ADITYA ENGINEERING COLLEGE

An Autonomous Institutuion

Approved by AICTE • Permanently Affiliated to JNTUK • Accredited by NAAC with 'A' Grade
Recognised by UGC under sections 2(f) and 12(B) of UGC Act, 1956
Aditya Nagar, ADB Road, Surampalem - 533437, Near Kakinada, E.G.Dt., Ph:99498 76662

Department of Electrical and Electronics Engineering

M.Tech (Power Electronics & Drives)-AR17-Course Articulation Matrix

Note: Enter Correlation Levels 1 or 2 or 3.   Where: 1- Slight(Low), 2 - Moderate(Medium), 3 - Substantial (High).

	CO Statements	POs											PSOs		
I SEM															
Course Code	**172PD1T01 - ELECTRICAL MACHINE MODELING & ANALYSIS**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Analyze the behavior of DC motor models for different applications.	2	3	3	3	-	-	-	-	-	-	-	3	3	-
CO2	Evaluate the characteristics of different types of DC motors for designing suitable controllers	3	3	-	3	2	-	-	-	-	-	-	3	3	-
CO3	Make use of the reference frame theory of AC machines to model the induction and Synchronous machines.	-	3	3	-	-	-	-	-	-	-	-	3	-	-
CO4	Evaluate the steady state and transient behavior of induction machines to propose the suitability of drives for different industrial applications	2	-	3	3	1	-	-	-	-	-	-	-	3	3
CO5	Evaluate the steady state and transient behavior of synchronous machines to propose the suitability of drives for different industrial applications.	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO6	Derive the 2-Phase induction machines using voltage and torque equations to differentiate the behavior and to propose their applications in real world.	2	-	2	-	-	-	-	-	-	-	-	3	-	-
Course Code	**172PD1T02 - ANALYSIS OF POWER ELECTRONIC CONVERTERS**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Analyze the operation of phase controlled converters and AC voltage converters.	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Analyze the requirements of power factor correction in converter circuits.	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Describe and analyze the operation of 3-phase inverters with and without PWM techniques.	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	Describe principles of operation and features of multilevel inverters	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO5	Explain the performance of three phase ful and half converter circuit.	2	1	-	-	-	-	-	-	-	-	-	2	-	-

	CO Statements	POs											PSOs		
Course Code	**172PD1T03 -POWER ELECTRONIC CONTROL OF DC DRIVES**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the performance characteristics of converter fed DC drives.	2	1	2	-	-	-	-	-	1	-	-	2	1	2
CO2	Analyze the two quadrants and four quadrant controls of DC motor drives.	2	3	3	-	-	-	-	-	1	-	-	3	-	3
CO3	Develop the mathematical models of DC drive components.	1	2	3	2	-	-	-	-	-	-	-	3	2	3
CO4	Analyze the four quadrant and closed loop control of DC-DC converter fed DC drive.	2	3	3	3	1	-	-	1	2	-	-	-	3	-
CO5	Explain the performance of three phase ful and half converter circuit.	3	3	3	3	3	-	-	3	3	3	-	3	3	-
CO6	Design various power electronic converters to control the DC motors.	3	3	3	3	3	-	-	3	3	3	-	3	3	-
Course Code	**172PD1T04 - FLEXIBLE AC TRANSMISSION SYSTEMS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze the performance improvement of transmission system with FACTS.	-	-	3	-	1	-	-	-	-	-	-	3	-	3
CO2	Examine the effect of static series compensation.	-	3	-	-	-	-	-	-	-	-	-	-	3	3
CO3	Examine the effect of UPFC.	-	3	-	3	-	-	-	-	-	-	-	3	3	-
CO4	Determine an appropriate FACTS device for different types of applications.	3	-	-	3	-	3	-	-	-	-	-	3	3	3
CO5	Analyze the properties of static stunt compensation	2	-	2	-	-	-	-	-	-	-	-	3	-	3
Course Code	**172PD1E01 - MODERN CONTROL THEORY (ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the state variable approach is suitable for higher order.	-	1	-	1	-	-	-	-	-	-	-	-	1	2
CO2	Examine the concepts of controllability and observability.	-	3	-	-	1	-	-	-	-	-	-	3	3	-
CO3	Analyze the various non-linearities through describing functions and phase plane analysis.	2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO4	Illustrate the different issues of stability and instability of continuous time invariant systems.	-	-	-	2	-	-	-	-	-	-	-	3	2	-
CO5	Discuss the various linear time invariant systems using time state equations	3	-	-	-	-	-	-	-	-	-	-	3	3	3
Course Code	**172PD1E02 - POWER QUALITY (ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze the knowledge on causes of power quality, power quality parameters.	2	-	-	--	-	-	-	-	-	-	-	2	2	-
CO2	Describe sources of transient over voltages and providing protection to transient over voltages.	-	1	-	-	-	-	-	-	-	-	-	-	1	-
CO3	Examine effects of harmonics, sources of harmonics and harmonic minimization.	-	1	-	-	-	-	-	-	-	-	-	2	-	2
CO4	Analyze long duration voltage variations and regulation of voltage variations.	2	-	-	-	-	-	-	-	-	-	-	-	-	2

