Name of Faculty	:	Faculty of Engineering & Technology
Name of Program	:	Master of Technology (M. Tech)
Course Code	:	2MPS05
Course Title	:	Power System Dynamics
Type of Course	:	Professional Core (PC)
Year of Introduction	:	2023-24

Prerequisite	:	Power system Dynamics & Control
Course Objective	:	The Dynamics of the power system and its control is becoming more and more complicated due to the increase in power system complexity. Under this scenario, this syllabus includes various types of stability issues with its improving techniques. This subject is the main source for research point of view as further studies of electrical engineering. In this context, this subject deals with the fundamentals of the dynamics of the power system and its control of the power system.
Course Outcomes	:	At the end of this course, students will be able to:
	CO1	**To Understand** the fundamental dynamic behaviour of power systems to perform basic stability issues
	CO2	**To Remember** fundamental knowledge about the modelling of synchronous machines
	CO3	**To Evaluate** the dynamic performance of power systems
	CO4	**To Understand** the power system stability and controls.

Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	SEE	CIA	SEE	CIA	
3	0	2	4	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	**Basic Concepts and Review of Classical Methods:** Power System Stability, States of Operation and System Security, System Dynamic Problems, Current Status, and Recent Trends, Analysis of Steady State Stability Analysis of Transient	08	18%	CO1

	Stability, Simplified Representation of Excitation Control			
2	**Modelling of Synchronous Machine:** Introduction, Synchronous Machine, Park's Transformation, Analysis of Steady State Performance Per Unit Quantities, Equivalent Circuits of Synchronous Machine, Determination of Parameters of Equivalent Circuits, Measurements for Obtaining Data, Transient Analysis of a Synchronous Machine	12	26%	CO2
3	**Excitation and Prime Mover Controllers** Excitation System, Excitation System Modelling, Excitation Systems-Standard Block Diagram, System Representation by State Equations, Prime-Mover Control System	10	22%	CO4
4	**Transmission Lines, SVC, and Loads** Transmission Lines, D-Q Transformation using α - β Variables, Loads	08	18%	CO3
5	**Dynamics of a Synchronous Generator Connected to Infinite Bus** System Model, Synchronous Machine Model Application of Model, Calculation of Initial Conditions.	07	16%	CO3

Suggested Distribution of Theory Marks Using Bloom's Taxonomy						
Level	Remembrance	Understanding	Application	Analyse	Evaluate	Create
Weightage	**20**	**25**	**10**	**30**	**15**	**0**

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	To study mathematical modeling of 3rd order differential equation	02
2	To study mathematical modeling of R-L, R-L-C, and complex electrical circuits using MATLAB.	02
3	To study short circuit analysis of overhead transmission line using MATLAB	02
4	To study and determine fault current for short circuit analysis using ETAP software	02
5	Find the steady-state stability limit of delivered power	02
6	Compute the equivalent circuit parameters using (a) exact calculation and (b) approximate method	02

7	Calculate the equivalent circuit parameters for the d-axis using (a) standard method (b) Exact method with the assumption Xc = Xau (c) Exact method	02
8	Obtain the response of the excitation system	02
9	Obtain the hybrid parameters for the two-port network	02
10	Study of basic elements of power system and its control	02

Major Equipment/ Instruments and Software Required

Sr. No.	Name of Major Equipment/ Instruments and Software
1	MATLAB
2	ETAP
3	Power world simulator
4	PSAT (MATLAB open source)
5	SCILAB (http://old.cloud.scilab.in/)

Suggested Learning Websites

Sr. No.	Name of Website
1	www.nptel.com
2	https://nptel.ac.in/courses/108/101/108101004/
3	https://a-lab.ee/projects/dq0-dynamics
4	https://ieeexplore.ieee.org/document/1490569

Reference Books

Sr. No.	Name of Reference Books
1	P.M. Anderson and A.A.Fouad, "Power System Control and Stability", Galgotia Publications, New Delhi, 2003 or P.M. Anderson and A. A. Fouad, "Power system control and stability", IEEE Press
2	R. Ramanujam, "Power Systems Dynamics"- PHI Publications
3	M.A.Pai and W.Sauer, "Power System Dynamics and Stability", Pearson Education Asia, India, 2002.
4	P. Kundur, "Power system stability and control", McGraw Hill Inc, New York, 1995
5	K.R.Padiyar, "Power System Dynamics, Stability & Control", BS Publications, Hyderabad - 500 095 - AP., Second Edition, 2008.