

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
ELECTRICAL ENGINEERING DEPARTMENT

SYLLABUS SCHEME FOR M.TECH (POWER ENGINEERING) FULL-TIME

SEMESTER-I									
Sr. No.	Course Type	Course code	Course Name	Hours per week		Internal Marks	External Marks	Total	Credits
				L	P				
1.	Core-I	MEP-101	Advanced Power System Analysis	3	0	50	100	150	3
2.	Core-II	MEP-102	Power System Dynamics-I	3	0	50	100	150	3
3.	Mandatory	MRM-101	Research Methodology and IPR	3	0	50	100	150	3
4.	Program Elective -I	MEP-103	Renewable Energy System	3	0	50	100	150	3
		MEP-104	Smart Grids						
		MEP-105	Dynamics of Electrical Machines						
		MEP-106	SCADA System and Applications						
5.	Program Elective -II	MEP-107	Electrical Power Distribution System	3	0	50	100	150	3
		MEP-108	Mathematical Methods for Power Engineering						
		MEP-109	Pulse Width Modulation for Power Electronics Converters						
		MEP-110	Electric and Hybrid Vehicles						
6.	Lab-I	LMEP-101	Power System Steady State Analysis Laboratory	0	4	50	50	100	2
7.	Lab-II	LMEP-102	Renewable Energy Laboratory	0	4	50	50	100	2
8.	Audit Course-I	MAC-XXX	Audit Course	2	0	50	-	50	S/US
TOTAL				17	8	400	600	1000	19

SEMESTER-II									
Sr. No.	Course Type	Course code	Course Name	Hours per week		Internal Marks	External Marks	Total	Credits
				L	P				
1.	Core-III	MEP-111	Digital Protection of Power System	3	0	50	100	150	3
2.	Core-IV	MEP-112	Power System Dynamics-II	3	0	50	100	150	3
3.	Program Elective -III	MEP-113	Restructured Power Systems	3	0	50	100	150	3
		MEP-114	Advanced Digital Signal Processing						
		MEP-115	High Power Converters						
		MEP-116	Power Apparatus Design						
4.	Program Elective -IV	MEP-117	Advanced Micro-Controller Based Systems	3	0	50	100	150	3
		MEP-118	Wind and Solar Systems						
		MEP-119	Power Quality						
		MEP-120	Artificial Intelligence Techniques						
5.	Project	MPEP-101	Project	0	4	50	50	100	2
6.	Lab-III	LMEP-103	Power System Protection Laboratory	0	4	50	50	100	2
7.	Lab-IV	LMEP-104	Smart Grids Laboratory	0	4	50	50	100	2
8.	Audit course-II	MAC-XXX	Audit Course	2	0	50	-	50	S/US
TOTAL				14	12	400	550	950	18

SEMESTER-III									
Sr. No.	Course Type	Course code	Course Name	Hours per week		Internal Marks	External Marks	Total	Credits
				L	P				
1.	Program Elective -V	MEP-121	Power System Transients	3	0	50	100	150	3
		MEP-122	Flexible AC Transmission and Custom Power Devices						
		MEP-123	Industrial Load Modeling and Control						
		MEP-124	Dynamics of Linear Systems						
2.	Open Elective	MOZZ-XXX	Open Elective	3	0	50	100	150	3
3.	Pre-Thesis	MPTEP-101	Pre-Thesis	0	2#+18*	100	100	200	10
TOTAL				6	20	200	300	500	16

Max. Hours for Teacher

* Independent Study hours

SEMESTER-IV									
Sr. No.	Course Type	Course code	Course Name	Hours per week		Internal Marks	External Marks	Total	Credits
				L	P				
1.	Thesis	MTEP-101	Thesis	0	4#+28*	100	200	300	16
TOTAL				0	32				16

Max. Hours for Teacher

* Independent Study hours

LIST OF AUDIT COURSES		
S. No.	Course Code	Course Name
1.	MAC-101	English for Research Paper Writing
2.	MAC-102	Disaster Management
3.	MAC-103	Sanskrit for Technical Knowledge
4.	MAC-104	Value Education
5.	MAC-105	Constitution of India
6.	MAC-106	Pedagogy Studies
7.	MAC-107	Stress Management by Yoga
8.	MAC-108	Personality Development through Life Enlightenment Skills

LIST OF OPEN ELECTIVE SUBJECT OFFERED TO OTHER DEPARTMENTS		
S. No.	Course Code	Course Name
1.	MOEP-101	Renewable Energy System
2.	MOEP-102	Optimization Techniques
3.	MOEP-103	Organisation & Finance in Power Sector
4.	MOEP-104	Electric and Hybrid Vehicles

GUIDELINES FOR M.TECH THESIS

For evaluation of M.Tech. Thesis at Mid-Term and End Semester Evaluation, the board will consist of Supervisor, M.Tech Incharge/HOD and one observer minimum of rank of Associate Professor and above from other than the parent department.