	CO Statements	POs											PSOs		
CO5	Develop solutions to wiring, grounding problems and power quality aspects in distributed generation.	2	-	-	-	-	-	-	-	-	-	-	2	-	
Course Code	**172PD1E03 -OPTIMIZATION TECHNIQUES (ELECTIVE – I)**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.	2	-	-	--	-	-	-	-	-	-	-	2	2	-
CO2	Apply classical optimization techniques to minimize or maximize a multi-variable objective function	-	1	-	-	-	-	-	-	-	-	-	-	1	-
CO3	Formulate a mathematical model and apply linear programming technique by using Simplex method.	-	1	-	-	-	-	-	-	-	-	-	2	-	2
CO4	Apply gradient and non-gradient methods to nonlinear optimization problems	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO5	Solve practical problems using PSO.	2	-	-	-	-	-	-	-	-	-	-	-	2	-
Course Code	**172PD1E04 -ENERGY AUDITING, CONSERVATION&MANAGEMENT (ELECTIVE – II)**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Analyze energy audit in different organizations.	2	3	-	-	2	-	-	-	-	-	-	3	-	-
CO2	Recommend energy efficient motors and design good lighting system.	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	Determine methods to improve the power factor.	-	3	-	3	-	-	-	-	-	-	-	-	2	-
CO4	Evaluate the depreciation of equipment.	-	-	2	-	-	-	-	-	-	-	-	-	2	3
CO5	Evaluate the payback period of the project.	3	-	-	-	-	-	-	-	-	-	-	3	-	3
Course Code	**172PD1E05 -ARTIFICIAL INTELLIGENCE TECHNIQUES (ELECTIVE – II)**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Explin neural networks and analyze different types of neural networks.	2	-	2	-	-	-	-	-	-	-	-	3	2	3
CO2	Design training algorithms for neural networks.	3	-	-	-	-	-	-	-	-	-	-	3	3	3
CO3	Develop algorithms using genetic algorithm for optimization.	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	Analyze and design fuzzy logic systems.	-	3	-	-	-	-	-	-	-	-	-	3	3	-
CO5	Apply AI Techniques in power electronics and DC drives.	-	-	-	-	-	-	-	-	-	-	-	-	3	-
Course Code	**172PD1E06 -HVDC TRANSMISSION (ELECTIVE – II)**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Explain the various schemes of HVDC transmission.	-	-	-	1	-	-	-	-	-	-	-	3	3	-
CO2	List the basic HVDC transmission equipment.	-	-	3	-	1	-	-	-	-	-	-	2	3	3
CO3	Make use of the control of HVDC systems.	-	2	3	2	-	-	3	-	-	-	-	3	-	3
CO4	Compare the interaction between HVAC and HVDC system.	2	-	-	-	-	-	2	-	-	-	-	3	-	3
CO5	Classify the various protection schemes of HVDC engineering	2	-	3	3	-	-	-	-	-	-	-	-	3	-
Course Code	**172PD1L01 -SIMULATION LAB**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Analyze the characteristics of power semiconductor devices in simulation.	3	2	-	1	3	-	-	-	-	-	-	3	3	-

