Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

PS2101: Power System Analysis

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	calculate voltage phasors at all buses, given the data using various methods of load flow.
2.	Rank various contingencies according to their severity
3.	Estimate the bus voltage phasors given various quantities viz. power flow, voltages, taps , CB status etc
4.	Estimate closeness to voltage collapse and calculate PV curves using continuation power flow

	Course Contents	Hours
Unit 1	• Load flow **:**Overview of Newton-Raphson ,Gauss-Siedel • fast decoupled methods, convergence properties, sparsity techniques, handling Qmax violations in constant matrix, inclusion in frequency effects • AVR in load flow, handling of discrete variable in load flow	**6**
Unit 2	• Fault Analysis**:** Simultaneous faults • open conductors faults • generalized method of fault analysis	8
Unit 3	• Security Analysis: Security state diagram, contingency analysis, generator shift distribution factors • line outage distribution factor, multiple line outages • overload index ranking	8
Unit 4	• Power System Equivalents **:** WARD • REI. equivalents	6
Unit 5	• State Estimation : Sources of errors in measurement • Virtual and Pseudo • Measurement, Observability • Tracking state estimation, • WSL method, bad data correction.	8
Unit 6	• Voltage Stability : Voltage collapse • P-V curve, multiple power flow solution • continuation power flow, optimal multiplies load flow • voltage collapse proximity indices.	**6**

Text Books	
1.	J.J. Grainger &W.D.Stevenson, “Power system analysis ”, McGraw Hill ,2003
2.	L.P. Singh , “Advanced Power System Analysis and Dynamics”, New Age International, 2006
Reference Books	
1.	A. R. Bergen & Vijay Vittal , “Power System Analysis” ,Pearson , 2000
2.	G.L. Kusic, “Computer aided power system analysis” ,Prentice Hall India, 1986
3.	A.J. Wood, “ Power generation, operation and control” , John Wiley, 1994
4.	P.M. Anderson, “Faulted power system analysis” , IEEE Press , 1995
Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc19_ee62/preview
2	https://nptel.ac.in/courses/108/105/108105172/
3	https://www.coursera.org/learn/power-system-analysis

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2		1	3							1	3		
CO 2	1	3	1	1	2	1							3		
CO 3	2	2	1	1	1		1					1	2		
CO 4	2	3	1	2	1							1	3		

Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

PS2102 : Power System Dynamics

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Demonstrate the modelling of synchronous machine in details system
2.	Construct models for induction motors and assess their dynamic behavior
3.	Derive and interpret flux-linkage equations for synchronous machines
4.	Analyse the behaviour of synchronous machines under different operating conditions using per unit system concepts

	Course Contents	Hours
Unit 1	• Synchronous Machines: Per unit systems • Park's Transformation (modified) • Flux-linkage equations.	**8**
Unit 2	• Voltage and current equations • Formulation of State-space equations • Equivalent circuit.	8
Unit 3	• Sub-transient and transient inductance and Time constants, Simplified models of synchronous machines	6
Unit 4	• Small signal model: Introduction to frequency model.	4
Unit 5	• Excitation systems and Philips-Heffron model • PSS Load modeling.	8
Unit 6	• Modeling of Induction Motors • Prime mover controllers.	6

Text Books

1.	P. M. Anderson & A. A. Fouad "Power System Control and Stability", Galgotia , New Delhi, 1981
2.	J Machowski, J Bialek& J. R W. Bumby, "Power System Dynamics and Stability", John Wiley & Sons, 1997

Reference Books

1.	P.Kundur, "Power System Stability and Control", McGraw Hill Inc., 1994.

2.	E.W. Kimbark, "Power system stability", Vol. I & III, John Wiley & Sons, New York 2002

Useful Links			
1	https://archive.nptel.ac.in/courses/108/102/108102080/		
2	https://www.iitp.ac.in/~siva/2021/ee549/index.html		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	1	3						2		2	3		
CO 2	3	3	1	3						2		3	3		
CO 3	3	3	2	2	1					2		1	3		
CO 4	3	3	3	3	3					2		3	3		

Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

PS2133: Non-conventional Energy Systems

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Evaluate diverse energy sources for distributed generation systems
2.	Synthesize the impact of distributed generation on power systems and grid interface:
3.	Analyze and propose solutions for power quality disturbances in distributed generation systems
4.	Formulate economic analyses and develop strategies for optimizing distributed generation systems

	Course Contents	Hours
Unit 1	• Introduction, Distributed vs Central Station Generation • Sources of Energy such as Micro-turbines • Internal Combustion Engines.	**6**
Unit 2	• Introduction to Solar Energy, Wind Energy, Combined Heat and Power • Hydro Energy, Tidal Energy, Wave Energy • Geothermal Energy, Biomass and Fuel Cells.	8
Unit 3	• Power Electronic Interface with the Grid	6
Unit 4	• Impact of Distributed Generation on the Power System • Power Quality Disturbances	8
Unit 5	• Transmission System Operation • Protection of Distributed Generators	8
Unit 6	• Economics of Distributed Generation • Case Studies	6

Text Books

1.	RanjanRakesh, Kothari D.P, Singal K.C, "Renewable Energy Sources and Emerging Technologies", 2nd Ed. Prentice Hall of India ,2011
2.	Math H.Bollen, Fainan Hassan, "Integration of Distributed Generation in the Power System", July 2011, Wiley –IEEE Press

Reference Books

1.	Loi Lei Lai, Tze Fun Chan, "Distributed Generation: Induction and Permanent Magnet Generators", October 2007, Wiley-IEEE Press.
2.	Roger A.Messenger, Jerry Ventre, "Photovoltaic System Engineering", 3rd Ed, 2010

3.	James F.Manwell, Jon G.McGowan, Anthony L Rogers, "Wind energy explained: Theory Design and Application", John Wiley and Sons 2nd Ed, 2010

Useful Links			
1.	https://www.coursera.org/learn/wind-energy		
2	https://online.stanford.edu/courses/xeiet200-planning-sustainable-future-wind-water-and-sun		
3	https://www.futurelearn.com/microcredentials/microgrid-market-and-policy		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	1	1	2	2					2	3		
CO 2	2	2	3	2	1	3	1					1	3		
CO 3	3	2	1	1	3	1	2					2	1		
CO 4	3	2	2	1	2	1	2						1		

Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

PS2124 : Smart Grid

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Appreciate the difference between smart grid & conventional grid
2.	Apply smart metering concepts to industrial and commercial installations
3.	Formulate solutions in the areas of smart substations, distributed generation and wide area measurements
4.	Select smart grid solutions using modern communication technologies

	Course Contents	Hours
Unit 1	• Introduction to Smart Grid, Evolution of Electric Grid • Concept of Smart Grid, Definitions • Need of Smart Grid, Concept of Robust & Self Healing Grid Present development & International policies in Smart Grid	**8**
Unit 2	• Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading(AMR) • Outage Management System(OMS) • Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation • Smart Substations, Substation Automation, Feeder Automation .	8
Unit 3	• Geographic Information System(GIS) • Intelligent Electronic Devices(IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS) • Phase Measurement Unit(PMU)	6
Unit 4	• Concept of micro-grid, need & applications of micro-grid, formation of micro-grid, Issues of interconnection, protection & control of micro-grid. Plastic & Organic solar cells, Thin film solar cells, Variable speed wind generators, fuel-cells, micro-turbines • Captive power plants, Integration of renewable energy sources	8
Unit 5	• Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources • Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring Power Quality Audit	6
Unit 6	• Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighborhood Area • Network (NAN), Wide Area Network (WAN)	8