The following Procedure is to be adopted for evaluation.

- a) Published/Accepted for publication in International/National/SCI Journal (non paid) with consent of Supervisor - 15 Marks
- b) Published/Accepted for publication in International/National Journal Non SCI Non paid (Scientific Citation Index) with consent of Supervisor – 10 Marks
- c) Published and Presented for publication in International Conference – 7 Marks
- d) Published and Presented for publication in National Conference with consent of Supervisor- 5 Marks.

For distinction, the candidate will have to earn at least A grade in Theory and O grade in Thesis. For obtaining O grade, the candidate has to publish a paper in any of the above mentioned categories (a to d).

In addition, the thesis report is to be submitted in spiral binding for external viva voce examination.

The hard bind report will be submitted (after incorporation of any modification recommended by the External Examiner) after the final viva-voce exam.

No dues will be submitted to office of Dean Academics after the end of final viva-voce exam.

After that the notification will be released from the office of Controller of Examination.

Subject Code: MEP-101

Subject Name: ADVANCED POWER SYSTEM ANALYSIS

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hour
Total marks: 150	Elective Status: Compulsory

Prerequisites: Computer Aided Power System Analysis (at UG Level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Perform load flow analysis using various methods
2	Apply generalized method of fault analysis on simultaneous and open conductor faults and rank various contingencies according to their severity
3	Apply Ward method and REI equivalents for reduction of large power system models
4	Apply Weighted Least Square method for power system state estimation
5	Estimate closeness to voltage collapse and calculate PV curves

Unit 1 Load flow: Overview of Newton-Raphson, Gauss-Siedel, Fast Decoupled methods, convergence properties, sparsity techniques, is handling Q_{\min} and Q_{\max} violations in Jacobian matrix, inclusion of frequency effects, Automatic Voltage Regulation in load flow.

Unit 2 Faults and Security Analysis: Simultaneous faults, open conductor faults, generalized method of fault analysis. Security state diagram, contingency analysis, generator shift distribution factors, line outage distribution factor, multiple line outages, overload index ranking.

Unit 3 Power System Equivalents: Ward Method, and Radial, Equivalent and Independent (REI) equivalents for reduction of large power system models.

Unit 4 State Estimation: Sources of errors in measurement, Virtual and Pseudo Measurements, Observability, Tracking state estimation, Weighted Least Square method, bad data correction.

Unit 5 Voltage Stability: Voltage collapse, P-V curve, multiple power flow solution, continuation power flow, optimal load flow, voltage collapse proximity indices.

Text/Reference:

1. J.J. Grainger and W.D. Stevenson, "Power system analysis", McGraw Hill, 2003
2. A. R. Bergen and Vijay Vittal, "Power System Analysis", Pearson, 2000
3. L.P. Singh, "Advanced Power System Analysis and Dynamics", New Age International, 2006
4. G. L. Kusic, "Computer aided power system analysis", Prentice Hall India, 1986
5. A. J. Wood, B. F. Wollenberg and G. B. Sheblé, "Power generation, operation and control", Wiley, 2013
6. P.M. Anderson, "Faulted power system analysis", IEEE Press, 1995

E-Book and Online learning material:

1. Debapriya Das, Indian Institute of Technology, Kharagpur,
<https://swayam.gov.in/courses/4745-july-2018-power-system-analysis>

Subject Code: MEP-102
Subject Name: POWER SYSTEM DYNAMICS-I

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Compulsory

Prerequisites: Electrical Machines (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand the modeling of synchronous machine
2	Develop synchronous machine equivalent representation
3	Carry out synchronous machine stability analysis
4	Develop model of excitation system
5	Understand the modeling of prime movers

Unit 1 Synchronous Machine Modelling: Per unit systems, Park's Transformation and Modified Park's Transformation, Flux-linkage equations.

Unit 2 Synchronous Machine Equivalent Representation: Voltage and current equations, Formulation of State-space equations, Equivalent circuit.

Unit 3 Synchronous Machine Stability: Sub-transient and transient inductance and Time constants, Simplified models of synchronous machines, Small signal model, Introduction to frequency model.

Unit 4 Synchronous Machine Excitation System: Philips-Heffron model and PSS Load modelling.

Unit 5 Prime Movers: Modelling of Hydraulic and steam turbine, governing systems.

Text/Reference:

1. P. M. Anderson and A. A. Fouad, "Power System Control and Stability", John Wiley & Sons, 2008.
2. J Machowski, J Bialek and J. R. W. Bumby, "Power System Dynamics and Stability", John Wiley & Sons, 1997.
3. P. Kundur, "Power System Stability and Control", McGraw Hill Inc., 1994.
4. E.W. Kimbark, "Power system stability", John Wiley & Sons, 2002.