	CO Statements	POs											PSOs		
CO2	Evaluate the operation of various power electronic converters in simulation.	-	3	2	2	3	-	-	-	-	-	-	3	3	-
CO3	Implement the speed controlling techniques for AC machines in imulation.	3	3	2	-	-	-	-	-	-	-	-	3	-	-
CO4	Develop the PWM techniques in simulation.	3	3	2	-	-	-	-	-	-	-	-	-	-	3
CO5	Demonstrate the dq modeling for various electrical machines using reference frame theory.	3	3	2	-	-	-	-	-	-	-	-	-	-	3

							II SEM									

Course Code	172PD2T05 -SWITCHED MODE POWER CONVERSION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Analyze the control operation of non-isolated switch mode converters.	2	-	3	-	-	-	-	-	-	-	-	3	3	3
CO2	Explain the operation of resonant converters and soft switching.	-	-	2	1	-	-	-	-	-	-	-	2	-	-
CO3	Explain the operation of isolated switch mode converters.	-	-	2	1	-	-	-	-	-	-	-	-	-	-
CO4	Apply the control schemes of resonant converters	1	-	3	2	-	-	-	-	-	-	-	3	2	-
CO5	Design the non-isolated switch mode converters based on linearization.	3	2	1	2	-	-	-	-	-	-	-	-	1	3

Course Code	172PD2T06 -POWER ELECTRONIC CONTROL OF AC DRIVES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Explain operation of induction motor and analyses speed control of AC drives by VSI fed drives.	2	3	3	3	-	-	-	-	-	-	-	3	-	3
CO2	Discuss the vector control of induction motors.	3	2	-	3	2	-	-	-	-	-	-	3	3	-
CO3	Analyze operation of traction drives.	-	3	3	-	-	-	-	-	-	-	-	-	3	-
CO4	Analyze control schemes to synchronous motor drives.	2	-	3	3	1	-	-	-	-	-	-	3	-	3
CO5	Examine the control of switched reluctance motor & stepper motor	3	3	-	-	-	-	-	-	-	-	-	-	-	-

Course Code	172PD2T07 -DIGITAL CONTROLLERS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Summarize the concepts of PIC microcontrollers 16C6X/7X.	-	1	-	2	2	1	-	3	3	-	-	-	1	2
CO2	Explain system configuration registers, memory, peripheral interfacing of C2xx DSP.	2	3	2	3	3	3	-	3	3	-	-	-	1	2
CO3	Demonstrate general purpose I/O and interrupt handling of C2xx DSP.	-	1	-	2	2	1	-	3	3	-	-	-	1	2
CO4	Illustrate General Event Manager Information of C2xx DSP.	1	2	1	3	3	2	-	3	3	-	-	-	1	2
CO5	Explain Xilinx XC3000 and XC4000 series using HDL programming	-	1	-	2	2	1	-	3	3	-	-	-	3	3

Course Code	172PD2T08 -CUSTOM POWER DEVICES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	List out the various power quality issues.	-	1	2	1	-	-	-	-	-	-	-	2	-	2
CO2	Explain the power quality issues in distribution systems.	2	-	3	3	-	-	-	-	-	-	-	3	-	-
CO3	Explain about various back up devices.	1	-	3	2	-	-	-	-	-	-	-	-	3	3
CO4	Classify the various types of custom power devices.	2	3	-	3	-	-	-	-	-	-	-	-	3	-