	• Bluetooth, ZigBee, GPS, Wi-Fi, Wi-Max based communication, • Wireless Mesh Network, Basics of CLOUD Computing & Cyber Security for Smart Grid Broadband over Power line (BPL) • IP based protocols	

Text Books	
1.	Ali Keyhani, "Design of smart power grid renewable energy systems", Wiley IEEE, 2011
2.	Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press , 2009
Reference Books	
1.	JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, "Smart Grid: Technology and Applications", Wiley 2012
2.	Stuart Borlase, "Smart Grid: Infrastructure, Technology and solutions " CRC Press
3.	A.G.Phadke, "Synchronized Phasor Measurement and their Applications", Springer
Useful Links	
1.	https://www.smartgrid.gov/the_smart_grid/smart_grid.html
2	https://www.energy.gov/smart-grid

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	1	1	2	2					2	3		
CO 2	2	2	3	2	1	3	1	2				1	3		
CO 3	3	2	1	1	3	1	2					2	1		
CO 4	3	2	2	1	2	1	3	1					1		

Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

PS2123: High Power Converter

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Differentiate characteristics of PSDs such as SCRs, GTOs, IGBTs and use them in practical systems and PWM techniques and the ability to use them properly
2.	Test Knowledge of working of multi-level VSIs, DC-DC switched mode converters, cyclo-converters
3.	Defend use of power conditioners and their applications
4.	Design power circuit and protection circuit of PSDs and converters

	Course Contents	Hours
Unit 1	• Power electronic systems • An overview of PSDs, multipulse diode rectifier, multipulse • SCR rectifier	**6**
Unit 2	• Phase shifting transformers, multilevel voltage source inverters: two level voltage source inverter, • cascaded • H bridge multilevel inverter.	8
Unit 3	• Diode clamped multilevel inverters, flying capacitor multilevel inverter	8
Unit 4	• PWM current source inverters, • DC to DC switch mode converters	6
Unit 5	• AC voltage controllers : Cyclo-converters, matrix converter, • Power conditioners and UPS.	8
Unit 6	• Design aspects of converters, protection of devices and circuits	6

Tutorials

Text Books

1.	N. Mohan, T. M. Undeland and W. P. Robbins, "Power Electronics: Converter, Applications and Design", John Wiley and Sons, 1989
2.	M.H. Rashid, "Power Electronics", Prentice Hall of India, 1994

Reference Books			
1.	B. K .Bose, “Power Electronics and A.C. Drives”, Prentice Hall, 1986		
2.	Bin Wu, “High power converters and drives”, IEEE press, Wiley Enter science		
Useful Links			
1.	https://archive.nptel.ac.in/courses/108/102/108102157/		
2	https://www.edx.org/learn/engineering/the-georgia-institute-of-technology-multilevel-converters-for-mediumhigh-power-applica		
3	https://skill-lync.com/electrical-engineering-courses/design-concepts-power-electronic-converters-industries		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	1	1	2						2	3		
CO 2	3	2	3	1	2	3						2	3		
CO 3	3	2	2	2	1	2						2	2		
CO 4	2	2	2	1	2	1							2		

Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

PS2114 : Electrical Power Distribution System

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Organise power distribution systems
2.	Formulate strategies for efficient distribution system management and control
3.	Analyze complex challenges in distribution network restoration and power quality
4.	Design and present comprehensive automation solutions for distribution systems

	Course Contents	Hours
Unit 1	• Distribution of Power, Management, Power Loads, • Load Forecasting Short-term & Long-term, • Power System Loading, Technological Forecasting.	**6**
Unit 2	• Advantages of Distribution Management System (D.M.S.) Distribution Automation: Definition, • Restoration / Reconfiguration of Distribution Network, Different Methods and constraints • Power Factor Correction	8
Unit 3	• Interconnection of Distribution, • Control & Communication Systems, • Remote Metering, • Automatic Meter Reading and its implementation	6
Unit 4	• SCADA: Introduction, Block Diagram, • SCADA Applied To Distribution Automation. • Common Functions of SCADA, • Advantages of Distribution Automation through SCADA	8
Unit 5	• Calculation of Optimum Number of Switches, Capacitors, Optimum Switching vice Placement in Radial, • Distribution Systems, Sectionalizing Switches – Types, Benefits, • Bellman's Optimality Principle, • Remote Terminal Units, • Energy efficiency in electrical distribution & Monitoring	8
Unit 6	• Maintenance of Automated Distribution Systems • Difficulties in Implementing Distribution.	**8**

	• Automation in Actual Practice, Urban/Rural Distribution, Energy Management, AI techniques applied to Distribution Automation			
Text Books				
1.	A.S. Pabla, " Electric Power Distribution", Tata McGraw Hill Publishing Co. Ltd., Fourth Edition.			
2.	M.K. Khedkar, G.M. Dhole, "A Text Book of Electrical power Distribution Automation", University Science Press, New Delhi			
Reference Books				
1.	Anthony J Panseni, "Electrical Distribution Engineering", CRC Press			
2.	James Momoh, "Electric Power Distribution, automation, protection & control", CRC Press Course			
Useful Links				
1.	https://www.coursera.org/learn/electrical-power-distribution			
2	https://www.udemy.com/course/electrical-power-distribution-course/			

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	1	1	2					1	2	2		
CO 2	3	2	3	1	2	3					1	2	2		
CO 3	3	2	2	2	3	2					1	2	3		
CO 4	2	2	2	1	2	1					1	1	3		

Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

PS2113: Control of Converters

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Demonstrate the importance of PWM techniques
2.	Compare different PWM strategies
3.	Control CSI and VSI using PWM
4.	Compare performance of converter for different PWM techniques

	Course Contents	Hours
Unit 1	• Modulation of one inverter phase leg • Modulation of single phase • VSI and 3 phase VSI	**6**
Unit 2	• Zero space vector placement modulation strategies • Losses-Discontinuous modulation • Modulation of CSI	8
Unit 3	• Over modulation of converters • programme modulation strategies	6
Unit 4	• Pulse width modulation for multilevel inverters • Implementation of modulation controller	8
Unit 5	• Continuing developments in modulation as random PWM • PWM for voltage unbalance	8
Unit 6	• Effect of minimum pulse width and dead time	8

Text Books

1.	D. Grahame Holmes, Thomas A. Lipo, “Pulse width modulation of Power Converter: Principles and Practice”, John Wiley & Sons, 03-Oct-2003
2.	Bin Vew, “High Power Converter”, Wiley Publication

Reference Books

1.	Marian K. Kazimicrczuk, “Pulse width modulated dc-dc power converter”, Wiley Publication

Useful Links

1.	https://www.coursera.org/learn/converter-control
2	https://onlinecourses.nptel.ac.in/noc22_ee100/preview
3	https://www.my-mooc.com/en/mooc/advanced-converter-control-techniques/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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CO 2	3	2	2	1	2	3	1					1	2		
CO 3	3	2	3	2	3	1	2					2	3		
CO 4	2	2	2	1	2	1							1		

Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

PS2134: Electrical Hybrid Vehicles

		Examination Scheme
eek		MSE
ek		ISE
		ESE
		Duration of ESE

ncepts, principles, analysis and design of hybrid and electric vehicles.

ignificance of hybrid and electric vehicles

pe vehicle performance and power sources

ies for energy management in hybrid and electric vehicles

Course Contents

electric vehicles,
tal importance of hybrid and electric vehicles
e-trains on energy supplies
rmance, vehicle power source characterization Transmission characteristics
o describe vehicle performance

rid traction,
us hybrid drive-train topologies
n hybrid drive-train topologies
sis.

