NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE PLAN – PART I			
Course Title	Power System Dynamics		
Course Code	EEHO15/EEPE39	**No. of Credits**	03
Department	Electrical and Electronics Engineering	**Faculty**	Dr. Vivek Mohan
Session:	Jan 2022	**Section:**	B. Tech
Pre-requisite Course	EEPC18		
Course Coordinator			
E-mail	vivekmohan@nitt.edu	**Telephone No.**	+91 8547336979
Course Type	**HO/PE**		

SYLLABUS (APPROVED BY BOS)

Stability considerations – Dynamic modeling requirements- angle stability - equal area criterion- Critical fault clearing time and angle-numerical integration techniques. Synchronous machines - Park's transformation – flux linkage equations – formulation of normalized equations – state space current model – simplified models of the synchronous machine – turbine, Generator – steady state equations and phasor diagrams. Dynamics of Synchronous machines - Mechanical relationships – electrical transient relationships – adjustment of machine models – Park's equation in the operational form. Induction motor equivalent circuits and parameters - free acceleration characteristics – dynamic performance – effect of three phase short circuit and unbalanced faults. Transient and dynamic stability distinction – linear model of unregulated synchronous machine and its oscillation modes – distribution of power impacts – effects of excitation on stability – supplementary stabilization signals.

ESSENTIAL READINGS: Textbooks, reference books, Website addresses, journals, etc

1. P. M. Anderson, 'A A Fouad, 'Power System Control and Stability', John Wiley & Sons, 1st Edition, 2008.
2. Yao-Nan Yu, 'Electric Power System Dynamics', Academic Press, 1983
3. Ramanujam R, 'Power System Dynamics', PHI Learning Pvt. Ltd., New Delhi, 2009.
4. T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1995.
5. Kundur P, 'Power System Stability and Control', McGraw-Hill, New York, 1994.
6. Krause P.C., 'Analysis of Electric Machinery', McGraw-Hill, 3 rd Revised Edition, 2013.

COURSE OBJECTIVES

This course aims to explain the power system stability problem, to understand the behavior of synchronous and induction machines during disturbance and to employ mathematical tools for power system stability analysis.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
Upon completion of the course the students would be able to:	
1. Understanding of the dynamic phenomena of the power system operation.	**1, 2, 3, 5, 14**
2. Knowledge to employ modeling techniques for investigating the response of system during disturbance.	**1, 2, 3, 5, 14**
3. Ability to interpret results coming from the simulation of differential - algebraic systems.	**1, 2, 3, 5, 14**

COURSE PLAN – PART II

COURSE TEACHING AND LEARNING ACTIVITIES

S. No.	Week	Topic	Mode of Delivery
1.	3rd Week of Jan (3hrs)	Synchronous Machine – Steady state modelling	Teams
2.	4th Week of Jan (3hrs)	Synchronous Machine – Steady state modelling	Teams
3.	1st week of Feb (3hrs)	Synchronous machines – Transient modelling	Teams
4.	2nd week of Feb (3hrs)	Concept of damping and synchronizing torque	Teams
5.	3rd week of Feb (3hrs)	Swing Equation	Teams
6.	4th week of Feb (3hrs)	Equal area criterion	Teams
7.	1st week of March (3hrs)	Load models and reactive power compensation	Teams
8.	2nd week of March (3hrs)	Excitation + Load Frequency Control	Teams

9.	3rd week of March (2hrs)	Power angle stability – small signal	Teams
10.	4th week of March (1hrs)	Voltage stability	Teams
11.	1st week of April (3hrs)	Voltage Stability	Teams
12.	2nd Week of April (3hrs)	Sub-synchronous resonance	Teams
13.	3rd Week of April to 2nd week of May	Non-linear stability+PSS	Teams

COURSE ASSESSMENT METHODS

S. No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Cycle Test	Feb last Week	1 hr	20%
2.	Surprise Test-1	March 3rd week	1 hr	15%
3.	Surprise Test-2	April 3rd week	1 hr	15%
4.	Group Activity	-	-	20%
5.	End Semester Examination	May 2nd week	1.5 hrs	30%

COURSE EXIT SURVEY

1. Students feedback through class committee meetings
2. Feedback from students on the course outcomes shall be obtained at the end of the course

COURSE POLICY

COMPENSATION ASSESSMENT: Attending all the assessments (1, 2, 3, 4 & 5) are mandatory for every student.

ACADEMIC HONESTY & PLAGIARISM: In case of any student found guilty indulging in malpractice, the student will be awarded zero mark in that assessment.

MODE OF COMMUNICATION: The Faculty can be contacted through class representatives. The lecture notes and videos are posted through the faculty homepage https://sites.google.com/view/vivekmohan/lecture-notes. For correspondence, please contact vivekmohan@nitt.edu or through class representatives.

FOR APPROVAL

[Dr. Vivek Mohan, AP/EEE] **Course Faculty**	**Class Committee Chairperson**	**HoD (EEE)**