	CO Statements	POs											PSOs		
CO5	Choose the devices for various power quality issues in distribution systems.	2	3	-	-	-	-	-	-	-	-	-	-	-	-	3
Course Code	**172PD2E07 -RENEWABLE ENERGY SYSTEMS (ELECTIVE – III)**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Identify alternate energy sources.	1		-	2		-	-	-	-	-	2	3	2	3
CO2	Classify and analyze different renewable energy systems.	-		-		-	-	-	-	3	-	2	1	2
CO3	Analyze different alternate energy sources for power generation.	2	3	3	3		-	-	-	2	-	-	3	-	-
CO4	Choose an optimal usage of different sources and interconnection with the grid.	3		-		2	-	-	-	-	-	-	-	-	-
CO5	Illustrate the basic operation of geothermal energy.	1	2	-	-	-	-	-	-	-	-	-	3	2	3
Course Code	**172PD2E08 -REACTIVE POWER COMPENSATION & MANAGEMENT (ELECTIVE – III)**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Analyze the various load compensations.	2	3	3	3	-	-	-	-	-	-	-	3	-	3
CO2	Develop the mathematical model of reactive power compensating devices.	1	2	3	-	-	-	-	-	-	-	-	3	-	-
CO3	Discuss the various application of reactive power compensation in electrical traction & arc furnaces.	-	3	-	3	-	-	-	-	-	-	-	3	3	-
CO4	Examine the various loss reduction techniques in Distribution side Reactive power Management	2	-	3	3	-	-	-	-	-	-	-	-	3	-
CO5	Identify the effects of under voltage harmonics in rective power distribution	-	2	-	-	-	-	-	-	-	-	-	-	2	-
Course Code	**172PD2E09 -ELECTRICAL DISTRIBUTION SYSTEMS (ELECTIVE – III)**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	**Analyze the distribution system.**	2	3	3	3	-	-	-	-	-	-	-	3	3	3
CO2	Design equipment for compensation of losses in the distribution system.	3	2	-	3	2	-	-	-	-	-	-	3	-	3
CO3	Design protective systems and co-ordinate the devices.	-	3	3	-	-	-	-	-	-	-	-	3	3	-
CO4	Analyze the capacitive compensation.	2	-	3	3	1	-	-	-	-	-	-	-	3	3
CO5	Explian different voltage control methods.	3	3	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**172PD2E10 -SMART GRID TECHNOLOGIES (ELECTIVE – IV)**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Analyze the smart grids and its policies and developments.	2	-	-	-	3	-	-	-	-	-	-	3	-	-
CO2	Develop the basic concepts of smart grid technologies in hybrid electrical vehicles etc.	1	2	1	3	3	-	-	-	-	-	-	3	2	-
CO3	Explain the smart substations, feeder automation, GIS etc.	3	-	3	-	-	-	-	-	-	-	-	3	3	-
CO4	Illustrate micro grids and distributed generation systems.	-	1	-	2	-	-	-	-	-	-	-	-	-	2
CO5	Investigate the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.	2	-	-	3	-	-	-	-	-	-	-	-	-	3

	CO Statements	POs											PSOs		
Course Code	**172PD2E11 -SPECIAL MACHINES (ELECTIVE – IV)**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Identify the characteristics of different types of PM type brushless DC motors and design suitable controllers.	1	2	-	3	3	-	-	-	-	-	-	3	2	3
CO2	Apply the knowledge of sensors used in PMSM which can be used for controllers and synchronous machines.	1	2	-	3	-	-	-	-	-	-	-	-	3	-
CO3	Analyze the different controllers used in electrical machines to propose the suitability of drives for different industrial applications.	-	3	2	-	-	-	-	-	-	-	-	3	-	3
CO4	Classify the types of DC linear motors and apply the knowledge of controllers to propose their application in real world.	-	-	-	-	2	-	-	-	-	-	-	-	2	-
CO5	Evaluate the steady state and transient behaviour linear induction motors.	3	-	3	3	-	-	-	-	-	-	-	3	3	3
CO6	Distinguish different special electrical machines.	2	-	-	3	3	-	-	-	-	-	-	3	-	-
Course Code	**172PD2E12 -PROGAMMABLE LOGIC CONTROLLERS & APPLICATIONS (ELECTIVE – IV)**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Explain the PLCs and their I/O modules.	-	1	-	-	-	-	-	-	-	-	-	2	1	2
CO2	Develop control algorithms to PLC using ladder logic etc	-	-	2	-	-	-	-	-	-	-	-	3	3	3
CO3	Describe effective utilization of PLC registers in different applications	-	-	3	-	-	-	-	-	-	-	-	3	-	3
CO4	Illustrate data functions to control of two axis and their axis robots with PLC	-	-	3	-	-	-	-	-	-	-	-	-	2	-
CO5	Design PID controller with PLC	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Course Code	**172PD2L02 -POWER CONVERTERS AND DRIVES LAB**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	Analyze the working of phase controlled converters.	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CO2	Demonstrate the working of AC voltage controllers	-	-	3	-	1	-	-	-	-	-	-	-	-	3
CO3	Analyze the working of PWM inverters	-	2	3	2	-	-	3	-	-	-	-	-	3	3
CO4	Demonstrate different methods of the speed control operation of power converter fed motors.	2	-	-	-	-	-	2	-	-	-	-	3	-	-