E-Book and Online learning material:

1. <https://courses.engr.illinois.edu/ece576/sp2018/Sauer%20and%20Pai%20book%20-%20Jan%202007.pdf>

Subject Code: MRM-101

Subject Name: RESEARCH METHODOLOGY AND IPR

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours:
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Mandatory

Prerequisites: Minor/ Major Projects (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand research problem formulation and analyze research related information.
2	Attain the knowledge of research ethics
3	Attain the knowledge of writing reports and research papers
4	Understanding emphasis of Intellectual Property Right and patenting
5	Gain the knowledge about new developments in IPR

Unit 1 Introduction: 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

Unit 2 Literature Studies Approaches: Effective literature studies approaches, analysis, plagiarism, and research ethics

Unit 3 Effective Technical Writing: Writing reports and research papers, Developing a Research Proposal, Format of research proposal, presentation and assessment by a review committee.

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 Patent Cooperation Treaty (PCT).

Unit 5 Patent Rights: Scope of Patent Rights, Licensing and transfer of technology, Patent information and databases, Geographical Indications, administration of Patent System. New developments in Intellectual Property Rights; IPR of Biological Systems, related computer software

Text/Reference:

1. S. Melville and W. Goddard, "Research methodology: an introduction for science and engineering students", Juta Academic, 1996
2. R. Kumar, "Research Methodology: A Step by Step Guide for beginners", SAGE, 2014
3. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
4. Mayall, "Industrial Design", McGraw Hill, 1992.
5. Niebel, "Product Design", McGraw Hill, 1974.
6. Asimov, "Introduction to Design", Prentice Hall, 1962.
7. R. P. Merges, P. S. Menell, M. A. Lemley, "Intellectual Property in New Technological Age", 2016.
8. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

E-Book and Online learning material:

1. <https://www.coursera.org/learn/research-methods>
2. <https://www.lawctopus.com/certificate-course-on-research-methodology-online/>
3. "How to Build a Start-up", Available at Udacity, Self-Paced (One Month). <https://in.udacity.com/course/how-to-build-a-startup--ep245>
4. "Intellectual Property Rights: A Management Perspective, Available at edx (Offered by IIM Bangalore), Starts on 1 August 2018 (6 weeks). <https://www.edx.org/intellectual-property-rights-a-management-perspective>

Subject Code: MEP-103

Subject Name: RENEWABLE ENERGY SYSTEM

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-I

Prerequisites: Non-Conventional Energy Sources (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand distributed and central generating station
2	Understand about renewable sources of energy
3	Apply the concepts of power electronic for grid interfacing of distributed generators
4	Understand power quality issues of distributed generation
5	Attain the knowledge of protection and economics of distributed generation

Unit 1 Introduction: Distributed vs. Central Station Generation, Turbo-generator, Nuclear generator and Micro-turbines.

Unit 2 Renewable Sources of Energy: Introduction to Solar Energy, Wind Energy, Combined Heat and Power, Hydro Energy, Tidal Energy, Wave Energy, Geothermal Energy, Biomass and Fuel Cells.

Unit 3 Interfacing Distributed Generators with Grid: Applications of Power Electronic devices for Grid Interfacing of Distributed Generators.

Unit 4 Power Quality Issues: Impact of Distributed Generation on the Power System, Power Quality Disturbances.

Unit 5 Protection and Economics: Transmission System Operation, Protection of Distributed Generators, Economics of Distributed Generation.

Text/Reference:

1. R. Ranjan, D. P. Kothari, and K. C. Singal, "Renewable Energy Sources and Emerging Technologies", Prentice Hall of India, 2011.
2. M. H. Bollen and F. Hassan, "Integration of Distributed Generation in the Power System", Wiley –IEEE Press, 2011.
3. L.L. Lai and T.F. Chan, "Distributed Generation: Induction and Permanent Magnet Generators", Wiley-IEEE Press, 2007.
4. R. A. Messenger and J. Ventre, "Photovoltaic System Engineering", 2010.
5. J. F. Manwell, J.G. McGowan and A.L Rogers, "Wind energy explained: Theory, Design and Application", John Wiley and Sons, 2010.

E-Book and Online learning material:

1. Technical University of Denmark, <https://www.coursera.org/learn/wind-energy>
2. P.Haridos, IIT Madras, <https://swayam.gov.in/courses/4894-july-2018-non-conventionalenergy-resources>
3. A. Smets, Sustainable Energy: Design a Renewable Future, TU Delft & EDX
4. A. Smets, Solar Energy, TU Delft & EDX
5. A. Stegner, P.P. Drobinski, Wind resources for renewable energies, École Polytechnique & Courser

Subject Code: MEP-104
Subject Name: SMART GRIDS

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-I

Prerequisites: Power System and Microcontroller (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Appreciate the difference between smart grid and 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	Understand integration of renewable energy sources with micro-grid
5	Come up with smart grid solutions using modern communication technologies

Unit 1 Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Concept of Robust and Self-Healing Grid, Present development and International policies in Smart Grid.

