of scr, mosfet and igbt.
CO-2	Explain the operation of single phase and three phase controlled rectifiers and their commutating circuits.
CO-3	Discuss the operation of different types of choppers, inverters.
I-Sem	**Course: Power Converters Laboratory**
CO-1	Upon completing this lab students must be able to correlate theoretical and practical
CO-2	Analyze ac-ac, dc-ac converters and also converter fed to ac&dc drives.
CO-3	Analyze the characteristics of mosfet, igbt, scr and scr firing ckts, these commutation techniques.
II Sem	**Course: Switched Mode Power Conversion**
CO-1	Analyze operation and control of non-isolated and isolated switch mode converters

CO-2	Design of non-isolated and isolated switch mode converters
CO-3	Analyze operation and control of resonant converters.
CO-4	Feedback design of switch mode converters based on linearized models.
CO-5	Analyze deep knowledge in pulse width modulated techniques
II Sem	**Course: Power Electronic Control of Electrical Drives**
CO-1	Understand the concepts of scalar and vector control methods for drive systems.
CO-2	Analyze and design controllers and converters for induction motor, pmsm and bldc drives.
CO-3	Select and implement proper control techniques for induction motor and pmsm for specific Applications.
CO-4	Analyze and design control techniques and converters for srm drives
CO-5	Analyze critical areas in application levels, and derive typical solutions
II Sem	**Course: Control & Integration of Renewable Energy Systems**
CO-1	Gain knowledge on different renewable energy sources and storage devices
CO-2	Recognize, model and simulate different renewable energy sources
CO-3	Analyze, model and simulate basic control strategies required for grid connection
CO-4	Implement a complete system for standalone/grid connected system
CO-5	Understand the applications of different renewable energy sources like ocean thermal, hydro, geothermal energy etc.
II Sem	**Course: Hybrid Electric Vehicles**
CO-1	Know the concept of electric vehicles and hybrid electric vehicles.
CO-2	Familiar with different motors used for hybrid electric vehicles
CO-3	Understand the power converters used in hybrid electric vehicles
CO-4	Know different batteries and other energy storage systems.
CO-5	Investigate and model the issues in mathematical domain related to grid interconnections of electric and hybrid vehicle
II Sem	**Course: Digital Control Systems**
CO-1	Analyze digital control systems using z-transforms and inverse z-transforms

CO-2	Evaluate the state transition matrix and solve state equation for discrete model for continuous time systems, investigate the controllability and observability
CO-3	Determine the stability; design state feedback controller
CO-4	Design an observer
CO-5	Solve a given optimal control problem.

II Sem	**Course: Advanced Digital Signal Processing**
CO-1	Describe structure of digital filters
CO-2	Design digital filters with different techniques
CO-3	Understand the implementation aspects of signal processing algorithms.
CO-4	Know the effect of finite word length in signal processing
CO 5	Analyze different power spectrum estimation techniques.

II Sem	**Course: Applications of Power Converters**
CO-1	Analyze power electronic application requirements.
CO-2	Identify suitable power converter from the available configurations
CO-3	Develop improved power converters for any stringent application requirements
CO-4	Improvise the existing control techniques to suit the application. Design of bi-directional converters for charge/discharge applications
CO-5	Identify the critical areas in application levels and derive typical alternative solutions, select suitable power converters to control electrical motors and other industry grade apparatus.

II Sem	**Course: Microcontrollers**
CO-1	Design the interfacing circuits for input and output to pic micro controllers and dsp processors.
CO-2	Write alp for dsp processors.
CO-3	Design pwm controller for power electronic circuits using fpga.
CO-4	Design electrical circuitry to the microprocessor i/o ports in order to interface the processor to external devices.
CO-5	Evaluate assembly language programs and download the machine code that will provide solutions real□world control problems.

II Sem	**Course: Electric Drives Simulation Laboratory**
CO-1	Analyze the performance of different electrical machines and drives

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CO-2	Set up control strategies to synthesize the voltages in dc and ac motor drives.
CO-3	Develop testing and experimental procedures applying basic knowledge in electronics, electrical circuit analysis, electrical machines, microprocessors, and programmable logic controllers.