rid traction,
us hybrid drive-train topologies
n hybrid drive-train topologies
sis.

ic components used in hybrid and electric vehicles
ntrol of DC Motor drives
ntrol of Introduction Motor drives configuration and control of Permanent Magnet Motor drives Configuration and control of S

ystem efficiency

machine and the internal combustion engine (ICE)
motor, sizing the power electronics Selecting the energy storage technology
pporting subsystems

management and their strategies used in hybrid and electric vehicle

ent energy management strategies Comparison of different energy management strategies Implementation issues of energy strategies

sign Techniques in Power Electronics Devices", Springer.

se, "Sliding mode control of switching Power Converters"

iit-
search&utm_term=course%20hybrid%20and%20electric%20vehicles&utm_campaign=s_iitr_ev_in&gclid=EAIaIQobChMIs5m72MXCgA

c-vehicle-design-online-course?&utm_source=search&utm_medium=gc9302765&utm_campaign=evd_course-ph-south-ser-lead-pr-
up_id=136608836337&ad_id=628213287075&utm_target=kwd-
e%20training&placement=&gclid=EAIaIQobChMIs5m72MXCgAMV5SqDAx3tcgf1EAAYAiAAEgLhTPD_BwE

d-vehicle-certification-program/?--
nyads&utm_campaign=LongTail_la.EN_cc.INDIA&utm_content=deal4584&utm_term=_._ag_118445032537_._ad_618853564450_._kw_
tchtype=&gclid=EAIaIQobChMIs5m72MXCgAMV5SqDAx3tcgf1EAAYBCAAEgJ9OPD_BwE

Mapping of COs and POs

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CO 2	1	2	3	1	1	3	1					1	3		
CO 3	3	1	1	2	3	2	2					2	2		
CO 4	2	2	2	1	2	1							1		

Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

OE2118: Business Analytics

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1	Judge role of business analytics within an organization.
2	Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3	Weigh business analytics to formulate and solve business problems and to support managerial decision making.
4	Develop, report, and analyze business data.

	Course Contents	Hours
Unit 1	Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.	**9**
Unit 2	Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.	**8**
Unit 3	Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.	9
Unit 4	Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time	**10**

	Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.	
Unit 5	Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.	**8**
Unit 6	Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.	**4**

Text Books	
1.	Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
Reference Books	
1.	Business Analytics by James Evans, persons Education.
Useful Links	
1.	https://www.edx.org/learn/business-analytics
2	https://www.coursera.org/specializations/business-analytics
3	https://www.coursera.org/specializations/business-analytics?utm_source=gg&utm_medium=sem&utm_campaign=B2C_INDIA_google-cybersecurity-certificates_PMax-arte-NRL_within_14D&utm_content=B2C&campaignid=20361657342&adgroupid=&device=c&keyword=&matchtype=&network=x&devicemodel=&adpostion=&creativeid=&hide_mobile_promo&gclid=EAIaIQobChMIwLqD_MXCgAMVa5pmAh2G2QxvEAMYAyAAEgLI5_D_BwE

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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CO 2	3	2	3	1	2	3	1					2	2		
CO 3	3	2	2	2	3	2	1					2	3		
CO 4	2	2	2	1	2	1							3		

Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

OE2128: Industrial Safety

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1	Analyze the causes, types, and consequences of industrial accidents and hazards
2	Synthesize strategies for effective maintenance engineering and equipment upkeep
3	Evaluate corrosion prevention methods and wear reduction techniques
4	Design systematic fault-tracing approaches for diverse equipment

	Course Contents	Hours
Unit 1	Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.	**8**
Unit 2	Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.	8
Unit 3	Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	6
Unit 4	Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.	8

Unit 5	Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance.	6
Unit 6	Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance	4

Text Books	
1.	Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2.	Maintenance Engineering, H. P. Garg, S. Chand and Company.
Reference Books	
1.	Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
2.	Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.
Useful Links	
1.	https://www.udemy.com/course/industrial-safety-processes/?utm_source=adwords&utm_medium=udemyads&utm_campaign=DSA_Catchall_la.EN_cc.INDIA&utm_content=deal4584&utm_term=_._ag_82569850245_._ad_533220805577_._kw__._de_c_._dm__._pl__._ti_dsa-41250778272_._li_9302765_._pd__._&matchtype=&gclid=EAIaIQobChMIjK3WucbCgAMVf5lmAh2DcQW2EAAYAiAAEgIwcfD_BwE
2	https://onlinecourses.nptel.ac.in/noc19_me40/preview

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	1	1	2	2					2	3		
CO 2	3	2	3	1	2	3	1					2	3		
CO 3	3	2	2	2	3	2	1					2	3		
CO 4	2	2	2	1	2	1							3		

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OE2138: Operations Research

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Construct problems of discreet and continuous variables.
2.	Execute the concept of non-linear programming
3.	Formulate sensitivity analysis
4.	Model the real world problem and simulate it.

	Course Contents	Hours
Unit 1	Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models	**8**
Unit 2	Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming	8
Unit 3	CPM/PERT - Network representation of project, critical path, optimum scheduling by CPM, crashing of project.	6
Unit 4	Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.	8
Unit 5	Single variable Optimization, Unconstrained multivariable optimization, Nonlinear programming with equality constraint, Nonlinear programming KKT conditions	8
Unit 6	Numerical optimization : Non linear programming - unimodal function, unrestricted search, Region elimination techniques, Fibonacci Method, Golden Section Methods, Interpolation Methods	

Text Books

1.	H.A. Taha, Operations Research, An Introduction, PHI, 2008
2.	H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.

Reference Books

1.	J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
2.	Hitler Libermann Operations Research: McGraw Hill Pub. 2009
3.	Pannerselvam, Operations Research: Prentice Hall of India 2010
4.	Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

Useful Links			
1.	https://onlinecourses.nptel.ac.in/noc19_ma29/preview		
2	https://www.coursera.org/learn/operations-research-theory		
3	https://www.classcentral.com/course/swayam-operations-research-14219		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	3	2	2	2	2			1	2	3		
CO 2	3	3	3	3	3	1	3	2			1	2	2		
CO 3	3	2	2	3	1	2	2	1				1	2		
CO 4	3	2	1	2	2	3	1					1			

Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

OE2148: Cost Management of Engineering Project

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Analyze cost concepts and their role in decision-making processes
2.	Synthesize methodologies for effective project management and execution
3.	Evaluate advanced costing techniques and their application in business strategies
4.	Design integrated cost management approaches for performance enhancement

	Course Contents	Hours
Unit 1	Introduction and Overview of the Strategic Cost Management Process	**6**
Unit 2	Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.	8
Unit 3	Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution : conception to commissioning. Project execution as conglomeration of technical and non technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team : Role of each member. Importance Project site : Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process	8
Unit 4	Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning,	6
Unit 5	Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-	4

	based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.	
Unit 6	Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.	6

Text Books	
1.	Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2.	Charles T. Horngren and George Foster, Advanced Management Accounting
Reference Books	
1.	Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
2.	Ashish K. Bhattacharya, Principles & Practices of CostAccounting A. H. Wheeler publisher
3.	N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.
Useful Links	
1.	https://www.coursera.org/learn/scope-time-management-cost
2	https://www.udemy.com/course/engineering-cost-management-course/
3	https://online.rice.edu/courses/scope-time-management-cost

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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CO 2	1	3	1	1	2	1						2	3		
CO 3	2	2	1	1	1	1						1	2		
CO 4	2	3	1	2	1							1	3		