Unit 2 Introduction to Smart Meters: Real Time Pricing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home and Building Automation, Smart Substations, Substation Automation, Feeder Automation.

Unit 3 Smart Measurement System: Geographic Information System(GIS), Intelligent Electronic Devices(IED) and their application for monitoring and protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU)

Unit 4 Micro-grid and Integration of Renewable Energy sources: Concept of micro-grid, need and applications of micro-grid, formation of micro-grid, Issues of interconnection, protection and control of micro-grid, Plastic and Organic solar cells, Thin film solar cells, Variable speed wind generators, fuel-cells, micro-turbines, Captive power plants, Integration of renewable energy sources

Unit 5 Smart Communication: Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighbourhood Area Network (NAN), Wide Area Network (WAN).Bluetooth, GPS, Wi-Fi, Wi-Max based communication, Wireless Mesh Network, Cyber Security for Smart Grid Broadband over Power line (BPL), IP based protocols

Text/Reference:

1. A. Keyhani, "Design of smart power grid renewable energy systems", Wiley IEEE, 2011
2. C.W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press, 2009
3. J. Ekanayake, N. Jenkins, K. Liyanage, "Smart Grid: Technology and Applications", Wiley 2012
4. S. Borlase, "Smart Grid: Infrastructure, Technology and solutions", CRC Press, 2012
5. A.G. Phadke, "Synchronized Phasor Measurement and their Applications", Springer, 2012

E-Book and Online learning material:

1. N.P. Pandey, "Introduction to smart grid", IIT Roorkee
<https://swayam.gov.in/courses/4778-july-2018-introduction-to-smart-grid>
2. Narayana Prasad Padhy, Premalata Jena, "Introduction to Smart Grid," NPTEL
https://onlinecourses.nptel.ac.in/noc18_ee42/preview
3. M. Vadari, M. Balasubramanian, Distributed Energy – Smart Grid Resources for the Future, IEEE, Coursera
4. Dr. M. Vadari and M. Balasubramanian, Smart Grids: Electricity for the Future, IEEE & EDX
5. Laura Ramirez, Pavol Bauer & Seyedmahdi Izadkhast, "Solar Energy: Integration of Photovoltaic Systems in Microgrids", Delf University of Technology, <https://www.edx.org/course/solar-energy-integration-photovoltaic-delftx-pv4x-0>

Subject Code: MEP-115

Subject Name: DYNAMICS OF ELECTRICAL MACHINES

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-I

Prerequisites: Electrical machines (At UG Level)

Additional Material allowed in ESE: Scientific Calculator

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Formulation of electrodynamic equations of all electric machines
2	Analyze the performance characteristics using Park's transformation
3	Knowledge of transformations for the dynamic analysis of machines
4	Knowledge of determination of stability of the machines under small signal and transient conditions
5	Study about synchronous machine

Unit 1 Introduction: Stability, Primitive 4 Winding Commutator Machine, Commutator Primitive Machine, Complete Voltage Equation of Primitive 4 Winding Commutator Machine

Unit 2 Torque Equations: Torque Equation Analysis of Simple DC Machines using the Primitive Machine Equations, The Three Phase Induction Motor, Transformed Equations, Different Reference Frames for Induction Motor Analysis Transfer Function Formulation

Unit 3 Three Phase Synchronous Machine: Three Phase Salient Pole Synchronous Machine, Parks Transformation, Steady State Analysis

Unit 4 Dynamic analysis: Large Signal Transient, Small Oscillation Equations in State Variable form, Dynamical Analysis of Interconnected Machines

Unit 5 Transient Analysis: Large Signal Transient Analysis using Transformed Equations, DC Generator /DC Motor System Alternator /Synchronous Motor System

Text/Reference:

1. D.P. Sengupta and J.B. Lynn, "Electrical Machine Dynamics", The Macmillan Press Ltd. 1980
2. R Krishnan "Electric Motor Drives, Modeling, Analysis, and Control", Pearson Education., 2001
3. P.C. Kraus, "Analysis of Electrical Machines", McGraw Hill Book Company, 1987
4. I. Boldia and S.A. Nasar, "Electrical Machine Dynamics", The Macmillan Press Ltd. 1992
5. C.V. Jones, "The Unified Theory of Electrical Machines", Butterworth, London. 1967

E-Book and Online learning material:

1. http://www.darshan.ac.in/Upload/DIET/Documents/EE/CED_Ch_2_Dynamics_of_Electrical_Drives_v1_03_042018_095922AM.pdf

