

SHRI VENKATESHWARA UNIVERSITY



EVALUATION SCHEME & SYLLABUS

M.TECH Power System

(Two Years Post Graduation Programme)

I SEMESTER

(w.e.f. 2019-20)

**SCHOOL OF ENGINEERING &
TECHNOLOGY**

M.TECH
Power System
SEMESTER-I

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	MPS-101	Power System Analysis	3	0	0	20	10	30		70		100	3
2	MPS-102	Power System Dynamics-I	3	0	0	20	10	30		70		100	3
3	MPS-011	Renewable Energy System	3	0	0	20	10	30		70		100	3
4	MPS-021	Electrical Power Distribution System	3	0	0	20	10	30		70		100	3
5	MLC-101	Research Methodology and IPR	2	0	0	20	10	30		70		100	2
6	MPS-111	Power System Steady State Analysis Lab	0	0	4				25		25	50	2
7	MPS-112	Power System Dynamics Lab	0	0	4				25		25	50	2
8	AUD-101	English for Research Paper Writing	2	0	0	20	10	30		70		100	0
		Total										700	18

Code	Course Name	L-T-P	Cr.
WPS -201	Power System Analysis	3-0-0	3

Course objective:

- Study various methods of load flow and their advantages and disadvantages
- Understand how to analyze various types of faults in power system
- Understand power system security concepts and study the methods to rank the contingencies
- Understand need of state estimation and study simple algorithms for state estimation
- Study voltage instability phenomenon

Unit No	Content
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.
2	Fault Analysis: Simultaneous faults, open conductors faults, generalized method of fault analysis
3	Security Analysis: Security state diagram, contingency analysis, generator shift distribution factors line outage distribution factor, multiple line outages, overload index ranking
4	Power System Equivalents: WARD REI. equivalents State Estimation : Sources of errors in measurement Virtual and Pseudo, Measurement, Observability, Tracking state estimation
5	WSL method, bad data correction
6	Voltage Stability : Voltage collapse, P-V curve, multiple power flow solution, Continuation power flow, optimal multiplies load flow, voltage collapse proximity indices.

Suggested reading:

- J.J. Grainger & W.D. Stevenson, "Power system analysis ", McGraw Hill ,2003.

- R. Bergen & Vijay Vittal , “Power System Analysis” ,Pearson , 2000.
- L.P. Singh , “Advanced Power System Analysis and Dynamics”, New Age International, 2006.
- G.L. Kusic, “Computer aided power system analysis” ,Prentice Hall India, 1986
- A.J. Wood, “ Power generation, operation and control” , John Wiley, 1994
- P.M. Anderson, “Faulted power system analysis” , IEEE Press , 1995

Course outcomes : Students will be able to:

- Able to calculate voltage phasors at all buses, given the data using various methods of load flow.
- Able to calculate fault currents in each phase.
- Rank various contingencies according to their severity.
- Estimate the bus voltage phasors given various quantities viz. power flow, voltages, taps , CB status etc.
- Estimate closeness to voltage collapse and calculate PV curves using continuation power flow.

Code	Course Name	L-T-P	Cr.
WPS -101	Power System Dynamics-I	3-0-0	3

Course Objectives: - Students will be able to:

- Study of system dynamics and its physical interpretation
- Development of mathematical models for synchronous machine
- Modeling of induction motor

Unit No.	Content
1	Synchronous Machines: Per unit systems Park's Transformation (modified) Flux-linkage equations.
2	Voltage and current equations Formulation of State-space equations Equivalent circuit.
3	Sub-transient and transient inductance and Time constants, Simplified models of synchronous machines
4	Small signal model: Introduction to frequency model.
5	Excitation systems and Philips-Heffron model PSS Load modeling.
6	Modeling of Induction Motors Prime mover controllers

Suggested reading:

- P. M. Anderson & A. A. Fouad "Power System Control and Stability", Galgotia , New Delhi, 1981.
- J Machowski, J Bialek & J. R W. Bumby, "Power System Dynamics and Stability", John Wiley & Sons, 1997.
- P.Kundur, "Power System Stability and Control", McGraw Hill Inc., 1994.
- E.W. Kimbark, "Power system stability", Vol. I & III, John Wiley & Sons, New York 2002

Course Outcomes: Students will be able to:

- Understand the modeling of synchronous machine in details.
- Carry out simulation studies of power system dynamics using MATLAB-SIMULINK, MI POWER
- Carry out stability analysis with and without power system stabilizer (PSS).
- Understand the load modeling in power system

Code	Course Name	L-T-P	Cr.
WPS -111	Power System Dynamics Lab	0-0-4	2

List of experiments:

S.No.	Experiments
1	Power Curves
2	Build a Wind Farm
3	Test the Capabilities of the Hydrogen Fuel Cells and Capacitors
4	Effect of Temperature on Solar Panel Output
5	Variables Affecting Solar Panel Output
6	Effect of Load on Solar Panel Output
7	Wind Turbine Output: The Effect of Load
8	Test the Capabilities of Solar Panels and Wind Turbines

Code	Course Name	L-T-P	Cr.
WPS -011	Renewable Energy System	3-0-0	3

Course Objectives:- Students will be able to:

- To learn various renewable energy sources.
- To gain understanding of integrated operation of renewable energy sources.