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OE2158: Composite Materials

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Evaluate the impact of reinforcement characteristics on composite performance
2.	Synthesize manufacturing methods and applications of diverse composite types
3.	Analyze mechanical behavior and failure criteria of composite materials
4.	Design composite material systems based on strength and laminar failure criteria

	Course Contents	Hours
Unit 1	INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.	**8**
Unit 2	REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements.	4
Unit 3	Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.	2
Unit 4	Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.	6
Unit 5	Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.	8
Unit 6	Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.	8

Text Books

1.	Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2.	Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

Reference Books			
1.	Hand Book of Composite Materials-ed-Lubin.		
2.	Composite Materials – K.K.Chawla.		
3.	Composite Materials Science and Applications – Deborah D.L. Chung.		
4.	Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi		

Useful Links			
1.	https://www.udemy.com/course/composite-materials/		
2	https://www.classcentral.com/course/swayam-introduction-to-composites-10005		
3	https://engineering.purdue.edu/online/courses/mechanics-composite-materials		
4	https://onlinecourses.nptel.ac.in/noc19_me67/preview		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	3	1	2	-	-	-	-	-	-	-	-		
CO 2	2	2	3	1	1	-	-	-	-	-	-	-	1		
CO 3	2	1	3	1	2	2	1	-	-	-	-	2	2		
CO 4	2	1	3	1	2	2	-	-	-	-	-	-	3		

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OE2168: Waste of Energy

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Differentiate various waste-to-energy conversion devices and their fuel sources
2.	Justify biomass pyrolysis processes, yields, and applications
3.	Analyze biomass gasification technologies, operation, and equilibrium considerations
4.	Evaluate the properties and applications of biogas and its production technologies

	Course Contents	Hours
Unit 1	Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors	**8**
Unit 2	Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.	8
Unit 3	Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.	6
Unit 4	Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.	8
Unit 5	Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification	4
Unit 6	Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.	4

Text Books

1.	Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2.	Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
Reference Books	
1.	Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
2.	Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.
Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc20_ch16/preview
2	https://www.udemy.com/course/the-concept-of-waste/
3	https://www.classcentral.com/course/swayam-waste-to-energy-conversion-7960

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	2	3	2						1	3		
CO 2	1	3	1	2	3								2		
CO 3	2	2	1	2	2	1	1						3		
CO 4	2	3	1	2	3							1	3		

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PS2105 : Research Methodology

Teaching Scheme			Examination Scheme	
Lectures	02 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	02		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Design research problems
2.	Analyse research related information
3.	Follow research ethics
4.	Organise New Developments in IPR

	Course Contents	Hours
Unit 1	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations	**8**
Unit 2	Effective literature studies approaches, analysis Plagiarism, Research ethics	4
Unit 3	Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee	6
Unit 4	Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT	8
Unit 5	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.	6
Unit 6:	New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.	8

Text Books

1.	Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'

2.	T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008
Reference Books	
1.	Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
2.	Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
3.	Mayall, “Industrial Design”, McGraw Hill, 1992.
4.	Asimov, “Introduction to Design”, Prentice Hall, 1962.
5.	Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New Technological Age”, 2016.
6	Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
Useful Links	
1.	https://www.coursera.org/learn/research-methods
2	https://onlinecourses.nptel.ac.in/noc22_ge08/preview
3	https://alison.com/course/essentials-of-research-methodology

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	3	2	1	2	2	1				2			
CO 2	3	2	1	2	2	3	1					1			
CO 3	3	1	3	2	2	2	1					1	1		
CO 4	2	3	2	1	2	1		1					2		

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PS2106: Renewable Energy Laboratory

Teaching Scheme			**Examination Scheme**	
Lectures	--		MSE	--
Tutorials	-- Hrs/week		ISE	25
Total Credits	02		ESE	25
Practicals	04 Hrs/week		Duration of ESE	03 Hrs

Course Outcomes (CO)

Students will be able to:

1.	Analyze and evaluate different renewable energy sources, such as solar, wind and select the most suitable option based on specific energy requirements and environmental considerations.
2.	Weigh the performance data obtained from renewable energy systems, using statistical methods and modelling techniques
3.	Design and create an innovative and sustainable renewable energy system that addresses a real-world energy challenge.

Course Contents

Minimum 8experiments on suitable computational platform to provide students hands-on experience and theoretical understanding of various renewable energy sources, technologies, and their applications.
The course aims to develop analytical skills, practical knowledge, and the ability to design innovative solutions in the field of renewable energy.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2		1	3							1	3		
CO 2	1	2	2	1	2	1						1	3		
CO 3	2	2	2	1	1							1	2		

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PS2107: Advance Simulation Laboratory

Teaching Scheme			Examination Scheme	
Lectures	--		MSE	--
Tutorials	-- Hrs/week		ISE	50
Total Credits	02		ESE	--
Practicals	04 Hrs/week		Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Analyze simulation results to evaluate the performance, stability, and behaviour of electrical systems, employing MATLAB, PSIM, ANSYS softwares
2.	Critically assess the impact of parameter variations on system responses and make informed recommendations for system optimization.
3.	Develop advanced simulation models that integrate multiple software tools, demonstrating the ability to model and solve real-world problems.

Course Contents

Minimum 8experiments on suitable computational platform to provide students with a comprehensive understanding of various simulation techniques and software tools in the field of electrical Power system. The course aims to equip students with the skills to model, analyze, and optimize complex systems and solve practical engineering problems using advanced simulation methods.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2		1	3							1	3		
CO 2	1	2	2	1	2	1						1	2		
CO 3	2	2	2		1							1	2		

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PS2201 : Digital Protection of Power System

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Investigate evolution of digital relays
2.	Justify importance of Digital Relays
3.	Apply Mathematical approach towards protection
4.	Develop various Protection algorithms

	Course Contents	**Hours**
Unit 1	• Evolution of digital relays from electromechanical relays • Performance and operational characteristics of digital protection	**6**
Unit 2	• Mathematical background to protection algorithms • Finite difference techniques	6
Unit 3	• Interpolation formulae • Forward, backward and central difference interpolation • Numerical differentiation • Curve fitting and smoothing • Least squares meth	8
Unit 4	• Basic elements of digital protection • Signal conditioning: transducers, surge protection, analog filtering, analog multiplexers • Conversion subsystem: the sampling theorem, signal aliasing • Error, sample and hold circuits, multiplexers, analog to digital conversion • Digital filtering concepts, • The digital relay as a unit consisting of hardware and software	8
Unit 5	• Sinusoidal wave based algorithms • Sample and first derivative (Mann and Morrison) algorithm.	8
Unit 6	• Fourier Algorithm: Full cycle window algorithm, fractional cycle window algorithm.	8

	• Least Squares based algorithms. Differential equation based algorithms. • Digital Differential Protection of Transformers. • Digital Line Differential Protection.	