Subject Code: MEP-118

Subject Name: SCADA SYSTEM AND APPLICATIONS

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-I

Prerequisites: Microcontroller (At UG Level)

Additional Material allowed in ESE: Scientific Calculator

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Describe the basic tasks of Supervisory Control Systems (SCADA) as well as their typical applications
2	Acquire knowledge about SCADA architecture, various advantages and disadvantages of each system
3	Knowledge about single unified standard architecture IEC 61850
4	Learn about SCADA system components: remote terminal units, PLCs, intelligent electronic devices, HMI systems, SCADA server
5	Learn and understand about SCADA applications in transmission and distribution sector, industries etc

Unit 1 Introduction: Introduction to SCADA, Data acquisition systems, Evolution of SCADA, Communication technologies. Monitoring and supervisory functions, SCADA applications in Utility Automation, Industries SCADA

Unit 2 Industry SCADA System: Industries SCADA System Components, Schemes- Remote Terminal Unit (RTU), Intelligent Electronic Devices(IED), Programmable Logic Controller (PLC), Communication Network, SCADA Server, SCADA/HMI Systems

Unit 3 Architecture: SCADA Architecture, Various SCADA architectures, advantages and disadvantages of each system, single unified standard architecture -IEC 61850.

Unit 4 Communication Technologies: SCADA Communication, various industrial communication technologies, wired and wireless methods and fiber optics, Open standard communication protocols

Unit 5 Applications: SCADA Applications: Utility applications, Transmission and Distribution sector operations, monitoring, analysis and improvement, Industries - oil, gas and water

Text/Reference:

1. Stuart A. Boyer: "SCADA-Supervisory Control and Data Acquisition", Instrument Society of America Publications,USA,2004
2. Gordon Clarke, Deon Reynders: "Practical Modern SCADA Protocols: DNP3, 60870.5 and Related Systems", Newnes Publications, Oxford, UK,2004
3. William T. Shaw, "Cyber security for SCADA systems", Penn Well Books, 2006
4. David Bailey, Edwin Wright, "Practical SCADA for industry", Newnes, 2003
5. Michael Wiebe, "A guide to utility automation: AMR, SCADA, and IT systems for electric power", PennWell 1999

E-Book and Online learning material:

1. Energy Management and SCADA, coordinated by IIT Madras, NPTEL, <http://www.nptel.ac.in/courses/108106022/8>,

Subject Code: MEP-107

Subject Name: ELECTRIC POWER DISTRIBUTION SYSTEM

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: I	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-II

Prerequisites: Power System Transmission and Distribution (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Attain the knowledge of power distribution and its management
2	Attain the knowledge of Distribution automation and its application in practice
3	Understand Control and Communication through SCADA system
4	Apply optimization concept for Distribution Systems Switching
5	Understand the problems and challenges of Distribution automation

Unit1 Introduction: Distribution of Power, Management, Power Loads, Load Forecasting Short-term and Long-term, Power System Loading, Technological Forecasting.

Unit 2 Distribution Management System: Advantages, Distribution Automation: Definition, Restoration/ Reconfiguration of Distribution Network, Different Methods and Constraints, Power Factor Correction

Unit 3 Supervisory Control and Data Acquisition (SCADA) System: Introduction, Block Diagram, SCADA Applied To Distribution Automation, Common Functions of SCADA, Advantages of Distribution Automation through SCADA, and Communication Systems, Remote Metering, Automatic Meter Reading and its implementation

Unit 4 Distribution Systems Switching: Calculation of Optimum Number of Switches, Capacitors, Optimum Switching Device Placement in Radial, Distribution Systems, Sectionalizing Switches – Types, Benefits, Bellman’s Optimality Principle, Remote Terminal Units, Energy efficiency in electrical distribution and Monitoring.

Unit 5 Maintenance of Automated Distribution Systems: Difficulties in Implementing Distribution, Automation in Actual Practice, Urban/Rural Distribution, Energy Management, AI techniques applied to Distribution Automation

Text/Reference:

1. A.S. Pabla, “Electric Power Distribution”, Tata McGraw Hill Publishing Co. Ltd. 2008.
2. M.K. Khedkar and G.M. Dhole, “A Text Book of Electrical power Distribution Automation”, University Science Press, 2011
3. A. J. Panseni, “Electrical Distribution Engineering”, CRC Press, 2012
4. J. Momoh, “Electric Power Distribution, automation, protection and control”, CRC Press, 2012

E-Book and Online learning material:

1. Energy Management and SCADA, coordinated by IIT Madras, NPTEL, <http://www.nptel.ac.in/courses/108106022/8>,

Subject Code: MEP-108

Subject Name: MATHEMATICAL METHODS FOR POWER ENGINEERING

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 60%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-II

Prerequisites: Numerical Statistical Techniques (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Attain the knowledge of vector spaces, linear transformation, eigenvalues and eigenvectors of linear operators
2	To learn about linear programming problems and understanding the simplex method for solving linear programming problems
3	Acquire knowledge about solving unconstrained nonlinear programming
4	Understanding the concept of random variables, functions of random variable and their probability distribution
5	Understand stochastic processes and their classification

Unit 1 Introduction: Vector spaces, linear transformations, Matrix representation of linear transformation, Eigen values and Eigen vectors of linear operator

Unit 2 Linear Programming: Formulation, Simplex Method, Duality.