- To understand Power Electronics Interface with the Grid

Unit No.	Content
1	Introduction, Distributed vs Central Station Generation Sources of Energy such as Micro-turbines Internal Combustion Engines
2	Introduction to Solar Energy, Wind Energy, Combined Heat and Power Hydro Energy, Tidal Energy, Wave Energy Geothermal Energy, Biomass and Fuel Cells.
3	Power Electronic Interface with the Grid
4	Impact of Distributed Generation on the Power System Power Quality Disturbances
5	Transmission System Operation Protection of Distributed Generators
6	Economics of Distributed Generation Case Studies

Suggested reading:

- RanjanRakesh, Kothari D.P, Singal K.C, “Renewable Energy Sources and Emerging Technologies”, 2nd Ed. Prentice Hall of India ,2011.
- Math H.Bollen, Fainan Hassan, “Integration of Distributed Generation in the Power System”, July 2011, Wiley –IEEE Press.
- Loi Lei Lai, Tze Fun Chan, “Distributed Generation: Induction and Permanent Magnet Generators”,October 2007, Wiley-IEEE Press.
- Roger A.Messenger, Jerry Ventre, “Photovoltaic System Engineering”, 3rd Ed, 2010.
- James F.Manwell, Jon G.McGowan, Anthony L Rogers, “Wind energy explained: Theory Design and Application”, John Wiley and Sons 2nd Ed, 2010

Course Outcomes:- Students will be able to:

- Knowledge about renewable energy
- Understand the working of distributed generation system in autonomous/grid connected modes.

Code	Course Name	L-T-P	Cr.
WPS -021	Electrical Power Distribution System	3-0-0	3

Course Objectives:-Students will be able to:

- Learning about power distribution system
- Learning of SCADA System
- Understanding Distribution Automation

Unit No	Content
1	Distribution of Power, Management, Power Loads, Load Forecasting Short-term & Long-term, Power System Loading, Technological Forecasting
2	Advantages of Distribution Management System (D.M.S.), Distribution Automation: Definition, Restoration / Reconfiguration of Distribution Network, Different Methods and Constraints, Power Factor Correction
3	Interconnection of Distribution, Control & Communication Systems, Remote Metering, Automatic Meter Reading and its implementation
4	SCADA: Introduction, Block Diagram, SCADA Applied To Distribution Automation. Common Functions of SCADA, Advantages of Distribution Automation through SCADA
5	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 & Monitoring
6	Maintenance of Automated Distribution Systems Difficulties in Implementing Distribution. Automation in Actual Practice, Urban/Rural Distribution, Energy Management, AI techniques applied to Distribution Automation

Suggested reading

- A.S. Pabla, “ Electric Power Distribution”, Tata McGraw Hill Publishing Co. Ltd., Fourth Edition.
- M.K. Khedkar, G.M. Dhole, “A Text Book of Electrical power Distribution
- Automation”, University Science Press, New Delhi

- Anthony J Panseni, “Electrical Distribution Engineering”, CRC Press
- James Momoh, “Electric Power Distribution, automation, protection & control”, CRC Press

Course Outcomes :-Students will be able to:

- Knowledge of power distribution system
- Study of Distribution automation and its application in practice
- To learn SCADA system

Code	Course Name	L-T-P	Cr.
AUD -101	English for Research Paper Writing	2-0-0	0

Course objectives: Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title

Syllabus- Content:

Unit No.	Content
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness
2	Clarifying Who Did What, Highlighting Your Findings, Hedging and 4 Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction
3	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.
4	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
5	skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions useful phrases, how to ensure paper is as good as it could possibly be the 4 first- time submission.

Suggested Studies:

Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

Code	Course Name	L-T-P	Cr.
MLC -101	Research Methodology and IPR	2-0-0	2

At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

nit No.	Content
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
2	Effective literature studies approaches, analysis, Plagiarism, Research ethics,
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

4	Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting,
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	development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.
5	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.
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.

References:

- Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students”
- Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
- Ranjit Kumar, 2nd Edition , “Research Methodology: A Step by Step Guide for beginners”
- Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
- Mayall , “Industrial Design”, McGraw Hill, 1992.
- Niebel , “Product Design”, McGraw Hill, 1974.
- Asimov , “Introduction to Design”, Prentice Hall, 1962.
- Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in NewTechnological Age”, 2016.
- T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008