Text Books	
1.	A.G. Phadke and J. S. Thorp, "Computer Relaying for Power Systems", Wiley/Research studies Press, 2009
2.	A.T. Johns and S. K. Salman, "Digital Protection of Power Systems", IEEE Press,1999
Reference Books	
1.	S. R. Bhide, "Digital Power System Protection" PHI
2.	"L. P. Singh, "Digital Protection", John Wiley & Sons Inc
Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc22_ee46/preview
2	https://archive.nptel.ac.in/courses/117/107/117107148/
3	https://www.classcentral.com/course/swayam-power-system-protection-19974

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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CO 2	3	2	3	1	2	3	1					2	3		
CO 3	3	2	2	2	3	2	1					2	3		
CO 4	2	2	2	1	2	1							3		

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PS2202 : Real Time Control of Power System

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1	Apply analytical methods for modeling and real-time monitoring of power system components
2	Evaluate load frequency control strategies and their application using modern control theory and AI
3	Analyze optimal control techniques for economic dispatch and power flow optimization
4	Design and implement reactive power control strategies in power systems

	Course Contents	**Hours**
Unit 1	Analytical Methods: Modeling& Identification of power system components, Real time data processing, Real time monitoring using phasor measurement.	**6**
Unit 2	Load Frequency Control: Objectives, tie line bias control, flat frequency control, supplementary control, interconnected areas, two area, three area systems, state variable model for single, two, three area cross coupling between control loops (AVR,AGC), Application of modern control theory, Application of Artificial Intelligence, AGC using Kalman method	8
Unit 3	Optimal Control: Generation mix, Optimum economic dispatch, Optimum generation allocation, Solution techniques for optimum power flow such as gradients , Newton's linear programming, Non linear programming methods such as Dommeltinney, EL Abiad-James. Dynamic programming methods. Fuel scheduling using linear programming, hydro solution to hydro thermal scheduling, short range and long range (Dynamic programming solution to hydro thermal scheduling), scheduling problems Kirchmayers method of co-ordinate equation.	8
Unit 4	Reactive power control: Need for adjustable reactive power, excitation control, tap changing transformers, fundamental concepts of series and dynamic shunt compensation, principles of static compensators and applications. Automatic P.F controlling scheme.	6
Unit 5	State estimation: Power system state estimation, Least square estimation of AC networks, estimation of orthogonal decomposition, application of state estimation to power systems.	6
Unit 6	SCADA and DAS: Power system security, contingency analysis, energy control centers, centralized and de-centralized control, SCADA systems, Recent trends on real time operations. Substation automation, remote metering, energy audit Reconfiguration of distribution networks under normal conditions for loss minimization and restoration of distribution system.	8

Text Books	
1.	B.Handschlw, "Real Time Control Of Electric Power System"
2.	Recent Trends In Electric Energy System—J.Nanda And D.P. Kothari
Reference Books	
1.	Computer Aided System Analysis And Control—Mahalanabis Kothari Ahason
2.	Power System Operation And Control—P.S.R.Murthy
3.	Electric Energy System Theory An Introduction—OlleD.Elgerd
4.	Reactive Power Control Of Electric Power System-T.J.E.Miller
Useful Links	
1.	https://www.udemy.com/course/electric-power-protectionswitchgear-and-control-masterclass/?--=&utm_source=adwords&utm_medium=udemyads&utm_campaign=LongTail_la.EN_cc.INDIA&utm_content=deal4584&utm_term=_._ag_118445032537_._ad_618853564450_._kw__._de_c_._dm__._pl__._ti_dsa-1212271230479_._li_9302765_._pd__._&matchtype=&gclid=EAIaIQobChMIobPTzsjCgAMVi2l9Ch1dzws4EAAYASAAEgLZWvD_BwE
2	https://onlinecourses.nptel.ac.in/noc23_ee128/preview
3	https://www.ntnu.edu/studies/courses/ET8105

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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CO 2	2	2	2	1	2	3						2	1		
CO 3	1	2	2	2	1	2						2	3		
CO 4	2	2	2	1	2	1							3		

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PS2213 : Restructured Power Systems

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Identify the need of regulation and deregulation.
2.	Define and describe the Technical and Non-technical issues in Deregulated Power Industry.
3.	Identify and give examples of existing electricity markets.
4.	Classify different market mechanisms and summarize the role of various entities in the market. PE

	Course Contents	Hours
Unit 1	• Fundamentals of restructured system • Market architecture • Load elasticity • Social welfare maximization	**8**
Unit 2	• OPF: Role in vertically integrated systems and in restructured markets • congestion management	8
Unit 3	• Optimal bidding • Risk assessment • Hedging • Transmission pricing • Tracing of power	8
Unit 4	• Ancillary services • Standard market design • Distributed generation in restructured markets	8
Unit 5	• Developments in India • IT applications in restructured markets	6
Unit 6	• Working of restructured power systems • PJM, Recent trends in Restructuring	6

Text Books

1.	LorrinPhilipson, H. Lee Willis, "Understanding electric utilities and de-regulation", Marcel Dekker Pub.,1998.
2.	Steven Stoft, "Power system economics: designing markets for electricity", John Wiley and Sons, 2002

Reference Books

1.	Kankar Bhattacharya, Jaap E. Daadler, Math H.J. Boolen, "Operation of restructured power systems", Kluwer Academic Pub., 2001.
2.	Mohammad Shahidehpour, MuwaffaqAlomoush, "Restructured electrical power systems: operation, trading and volatility", Marcel Dekker.

Useful Links

1.	https://archive.nptel.ac.in/courses/108/101/108101005/
2	https://www.amrita.edu/course/restructured-power-system-optimisation/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	3	2	2	2	2				3	3		
CO 2	3	3	3	3	3	1	3	2				3	2		
CO 3	3	2	2	3	1	2	2	1				3	2		
CO 4	3	2	1	2	2	3	1					3			

GovernmentCollegeofEngineering,Karad				
FirstYearM. TechinElectricalPowerSystems				
PS2223: DynamicsofElectricalM/Cs				
TeachingScheme			**ExaminationScheme**	
Lectures	03Hrs/week		MSE	20
Tutorials	--Hrs/week		ISE	20
TotalCredits	03		ESE	60

			Duration of ESE	02 Hrs 30 Min

CourseOutcomes(CO)

Studentswillbeableto:

1.	Formulate Performancecharacteristicsofmachine.
2.	Judge dynamicsofmachine.
3.	Derive and apply complete voltage and torque equations for primitive 4-winding commutator machines
4.	Evaluate performance and characteristics of three-phase induction motors using transformed equations and reference frames.

	CourseContents	Hours
Unit1	• Stability. • Primitive4WindingCommutatorMachine.CommutatorPrimitive • Machine. • CompleteVoltageEquationofPrimitive4WindingCommutator • Machine.	6
Unit2	• TorqueEquation.AnalysisofSimpleDCMachinesusingthePrimitive • MachineEquations. • TheThreePhaseInductionMotor.TransformedEquations. • DifferentReferenceFramesforInductionMotorAnalysisTransfer • FunctionFormulation	10
Unit3	• ThreePhaseSalientPoleSynchronousMachine. • ParksTransformation-SteadyStateAnalysis.	6
Unit4	• LargeSignalTransient.SmallOscillationEquationsinStateVariable • form • DynamicalAnalysisofInterconnectedMachines	6
Unit5	• LargeSignalTransientAnalysisusingTransformedEquations. • DCGenerator/DCMotorSystem.	8
Unit6	• Alternator/SynchronousMotorSystem.	4

TextBooks				
1.	D.P.Sengupta&J.B.Lynn,"ElectricalMachineDynamics",TheMacmillanPressLtd.1980			
2.	RKrishnan"ElectricMotorDrives,Modeling,Analysis,andControl",PearsonEducation.,2001			
ReferenceBooks				
1.	.P.C.Kraus,"AnalysisofElectricalMachines",McGrawHillBookCompany,1987			
2.	.I.Boldia&S.A.Nasar,,"ElectricalMachineDynamics",TheMacmillanPressLtd.1992.			
3.	C.V.Jones,"TheUnifiedTheoryofElectricalMachines",Butterworth,London.1967			
UsefulLinks				
1	https://archive.nptel.ac.in/courses/108/106/108106023/			
2	https://onlinecourses.nptel.ac.in/noc23_ee55/preview			