Unit 3 Non Linear Programming: Formulation, Unconstrained Problems, Search methods.

Unit 4 Constrained Problems: Lagrange method, Kuhn-Tucker conditions, Random Variables, Distributions.

Unit 5 Stochastic Processes: Introduction, Independent Random Variables, Marginal and Conditional distributions.

Text/Reference:

1. K. Hoffman and R. Kunze, "Linear Algebra", 2nd Edition, PHI, 1992
2. E. Kreyszig, "Introductory Functional Analysis with Applications", John Wiley & Sons, 2004
3. I. Miller, M. Miller and J. E. Freund's "Mathematical Statistics", PHI, 2002
4. J. Medhi, "Stochastic Processes", New Age International, New Delhi., 1994
5. A Papoulis, "Probability, Random Variables and Stochastic Processes", McGraw Hill, 2002
6. J. B Thomas, "An Introduction to Applied Probability and Random Processes", John Wiley, 2000
7. F. S. Hillier and G. J. Liebermann, "Introduction to Operations Research", McGraw Hill, 2001
8. D. M. Simmons, "Non Linear Programming for Operations Research", PHI, 1975

E-Book and Online learning material:

1. <https://pdfs.semanticscholar.org/905c/728be51197ea7af9e19e4848f037fb097341.pdf>

Subject Code: MEP-109

Subject Name: PULSE WIDTH MODULATION FOR PE CONVERTERS

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-II

Prerequisites: Power Electronics (At UG Level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Appreciate importance of power electronics converters and its modulation techniques
2	Apply advanced modulation strategies such as zero space vector placement, loss discontinuous and modulation applied to current source inverter.
3	Implement PWM using different strategies
4	Demonstrate the knowledge of continuing developments in modulation
5	Demonstrate the necessity of providing minimum pulse width and its effect

Unit 1 Introduction: Introduction to Power Electronic converters, Modulation of one inverter phase leg, Modulation of single phase VSI and 3 phase VSI.

Unit 2 Modulation: Zero space vector placement modulation strategies, Losses-Discontinuous modulation, Modulation of CSI, over modulation of converters, programme modulation strategies

Unit 3 Pulse width modulation: Pulse width modulation for multilevel inverters, Implementation of modulation controller

Unit 4 Recent developments: Continuing developments in modulation as random PWM, PWM for voltage unbalance

Unit 5 Minimum pulse width: Effect of minimum pulse width and necessity of providing dead time

Text/Reference:

1. D. Grahame Holmes, Thomas A. Lipo, "Pulse width modulation of Power Converter: Principles and Practice", John Wiley & Sons, 03-Oct-2003
2. B.Vew, "High Power Converter", Wiley Publication
3. M. K. Kazimierczuk, "Pulse width modulated dc-dc power converter", Wiley Publication

E-Book and Online learning material:

1. Dr. K. Afridi, Dr. R. Erickson, Dr. D. Maksimovic, Power Electronics Specialization, University of Colorado, Coursera

Subject Code: MEP-110

Subject Name: ELECTRIC AND HYBRID VEHICLES

Programme: M.Tech (Power Engg.)	L: 3 T: 0 P: 0
Semester: 1	Teaching Hours: 44
Theory/Practical: Theory	Credits: 3
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 40%
External Marks: 100	Duration of End Semester exam (ESE): 3 hr
Total marks: 150	Elective Status: Elective-II

Prerequisites: Electrical Machines and Electric Drives (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Acquire knowledge about fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
2	Understand hybrid drive-train topologies.
3	Attain the knowledge about DC motor drives configuration and control
4	Understand the selection and sizing of energy storage systems
5	Compare different energy management strategies

Unit 1 History of Hybrid and Electric Vehicles: Social and environmental importance of hybrid and electric vehicles, Impact of modern drive-trains on energy supplies, Basics of vehicle performance, vehicle power source characterization Transmission characteristics.

Unit 2 Hybrid Drive-Train Topologies: Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis.

Unit 3 DC Motor Drives Configuration and Control: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance, Drive system efficiency.

Unit 4 Matching the Electric Machine and Internal Combustion Engine: Sizing the propulsion motor, selecting the energy storage technology, sizing the power electronics devices for energy storage.

