



**ZEAL EDUCATION SOCIETY'S  
ZEAL COLLEGE OF ENGINEERING AND RESEARCH  
NARHE | PUNE -41 | INDIA**



**Electrical Engineering Department**

**Course Outcomes (COs)**

**B.E. Electrical Engineering (2015 Course)**

<b>Course Code: 403141</b>	
<b>Name of Course: Power System Operation and Control</b>	
C401.1	Discuss steady state, transient ability along with concept of swing equation, equal area criteria and its applications, method to improve steady state and transient stability analysis along with its simulation models.
C401.2	Identify the effect of reactive power on power system and suggest the suitable means of reactive power management.
C401.3	Explain the configuration of FACTS controller and working principle, construction and characteristics of SVC, TCSC, STATCOM, and UPFC.
C401.4	Formulate the mathematical model of load-frequency control of an isolated power system in single area and two area LFC along with its steady and dynamic responses.
C401.5	Formulate objective functions for optimization of unit commitment and economic load dispatch and determine the solution using computational techniques up to two decimal points.
C401.6	Understand the importance of maintain reliability of power system components with its hierarchical levels and compare energy control and interchange of power between interconnected utilities.

<b>Course Code: 403142</b>	
<b>Name of Course: PLC and SCADA Applications</b>	
C402.1	Explain the working of PLC with the help of a block diagram and compare PLCs manufactured by Allen Bradley, Siemens, ABB, Mitsubishi, GE, Fanuc, and Schneider.
C402.2	Classify the input and output interfacing devices with the PLC.
C402.3	Develop the ladder logic using timers and counters in the applications of tank level control, temperature control, sequencing of motors, bottle filling plant, car parking, and traffic light system.
C402.4	Discuss analog PLC operation and its signal processing in developing the systems of tank level controller, temperature controller using RTD, and speed control of electric motor.
C402.5	Describe SCADA system, its architecture, functions features, and generations used in critical infrastructures.
C402.6	Discuss the SCADA protocols along with its architecture.

<b>Course Code: 403143</b>	
<b>Name of Course: Power Quality</b>	
C403.1	To develop ability to identify various power quality issues, its sources and effects on



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	various equipment.
C403.2	To monitor and analyze various power quality problems
C403.3	List and explain various causes and effects of power quality problems
C403.4	Analyze power quality parameters and carry out power quality analysis
C403.5	To describe and select of cost effective power quality mitigation solutions.
C403.6	Explain use of power quality standards

<b>Course Code: 403144</b>	
<b>Name of Course: Electric and Hybrid Vehicles</b>	
C404.1	Review history, Social and environmental importance of Hybrid and Electric vehicles
C404.2	Describe the performance and selection of energy storage systems and Analyze battery management system.
C404.3	Distinguish between the performance and architecture of various drive trains.
C404.4	Describe the different Instrumentation and Control used for electric vehicles.
C404.5	Differentiate between Vehicle to Home, Vehicle to Vehicle and Vehicle to Grid energy systems concepts

<b>Course Code: 403145</b>	
<b>Name of Course: Control System II</b>	
C405.1	Understand the basic concepts, types, and models of the digital control systems, sampling, and reconstruction.
C405.2	Analyze the given system using Z- transform and pulse transfer function.
C405.3	Analyze the stability of digital controllers using Jury's stability and Bilinear transformation.
C404.4	Analyze the state space equations and state model of armature of controlled DC motor.
C405.5	Evaluate solution of homogeneous and non-homogeneous system and state transition matrix.
C405.6	Analyze controllability, observability, and design of system by pole placement technique and by full order observer.

<b>Course Code: 403147</b>	
<b>Name of Course: Switchgear and Protection</b>	
C406.1	Understand the need of protective relaying and operating principles of different directional, distance and induction relays.
C406.2	Describe arc interruption methods, restriking voltage and RRRV in circuit breaker.
C406.3	Explain construction and working principle of ABCB, SF6 CB, and VCB.
C406.4	Apply the static and numerical relays for protection schemes.
C406.5	Identify the protection schemes and apply for transformer, alternator and three-phase induction motor.
C406.6	Apply the transmission line protection schemes using numerical relays, impedance relays, reactance and mho relay.



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<b>Course Code: 403148</b>	
<b>Name of Course: Power Electronic Controlled Drives</b>	
C407.1	Explain motor load dynamics and multi quadrant operation of drives.
C407.2	Analyze operation of converter fed and chopper fed DC drives.
C407.3	Describe braking methods of DC and induction motor drives.
C407.4	Explain vector control of induction motor.
C407.5	Describe synchronous motor drive.
C407.6	Identify classes and duty cycles of motor, and applications of drives in industries.
<b>Course Code: 403149</b>	
<b>Name of Course: High Voltage Engineering</b>	
C407.1	Identify, describe and analyze the breakdown theories of solid, liquid, and gaseous materials.
C407.2	Describe as well as use different methods of generation of high AC, DC, impulse voltage, and current.
C407.3	Demonstrate and use different methods of measurement of high AC, DC, impulse voltage, and current.
C407.4	Identify the occurrence and to provide remedial solutions.
C407.5	Demonstrate an ability to carry out different tests on high voltage equipment and devices as well as ability to design the high voltage laboratory with all safety measures.
<b>Course Code: 403150</b>	
<b>Name of Course: Smart Grid</b>	
C408.1	Distinguish Conventional Grid and Smart Grid.
C408.2	Elaborate the importance of Smart Grid, Micro Grid, Smart metering, Smart storage, Hybrid Vehicles, Home Automation, and Smart Communication.
C408.3	Recommend smart meters for Smart Grid depending upon the different Communication protocols
C408.4	Analysis the threats of Power Quality issues to Smart Grid