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	1	1	2						2	1		
CO 2	3	2	3	1	2	1						1	1		
CO 3	3	2	1	2	1	2						2	1		
CO 4	2	2	2	1	1	1							1		

GovernmentCollegeofEngineering,Karad

FirstYearM.TechinElectricalPowerSystems

PS2233: PowerApparatusDesign

TeachingScheme			**ExaminationScheme**	
Lectures	03Hrs/week		MSE	20
Tutorials	--Hrs/week		ISE	20
TotalCredits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

CourseOutcomes(CO)

Studentswillbeableto:

1.	Apply principles of machine design to determine appropriate loadings and dimensions for electrical machines
2.	Analyze factors affecting the efficiency, losses, and heating of electrical machines, and select suitable cooling methods
3.	Evaluate design considerations and calculations for transformers, including losses, efficiency, and magnetic properties
4.	Design stator and rotor windings, analyze leakage flux, and optimize machine performance using design data

	CourseContents	**Hours**
Unit1	• PrinciplesofDesignofMachines-Specificloadings,choiceofmagneticandelectricloadings • Realand apparentfluxdensities, temperature rise calculation, Separation of maindimensionforDCmachines • Inductionmachinesandsynchronousmachines • DesignofTransformers-Generalconsiderations,outputequation,emfperturn,choiceoffluxdensityandcurrentdensity,maindimensions,leakagereactanceandconductor size, designoftank and cooling	8
Unit2	• Specificloadings,choiceofmagneticandelectricloadingsRealandapparentflux-densities,temperaturerisecalculation • SeparationofmaindimensionforDCmachines • Inductionmachinesandsynchronousmachines • Heating and coolingof machines, types ofventilation, continuous andintermittentrating	8
Unit3	• Generalconsiderations,outputequation,emfperturn,choiceoffluxdensityandcurrentdensity, main dimensions, leakage reactance andconductor size, designoftankandcoolingtubes • Calculationoflosses,efficiencyandregulation • Forceswindingduringshortcircuit	8
Unit4	• Choiceofspecificelectricandmagneticloadings,efficiency,powerfactor • Numberofslotsinstatorandrotor	6

	• Eliminationofharmonictorques	
Unit5	• Designofstatorandrotorwinding,slotleakageflux • Leakagereactance,equivalentresistanceofsquirrelcagerotor,Magnetizingcurrent,efficiencyfromdesigndata	6
Unit6	• Typesofalternators,comparison,specificloadings,outputco-efficient,designofmaindimensions • IntroductiontoComputerAidedElectricalMachineDesignEnergyefficientmachines	6

TextBooks	
1.	ClaytonA.E,"ThePerformanceandDesignofD.C.Machines",SirI.Pitman&sons,Ltd.
2.	M.G.Say,"ThePerformanceandDesignofA.C.Machines",Pitman
ReferenceBooks	
1.	SawhneyA.K,"AcourseinElectricalMachineDesign",DhanpatRai&Sons,5thEdition
UsefulLinks	
1	https://www.udemy.com/topic/electrical-design/
2	https://www.udemy.com/course/electrical-power-equipment/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	1		2						2	1		
CO 2	2	2	2	1	2							2	1		
CO 3	3	2	2	2	1							1	1		
CO 4	2	2	1	1	2	1							1		

Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

PS2214 : Power Quality

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Differentiate harmonics, harmonic introducing devices and effect of harmonicson system equipment and loads
2.	Develop analytical modeling skills needed for modeling and analysis of harmonics innetworks and components
3.	Design problems of active power factor correction based on static VAR compensators andits control techniques
4.	Relate shunt active power filtering techniques for harmonics.

	Course Contents	**Hours**
Unit 1	• Introduction-power quality-voltage quality-overview of power • Quality phenomena classification of power quality issues. • Power quality measures and standards-THD-TIF-DIN-C-message weights. • Flicker factor transient phenomena-occurrence of power quality problems • Power acceptability curves-IEEE guides • Standards and recommended practices.	**5**
Unit 2	• Harmonics-individual and total harmonic distortion • RMS value of a harmonic waveform • Triplex harmonics. Important harmonic introducing devices.SMPS • Three phase power converters-arcing devices saturable devices • Harmonic distortion of fluorescent lamps-effect of power system harmonics on power system equipment and loads.	8
Unit 3	• Modeling of networks and components under non-sinusoidal conditions • Transmission and distribution systems • Shunt capacitors-transformers.Electric machines. • Ground systems loads that cause power quality problems. • Power quality problems created by drives and its impact on drive	6
Unit 4	• Power factor improvement- Passive Compensation. • Passive Filtering.HarmonicResonance.Impedance Scan Analysis • Active Power Factor Corrected Single Phase Front End	6

	• Control Methods for Single Phase APFC. • Three Phase APFC and Control Techniques • PFC based on Bilateral Single Phase and Three Phase Converter	
Unit 5	• Hamilton-Jacobi-Bellman equation - model reference adaptive systems (MRAS) - Design hypothesis.	8
Unit 6	• Introduction to design method based on the use of Liapunov function. • Design and simulation of variable structure adaptive model following control.	8

Text Books	
1.	G.T. Heydt, "Electric power quality", McGraw-Hill Professional, 2007
2.	Math H. Bollen, "Understanding Power Quality Problems", IEEE Press, 2000
Reference Books	
1.	J. Arrillaga, "Power System Quality Assessment", John wiley, 2000
2.	J. Arrillaga, B.C. Smith, N.R. Watson & A. R.Wood ,"Power system Harmonic Analysis", Wiley, 1997
Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc23_ee63/preview
2	https://www.udemy.com/course/introduction-to-power-quality/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	3	1	2	-	-	-	-	-	-	-	-		
CO 2	2	2	3	1	1	-	-	-	-	-	-	-	1		
CO 3	2	1	3	1	2	2	1	-	-	-	-	2	2		
CO 4	2	1	3	1	2	2	-	-	-	-	-	-	3		

Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

PS2224 : FACTS and custom Power Devices

Teaching Scheme			**Examination Scheme**	
Lectures	03Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Acquire knowledge about the fundamental principles of Passive and Active Reactive PowerCompensation Schemes at Transmission and Distribution level in Power Systems.
2.	Learn various Static VAR Compensation Schemes like Thyristor/GTO Controlled Reactive Power Systems, PWM_Inverter based Reactive Power Systems and their controls .
3.	Develop analytical modelling skills needed for modelling and analysis of such Static VARSystems.
4.	Compare IEEE power qualitystandards

	Course Contents	**Hours**
Unit 1	• Reactive power flow control in Power Systems • Control of dynamic power unbalances in Power System • Power flow control-Constraints of maximum transmission line loading • Benefits of FACTS Transmission line compensation- Uncompensated line Shunt compensation - Series compensation –Phase angle control. • Reactive power compensation – Shunt and Series compensation principles – Reactive compensation at transmission and distribution level .	**8**
Unit 2	• Static versus passive VAR compensator,Static shunt compensators: SVC and • STATCOM - Operation and control of TSC, TCR and STATCOM Compensator control • Comparison between SVC and STATCOM.	4
Unit 3	• Static series compensation: TSSC, SSSC -Static voltage and phase angle regulators – TCVR and TCPAR • Operation and Control –Applications • Static series compensation – GCSC,TSSC, TCSC • Static synchronous series compensators and their Control	6
Unit 4	• SSR and its damping Unified Power Flow Controller: Circuit Arrangement • Operation and control of UPFC- Basic Principle of P and Q control • Independent real and reactivepower flow control- Applications.	4
Unit 5	• Introduction to interline power flow controller. • Modeling and analysis of FACTS Controllers Passive filters, active filtering	6
Unit 6	• Voltage swells , sags, flicker, unbalance and mitigation of these problems by power line	4

	conditioners • IEEE standards on power quality.	

