

<b>Name of Faculty</b>	:	Faculty of Engineering & Technology
<b>Name of Program</b>	:	Master of Technology (M. Tech)
<b>Course Code</b>	:	1MPS02
<b>Course Title</b>	:	Power System Analysis & Simulation
<b>Type of Course</b>	:	Professional Core (PC)
<b>Year of Introduction</b>	:	2023-24

<b>Prerequisite</b>	:	Power System II
<b>Course Objective</b>	:	Power System is a very complicated field of Electrical Engineering. This subject covers the different types of contingency situations, methods to increase security, efficiency & to eliminate Bad data from the system.
<b>Course Outcomes</b>	:	At the end of this course, students will be able to:
	CO1	<b>To Apply</b> concepts of frequency control and voltage control in small sample single area power system.
	CO2	<b>To Analyse</b> performance of transmission lines with respect to reactive power requirement for voltage stability.
	CO3	<b>To Evaluate</b> the state of small sample power system.
	CO4	<b>To Understand</b> concepts of power system security and load forecasting.

#### Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
L	T	P		Theory Marks		Practical Marks		Total Marks
			C	SEE	CIA	SEE	CIA	
4	0	2	5	70	30	30	20	150

*Legends: L-Lecture; T-Tutorial/Teacher Guided Theory Practice; P – Practical, C – Credit, SEE – Semester End Examination, CIA - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)*

#### Course Content

Unit No.	Topics	Teaching Hours	Weightage	Mapping with CO
1	<b>Current and Voltage Relations on a Transmission Line:</b> Representation of line, The short transmission line, The medium-length line, The long transmission line: Solution of the differential equations, The long transmission line: Interpretation of the equations. The equivalent circuit of a long line, Power flow through a	11	20%	CO2

	transmission line, Reactive compensation of transmission lines.			
2	<b>Symmetrical Faults:</b> Transients in RL Series circuits, Short-Circuit currents and the reactance of Synchronous machines, Internal voltages of loaded machines under transient conditions, The bus impedance matrix in fault calculations, A bus impedance matrix equivalent network, The selection of circuit breakers.	11	15%	CO2
3	<b>Unsymmetrical Faults:</b> Single line to ground fault on an unloaded generator, Line to Line fault on an unloaded generator, Double Line to Ground fault on an unloaded generator, Unsymmetrical faults on power systems, Single line to Ground fault on a power system, Line to Line fault on a power system.	10	15%	CO2
4	<b>Corona:</b> Critical Disruptive Voltage, Corona Loss, Line Design based on Corona, Disadvantages of Corona, Radio Interference, Inductive interference between Power and Communication lines.	09	15%	CO1 CO4
5	<b>Neutral Grounding:</b> Effectively Grounded System, Ungrounded system, Resonant Grounding, Methods of Neutral Grounding, Generator Neutral Breaker, Grounding Practices.	09	15%	CO4
6	<b>Transients in Power Systems:</b> Transients in Simple Circuits, 3-phase Sudden Short Circuit of an Alternator, The Restriking Voltage after Removal of Short Circuit, Travelling Waves on Transmission Lines, Attenuation of Travelling Waves, Capacitance Switching, Overvoltage due to Arcing Ground.	10	20%	CO3

Suggested Distribution of Theory Marks Using Bloom's Taxonomy						
Level	Remembrance	Understanding	Application	Analyse	Evaluate	Create
<b>Weightage</b>	<b>40</b>	<b>20</b>	<b>10</b>	<b>20</b>	<b>10</b>	<b>00</b>

*NOTE: This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.*

### Suggested List of Experiments/Tutorials

Sr. No.	Name of Experiment/Tutorial	Teaching Hours
1	Solution of set of linear equations using one or two suitable numerical methods (like Gaussian Elimination)	02
2	Solution of a single nonlinear equation and a set of nonlinear algebraic equation using G-S method.	02
3	Computation of leakage inductance of a transformer using FEM analysis.	02
4	To analyse the performance of transmission line for specified receiving end quantities.	02
5	To analyse the performance of transmission line for specified sending end quantities	02
6	To analyse the performance of transmission line for specified load impedance.	02
7	To obtain receiving end power circle diagram of a transmission line.	02
8	To obtain voltage profile and load ability curve for a transmission line	02
9	. To obtain circle diagram of a three-phase induction motor.	02
10	To simulate uncontrolled rectifier with R, RL, and C filter, with and without load	02

### Major Equipment/ Instruments and Software Required

Sr. No.	Name of Major Equipment/ Instruments and Software
1	MATLAB Simulink
2	POWER WORLD SIMULATOR
3	ETAP

### Suggested Learning Websites

Sr. No.	Name of Website
1	<a href="http://www.nptel.com">www.nptel.com</a>

### Reference Books

Sr. No.	Name of Reference Books
1	Elements of Power Systems Analysis : W. D. Stevenson Jr., 4th Edition, McGraw Hill International
2	Electrical Power systems: C. L . Wadhwa, 5th Edition, New Age International Publishers.
3	Power Systems Analysis by A R Bergen, Vijay Vittal, 2nd edition, Pearson Education
4	Electric Energy Systems Theory An Introduction by Olle I Elgerd, Tata McGraw Hill.
5	Modern Power system Analysis by I J Nagrath, D P Kothari, Tata McGraw Hill.
6	Power System Analysis by Hadi Saadat, Tata McGraw Hill.