Unit 5 Introduction to Energy Management and Their Strategies: Classification of different energy management strategies Comparison of different energy management strategies Implementation issues of energy strategies.

Text/Reference:

1. S. Ramirez, R. S. Ortigoza, "Control Design Techniques in Power Electronics Devices", Springer, 2011
2. S.C. Tan, Y.M. Lai and C. K. Tse, "Sliding mode control of switching Power Converters" CRC press, 2012

E-Book and Online learning material:

1. <https://nptel.ac.in/courses/108103009/>
2. https://books.google.co.in/books?id=bQFuTCGNYWgC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

Subject Code: LMEP-101

Subject Name: POWER SYSTEM STEADY STATE ANALYSIS LABORATORY

Programme: M.Tech (Power Engg.)	L: 0 T: 0 P: 4
Semester: 1	Teaching Hours: 48
Theory/Practical: Practical	Credits: 2
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 100%
External Marks: 50	Duration of End Semester exam (ESE): NIL
Total marks: 100	Elective Status: Core

Prerequisites: CAPSA Lab (At UG Level)

On Completion of the course, the student will have the ability to apply software tools for:

CO#	Course Outcomes (CO)
1	Load flow techniques, short circuit, transient stability
2	Load forecasting and unit commitment
3	Thyristor converters and IGBT inverters
4	PID controller using software and hardware tools

Sr. No.	Name of Practical
	Use of MATLAB /SIMULNK/PSIM/PSAT/MiPOWER/PSCAD/ETAP/other software tools for following experiments
1.	Load Flow Studies
2.	Short Circuit Studies.
3.	Transient Stability Studies
4.	Load Forecasting
5.	Unit Commitment
6.	Simulation of Thyristor Converters.
7.	Simulation of IGBT Inverters.
8.	Simulation of PID controller
9.	Hardware design of PID using ARDUINO UNO
10.	Weighted Least Square Method for state estimation

Subject Code: LMEP-102

Subject Name: RENEWABLE ENERGY LABORATORY

Programme: M.Tech (Power Engg.)	L: 0 T: 0 P: 4
Semester: 1	Teaching Hours: 48
Theory/Practical: Practical	Credits: 2
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 100%
External Marks: 50	Duration of End Semester exam (ESE): NIL
Total marks: 100	Elective Status: Core

Prerequisites: Renewable Energy Resources (At UG Level)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Determine calorific value of a fuel
2	Analyze characteristics of solar module
3	Attain the knowledge of different MPPT techniques
4	Use of HOMER software

Sr. No. **Name of Practical**

1. Calorific value using Bomb calorimeter
2. Gas Analyser for biomass plants
3. I-V curves for solar cell
4. Energy management of solar modules
5. Implementation of MPPT techniques for solar module
6. Effect of Load on Solar Panel Output
7. Analysis of renewable energy resources in HOMER software
8. Test the Capabilities of Solar Panels

Subject Code: MAC-101**Subject Name: ENGLISH FOR RESEARCH PAPER WRITING**

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): 3 hr
Total marks: 50	Elective Status: Audit Course

Prerequisites: Communication Skills (at UG level)

Additional Material allowed in ESE: Nil

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Plan and prepare research papers/ reports
2	Prepare layout and sections of a report/ research paper
3	Develop skills for readability and writing review of the Literature
4	Develop skills for writing various sections of a research paper/ report
5	Develop skills for ensuring quality of research paper/ report

Unit 1 Planning and Preparation: Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit 2 Layout of a report/ research paper: Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts.

Unit 3 Review of the Literature: Introduction, Methods, Results, Discussion, Conclusions, the Final Check, key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

Unit 4 Writing Skills: Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, and skills are needed when writing the Conclusions

Unit 5 Miscellaneous Topics: Useful phrases, ensuring quality of research paper, first- time submission

Text/Reference:

1. R. Goldbort, "Writing for Science", Yale University Press, 2006.
2. R. Day, "How to Write and Publish a Scientific Paper", Cambridge University Press, 2006
3. N. Highman, "Handbook of Writing for the Mathematical Sciences", SIAM, 1998.
4. A. Wallwork, "English for Writing Research Papers", Springer New York, 2011

E-Book and Online learning material:

1. "Take Your English Communication Skills to the Next Level". Available at Coursera (Offered by Georgia Institute of Technology), 4 weeks, Starts on September 10, 2018.
<https://www.coursera.org/learn/english-communication-capstone>
2. "Effective Communication in Globalised Workplace- The Capstone". Available at Coursera (Offered by National University of Singapore), 3 weeks, Starts on August 06, 2018.
<https://www.coursera.org/specializations/effective-communication>

Subject Code: MAC-102

Subject Name: Disaster Management

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): 3 hr
Total marks: 50	Elective Status: Audit Course

Prerequisites: Communication Skills (at UG level)

Additional Material allowed in ESE: Nil

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2	critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
3	Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4	critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Unit 1 Introduction: Disaster - Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural And Manmade Disasters: Difference, Nature, Types and Magnitude.