Text Books			
1.	K R Padiyar, "FACTS Controllers in Power Transmission and Distribution", New AgeInternationalPublishers, 2007		
2.	X P Zhang, C Rehtanz, B Pal, "Flexible AC Transmission Systems- Modelling and Control",SpringerVerlag, Berlin, 2006		
Reference Books			
1.	N.G. Hingorani, L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", IEEE Press Book, Standard Publishers and Distributors, Delhi, 2001.		
2.	K.S.Sureshkumar ,S.Ashok , "FACTS Controllers & Applications", E-book edition, Nalanda Digital Library, NIT Calicut,2003.		
3.	G T Heydt , "Power Quality", McGraw-Hill Professional, 2007.		
4.	T J E Miller, "Static Reactive Power Compensation", John Wiley and Sons, Newyork, 1982.		
Useful Links			
1.	https://onlinecourses.nptel.ac.in/noc23_ee58/preview		
2	https://www.classcentral.com/course/swayam-facts-devices-119462		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	2	3	2						1	3		
CO 2	1	3	1	2	3								2		
CO 3	2	2	1	2	2	1	1						3		
CO 4	2	3	1	2	3							1	3		

GovernmentCollegeofEngineering,Karad

FirstYearM.TechinElectricalPowerSystems

PS2234:SCADA systemsandApplications

TeachingScheme			**ExaminationScheme**	
Lectures	03Hrs/week		MSE	20
Tutorials	--Hrs/week		ISE	20
TotalCredits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

CourseOutcomes(CO)

Studentswillbeableto:

1.	Demonstrate understanding of SCADA fundamentals and its evolution
2.	Employ communication technologies in SCADA systems and compare various architectures
3.	Relate the role of intelligent devices and communication protocols in SCADA networks
4.	Design SCADA applications for utility automation and industrial sectors

	CourseContents	**Hours**
Unit1	• IntroductiontoSCADA • Dataacquisitionsystems • EvolutionofSCADA • Communicationtechnologies	8
Unit2	• Monitoringandsupervisoryfunctions • SCADAapplicationsinUtilityAutomation • IndustriesSCADA	6
Unit3	• IndustriesSCADASystemComponents • Schemes-RemoteTerminalUnit(RTU) • IntelligentElectronicDevices(IED) • ProgrammableLogicController(PLC) • CommunicationNetwork,SCADAServer,SCADA/HMISystems	8
Unit4	• SCADAArchitecture • VariousSCADAarchitectures,advantagesanddisadvantagesofeachsystem • singleunifiedstandardarchitecture-IEC61850.	8
Unit5	• SCADACommunication • variousindustrialcommunicationtechnologies • wiredandwirelessmethodsandfiberoptics • Openstandardcommunicationprotocols	8
Unit6	• SCADAApplications:Utilityapplications • TransmissionandDistributionsectoroperations,monitoring,analysisand • improvement	6

	• Industries-oil,gasandwater • Casestudies,Implementation,SimulationExercises	

TextBooks			
1.	StuartA.Boyer:"SCADA-SupervisoryControlandDataAcquisition",InstrumentSocietyof AmericaPublications,USA,2004		
2.	GordonClarke,DeonReynders:"PracticalModernSCADAProtocols:DNP3,60870.5and RelatedSystems",NewnesPublications,Oxford,UK,2004		
ReferenceBooks			
1.	WilliamT.Shaw,"CybersecurityforSCADAsystems",PennWellBooks,2006		
2.	DavidBailey,EdwinWright,"PracticalSCADAforindustry",Newnes,2003		
3.	MichaelWiebe,"Aguidetoutilityautomation:AMR,SCADA,andITsystemsforelectric power",PennWell1999		
UsefulLinks			
1	https://www.udemy.com/course/learn-scada-in-a-day-starting-from-scratch/?gclid=EAIaIQobChMI9dnilsrCgAMVD1orCh1HgQeOEAAYASAAEgKK5fD_BwE&matchtype=b&utm_campaign=LongTail_la.EN_cc.INDIA&utm_content=deal4584&utm_medium=udemyads&utm_source=adwords&utm_term=_.ag_78875707083_.ad_533133858411_.kw_scada+training_.de_c_.dm__.pl__.ti_kwd-1010276589_.li_9302765_.pd__._		
2	https://www.udemy.com/course/arduino-scada-system-interface-with-arduino/		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	2	3							1	2		
CO 2	1	2	1	2	3	2						1	2		
CO 3	2	2	1	2	2	1	1						2		
CO 4	2	3	1	2	3	1						1	1		

Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

PS2215 : Power System Transients

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	-- Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to:

1.	Gain knowledge of various transients that could occur in power system and their mathematical formulation
2.	Design various protective devices in power system for protecting equipment and personnel
3.	Select insulation coordination
4.	Design power system for transient analysis

	Course Contents	**Hours**
Unit 1	• Fundamental circuit analysis of electrical transients • Laplace Transform method of solving simple Switching transients • Damping circuits -Abnormal switching transients, Three-phase circuits and transients • Computation of power system transients	**8**
Unit 2	• Principle of digital computation – Matrix method of solution • Modal analysis- Z transform- Computation using EMTP • Lightning, switching and temporary over voltages, Lightning • Physical phenomena of lightning.	8
Unit 3	• Interaction between lightning and power system • Influence of tower footing resistance and Earth Resistance • Switching: Short line or kilometric fault • Energizing transients - closing and • re-closing of lines • line dropping, load rejection – over voltages induced by faults	8
Unit 4	• Switching HVDC lineTravelling waves on transmission line • Circuits with distributed Parameters Wave Equation • Reflection, Refraction, Behaviour of Travelling waves at the line terminations • Lattice Diagrams – Attenuation and Distortion	8

	• Multi-conductor system • and Velocity wave	
Unit 5	• Insulation co-ordination: Principle of insulation co-ordination in Air Insulated substation (AIS) and Gas Insulated Substation (GIS) Coordination between insulation and protection level • Statistical approach	6
Unit 6	• Protective devices • Protection of system against over voltages • lightning arresters, substation earthling	6

Text Books	
1.	Allan Greenwood, "Electrical Transients in Power System", Wiley & Sons Inc. New York, 1991
Reference Books	
1.	Juan A. Martinez-Velasco "Power System Transients Parameter Determination" © 2010 by Taylor and Francis Group, LLC CRC Press is an imprint of Taylor & Francis Group, an Informa business
2.	GevorkGharehpetian, AtousaYazdani, BehroozZaker "Power System TransientsModelling Simulation and Applications" 1ST edition" ISBN 9781032185583248 Pages 212 B/W IllustrationsPublished January 27, 2023 by CRC Press
Useful Links	
1.	https://www.udemy.com/course/electrical-power-system-stability-beginner-to-advanced/
2	https://pdhonline.com/courses/e491/e491_new.htm

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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CO 2	3	2	3	1	2	3	1					2	3		
CO 3	3	2	2	2	3	2	1					2	3		
CO 4	2	2	2	1	2	1							3		

GovernmentCollegeofEngineering,Karad

FirstYearM. TechinElectricalPowerSystems

PS2225:AI Techniques

TeachingScheme			**ExaminationScheme**	
Lectures	03Hrs/week		MSE	20
Tutorials	--Hrs/week		ISE	20
TotalCredits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