III- Sem	Course: Electric Drives Laboratory
CO-1	use standard methods to determine accurate modeling/simulation parameters for various general purpose electrical machines and power electronics devices required for designing a system and solve drives related problems
CO-2	Estimate constraints, uncertainties and risks of the system (social, environmental, business, safety issues etc.)
CO-3	Combine the use of computer based simulation tools relevant to electrical drives with practical laboratory experimentation.

III- Sem	Course: Digital Signal Processor Controlled Drives
CO-1	Interface the dsp platform with sensors such as hall-effect voltage sensors,
CO-2	Use hall-effect current sensors, shaft encoder for data acquisition for motor drive applications
CO-3	Scale and normalize the data to suit the requirements of the drive system
CO-4	Exploit the architectural features of the dsp platform to design and implement
CO-5	Use algorithms for the realization of controllers, pulse width modulators and observers

III- Sem	Course: Smart Grid Technologies
CO-1	Understand smart grids and analyze the smart grid policies and developments in smart grids.
CO-2	Develop concepts of smart grid technologies in hybrid electrical vehicles etc.
CO-3	Understand smart substations, feeder automation, gis etc.
CO-4	Analyze micro grids and distributed generation systems.
CO-5	Analyze the effect of power quality in smart grid and to understand latest developments in ict for smart grid.

III- Sem	Course: Modeling and Simulation of Power Electronic Systems
CO-1	Understand the back ground activities i.e. Numerical solution used in the simulation software.
CO-2	Judge or properly choose the required numerical solver to be used for analysis.
CO-3	Understand and debug the convergence problems occurring during simulation

CO-4	Analysis of multi converter dc power electronic systems
CO-5	Based real time simulation of power electronic system

III- Sem	Course: Industrial Safety
CO-1	Understand the general industrial requirements like lighting, cleanliness prevention from hazards and accidents.
CO-2	Analyze maintenance requirements of the industry and cost associated.
CO-3	Analyze wear and corrosion aspects of the industry and their prevention
CO-4	Identify the faults prone areas and their repair and periodic maintenance.
CO-5	Prepare them to be comfortable with verbal ability.

III- Sem	Course: Energy Audit Conservation & Management
CO-1	Understand the principle of energy audit and their economic aspects.
CO-2	Recommend energy efficient motors and design good lighting system.
CO-3	Understand advantages to improve the power factor
CO-4	Evaluate the depreciation of equipment.
CO-5	Carry out the cost- benefit analysis of various investment alternatives for meeting the energy needs of the organization.

III- Sem	Course: Composite Materials
CO-1	Understand characteristics and advantages of composite materials
CO-2	Acquire knowledge of reinforcement, glass fiber, etc.
CO-3	Identify the usage of metal matrix composites
CO-4	Understand manufacturing of polymer matrix composites
CO-5	Understand manufacturing of polymer matrix composites

III- Sem	Course: Audit 1 and 2: English for Research Paper Writing
CO-1	Knowledge of selected literary texts, movements and concepts in literature; the process of research oriented study and critical thinking.
CO-2	Human values and perspectives available in literary texts that embody the essence of multiple societies and cultures;
CO-3	Written and oral communication essential to participate in a global community;

III- Sem	Course: Audit 1 and 2: Sanskrit for Technical Knowledge
CO-1	Determine and predetermine the performance of dc machines and transformers
CO-2	Control the speed of dc motor
CO-3	Obtain three phase to two phase transformation

III- Sem	Course: Audit 1 and 2: Value Education
CO-1	Knowledge of self-development
CO-2	Learn the importance of human values 3.developing the overall personality
CO-3	It also helps in developing a strong relationship with family and friends.

III- Sem	Course: Audit 1 and 2: Constitution of India
CO-1	Discuss the growth of the demand for civil rights in india for the bulk of indians before the arrival of Gandhi in Indian politics.
CO-2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in india.
CO-3	Discuss the circumstances surrounding the foundation of the congress socialist party [csp] under the leadership of Jawaharlal nehru and the eventual failure of the proposal of direct elections through adult suffrage in the indian constitution

III- Sem	Course: Audit 1 and 2: Pedagogy Studies
CO-1	Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
CO-2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
CO-3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

III- Sem	Course: Audit 1 and 2: Stress Management by Yoga
CO-1	Develop healthy mind in a healthy body thus improving social health also
CO-2	Improve efficiency
CO-3	The students will gain the ability to manage yoga training classes.

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