Unit 2 Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem; Natural Disasters - Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches; Man-made disasters - Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

Unit 3 Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards With Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

Unit 4 Disaster Preparedness and Management: Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

Unit 5 Risk Assessment: Disaster Risk - Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

Unit 6 Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India

Text/References:

1. R. Nishith, Singh A.K., "Disaster Management in India: Perspectives, issues and strategies" New Royal book Company.
2. Sahni, Pardeep et al. (Eds.), "Disaster Mitigation Experiences and Reflections", Prentice Hall Of India, New Delhi.
3. Goel S.L., Disaster Administration and Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi.

Subject Code: MAC-103

Subject Name: Sanskrit for Technical Knowledge

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): 3 hr
Total marks: 50	Elective Status: Audit Course

Prerequisites: Communication Skills (at UG level)

Additional Material allowed in ESE: Nil

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understanding basic Sanskrit language
2	Ancient Sanskrit literature about science & technology can be understood
3	Being a logical language will help to develop logic in students

Unit 1: Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

Unit 2: Order, Introduction of roots, Technical information about Sanskrit Literature

Unit 3: Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Text/References:

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi

Subject Code: MAC-104

Subject Name: Value Education

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): 3 hr
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL

Additional Material allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Knowledge of self-development
2	Learn the importance of Human values
3	Developing the overall personality

Unit 1: Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value judgments.

Unit 2: Importance of cultivation of values, Sense of duty. Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

Unit 3: Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking. Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship, Happiness Vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature

Unit 4: Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of reincarnation, Equality, Nonviolence ,Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively

Text/References:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

Subject Code: MAC-105

Subject Name: Constitution of India

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): 3 hr
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL

Additional Material allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics. 2. 3.
2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4	Discuss the passage of the Hindu Code Bill of 1956.

Unit 1: History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)

Unit 2: Philosophy of the Indian Constitution: Preamble Salient Features

Unit 3: Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

Unit 4: Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit 5: Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Unit 6: Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women

Text/References:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Subject Code: MAC-106

Subject Name: Pedagogy Studies

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): 3 hr
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL

Additional Material allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

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

Unit 1 Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education, Conceptual framework, Research questions, Overview of methodology and Searching.

Unit 2 Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education.

Unit 3 Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies, how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? , Theory of change, Strength and nature of the body of evidence for effective pedagogical practices, Pedagogic theory and pedagogical approaches, Teachers' attitudes and beliefs and Pedagogic strategies.

Unit 4 Professional development: alignment with classroom practices and follow up support, Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes

Unit 5 Research gaps and future directions, Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Text/References:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379

Subject Code: MAC-107

Subject Name: Stress Management By Yoga

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): 3 hr
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL

Additional Material allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Develop healthy mind in a healthy body thus improving social health also
2	Improve efficiency

Unit 1: Definitions of Eight parts of yog. (Ashtanga)

Unit 2: Yam and Niyam. Do`s and Don`t`s in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Unit 3: Asan and Pranayam i) Various yog poses and their benefits for mind & body ii) Regularization of breathing techniques and its effects-Types of pranayam

Text/References:

1. ‘Yogic Asanas for Group Training-Part-I’: Janardan Swami Yogabhyasi Mandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

Subject Code: MAC-8**Subject Name: Personality Development through Life Enlightenment Skills**

Programme: M.Tech (Power Engg.)	L: 2 T: 0 P: 0
Semester: 1/2	Teaching Hours: 28
Theory/Practical: Theory	Credits: S/US
Internal marks: 50	Percentage of Numerical/Design/ Programming Problems: 0%
External Marks: 00	Duration of End Semester exam (ESE): 3 hr
Total marks: 50	Elective Status: Audit Course

Prerequisites: NIL**Additional Material allowed in ESE:** NIL**On Completion of the course, the student will have the ability to:**

CO#	Course Outcomes (CO)
1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3	Study of Neetishatakam will help in developing versatile personality of students.

Unit 1 Neetisatakam-Holistic development of personality:

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

Unit 2 Approach to day to day work and duties:

Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48, Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.

Unit 3 Statements of basic knowledge:

- Shrimad Bhagwad Geeta: Chapter 2-Verses 56, 62, 68, Chapter 12 -Verses 13, 14, 15, 16,17,
- Personality of Role model.
- Shrimad Bhagwad Geeta: Chapter 2-Verses 17, Chapter 3-Verses 36,37, 42, Chapter 4-Verses 18, 38,39, Chapter18 – Verses 37,38,63

Text/References:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.