CourseOutcomes(CO)

Studentswillbeableto:

1.	Demonstrate understanding of AI concepts, problems, and techniques
2.	Employ heuristic search techniques and analyze production system characteristics
3.	Relate knowledge representation approaches using predicate logic and rule-based systems
4.	Synthesize various AI reasoning methods, including symbolic reasoning under uncertainty and statistical reasoning

	CourseContents	**Hours**
Unit1	WhatisAI(ArtificialIntelligence)?:TheAIProblems,TheUnderlyingAssumption,WhatareAITechniques,TheLevelOfTheModel,CriteriaForSuccess,SomeGeneralReferences,OneFinalWordProblems,StateSpaceSearch&HeuristicSearchTechniques:DefiningTheProblemsAsAStateSpaceSearch,ProductionSystems,ProductionCharacteristics,ProductionSystemCharacteristics,AndIssuesInTheDesignOfSearch Programs,AdditionalProblems.Generate-And-Test,HillClimbing,Best-FirstSearch,ProblemReduction,ConstraintSatisfaction,Means-EndsAnalysis.	8
Unit2	KnowledgeRepresentationIssues:RepresentationsAndMappings,ApproachesToKnowledgeRepresentation.UsingPredicateLogic:RepresentationSimpleFactsInLogic,RepresentingInstanceAndIsaRelationships,ComputableFunctionsAndPredicates, Resolution.RepresentingKnowledgeUsingRules:ProceduralVersusDeclarativeKnowledge,LogicProgramming,ForwardVersusBackwardReasoning.	8
Unit3	SymbolicReasoningUnderUncertainty:IntroductionToNomonotonicReasoning,LogicsForNon-monotonicReasoning.StatisticalReasoning:ProbabilityAndBays'Theorem, CertaintyFactorsAndRule-BaseSystems,BayesianNetworks,DempsterShaferTheory	6
Unit4	FuzzyLogic.WeakSlot-and-FillerStructures:SemanticNets,Frames.StrongSlot-and-FillerStructures:ConceptualDependency,Scripts,CYC	6
Unit5	GamePlaying:Overview,AndExampleDomain:Overview,MiniMax,Alpha-BetaCut-off,Refinements,Iterativedeepening,TheBlocksWorld,ComponentsOfAPlanningSystem,GoalStackPlanning,NonlinearPlanningUsingConstraintPosting,HierarchicalPlanning,ReactiveSystems,OtherPlanningTechniques.Understanding:Whatisunderstanding? Whatmakesithard?Asconstraintsatisfaction	8

Unit6	NaturalLanguageProcessing:Introduction,SyntacticProcessing,SemanticAnalysis,SemanticAnalysis,DiscourseAndPragmaticProcessing,SpellCheckingConnectionistModels:Introduction:HopfieldNetwork,LearningInNeuralNetwork,ApplicationOfNeuralNetworks,RecurrentNetworks,DistributedRepresentations,ConnectionistAIAnd SymbolicAI.			8
TextBooks				
1.	ElaineRichandKevinKnight"ArtificialIntelligence",2ndEdition,TataMcgraw-Hill,2005.			
ReferenceBooks				
1.	StuartRusselandPeterNorvig,"ArtificialIntelligence:AModernApproach",3rd Edition,PrenticeHall,2009.			
UsefulLinks				
1	https://www.udemy.com/course/artificial-intelligence-az/			
2	https://onlinecourses.nptel.ac.in/noc22_cs56/preview			

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	1	1	2	2				1	1	2		
CO 2	3	2	3	1	2	3	1				1	2	3		
CO 3	3	2	2	1	3	2	1					2	2		
CO 4	2	3	1	1	2	1					1		3		

GovernmentCollegeofEngineering,Karad

FirstYearM.TechinElectricalPowerSystems

PS2235: IndustrialLoadModellingandControl

TeachingScheme			**ExaminationScheme**	
Lectures	03Hrs/week		MSE	20
Tutorials	--Hrs/week		ISE	20
TotalCredits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

CourseOutcomes(CO)

Studentswillbeableto:

1.	Relate electric energy scenario and demand side management strategies in industrial settings
2.	Apply electricity pricing models and optimization algorithms to control industrial loads
3.	Illustrate the impact of reactive power management and power quality on industries, along with filter application
4.	Justify impact of reactive power management and power quality on industries, along with filter application

	CourseContents	**Hours**
Unit1	• ElectricEnergyScenario-DemandSideManagement-IndustrialLoadManagement • LoadCurves-LoadShapingObjectives • Methodologies-Barriers • ClassificationofIndustrialLoads • ContinuousandBatchprocesses-LoadModeling	**8**
Unit2	• Electricitypricing–Dynamicandspotpricing-Models • Directloadcontrol-Interruptibleloadcontrol • Bottomupapproach-scheduling-FormulationofloadModels • Optimizationandcontrolalgorithms-Casestudies	8
Unit3	• Reactivepowermanagementinindustriescontrols-powerqualityimpacts • applicationoffiltersEnergysavinginindustries	6
Unit4	• Coolingandheatingloads • loadprofiling • Modeling-Coolstorage • Types-Controlstrategies • Optimaloperation • Problemformulation-Casestudies	8
Unit5	• Captivepowerunits • Operatingandcontrolstrategies • PowerPooling-Operationmodels • Energybanking • IndustrialCogeneration	6

Unit6	• SelectionofSchemesOptimalOperatingStrategies • Peakloadsaving • ConstraintsProblemformulation-Casestudy • IntegratedLoadmanagementforIndustries	6

TextBooks	
1.	C.O.Bjork"IndustrialLoadManagement-Theory,PracticeandSimulations",Elsevier,the Netherlands,19892
2.	C.W.GellingsandS.N.Talukdar,.Loadmanagementconcepts.IEEEPress,NewYork,1986
ReferenceBooks	
1.	Y.ManichaikulandF.C.Schweppe,"PhysicallybasedIndustrialload",IEEETrans.onPAS, April1981
2.	H.G.Stoll,"LeastcostElectricityUtilityPlanning",WileyIntersciencePublication,USA,1989.
3.	I.J.NagarathandD.P.Kothari,.ModernPowerSystemEngineering.,TataMcGrawHillpublishers, NewDelhi,1995
4.	IEEEBronzeBook-"RecommendedPracticeforEnergyConservationandcosteffectiveplanning inIndustrialfacilities",IEEEInc,USA
UsefulLinks	
1	https://onlinecourses.nptel.ac.in/noc23_ee128/preview

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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CO 2	2	2	2	3	2	3	1				1	2	2		
CO 3	3	2	2	2	1	2	1				1	2	3		
CO 4	2	2	2	1	2	1						1	3		

Government College of Engineering, Karad

First Year M. Tech in Electrical Power Systems

PS2208: Mini Project/ Industrial Training

Teaching Scheme			Examination Scheme	
Lectures	--		MSE	--
Tutorials	-- Hrs/week		ISE	100
Total Credits	02		ESE	--
Practicals	04 Hrs/week		Duration of ESE	03 Hrs

Course Outcomes (CO)

Students will be able to:

1.	Organise technical reports documenting project objectives, methodologies, findings, and conclusions, adhering to professional standards and best practices.
2.	Support effectively with team members or industry professionals, communicate project progress, challenges, and results, and present findings in a clear and concise manner.
3.	Demonstrate the ability to adapt to new technologies, methodologies, and industry trends, showcasing a commitment to lifelong learning and professional development.

Course Contents

Students should undergo industrial training or carry out mini project as per the guidelines given by respective guide.