NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE PLAN – PART I			
Course Title	Power System Stability		
Course Code	EE606	**No. of Credits**	03
Department	Electrical and Electronics Engineering	**Faculty**	Dr. S. Kayalvizhi
Session:	January 2023	**Section:**	M.Tech Power Systems
Pre-requisite Course	Numerical Methods, Electrical Machines, Power System Analysis		
Course Coordinator			
E-mail	Kayalvizhi@nitt.edu	**Telephone No.**	+91 9790050752
Course Type	**Core**		

SYLLABUS (APPROVED BY BOS)

Unit I: Power system stability considerations – definitions-classification of stability - rotor angle and voltage stability- synchronous machine – Modeling - load modeling concepts - modeling of excitation systems - modeling of prime movers.

Unit II: Transient stability - swing equation-equal area criterion - solution of swing equation- Numerical methods - Euler method -Runge-Kutte method - critical clearing time and angle - effect of excitation system and Governors - Multi-machine stability – extended equal area criterion - transient energy function approach.

Unit III: Small signal stability – state space representation – eigen values - modal matrices - small signal stability of single machine infinite bus system – effect of field circuit dynamics - effect of excitation system-small signal stability of multi machine system.

Unit IV: Voltage stability – generation aspects - transmission system aspects – load aspects – PV curve – QV curve – PQ curve – analysis with static loads – loadability limit - sensitivity analysis - continuation power flow analysis - instability mechanisms – examples.

Unit V: Methods of improving stability – transient stability enhancement – high speed fault clearing – steam turbine fast valving - high speed excitation systems - small signal stability enhancement - power system stabilizers – voltage stability enhancement – reactive power control.

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

1. Kundur, P., 'Power System Stability and Control', McGraw-Hill International Editions, 1994.
2. Van Cutsem, T. and Vournas, C., 'Voltage Stability of Electric Power Systems', KluwerAcademic Publishers, 1998.
3. Abhijit Chakrabarti, D.P. Kothari, A.K. Mukhopadhyay and Abhinandan De, 'An Introduction to Reactive Power
Control and Voltage Stability in Power Transmission Systems', PHI Learning Private Ltd., 2010.
4. R.Ramanujam, 'Power System Dynamics: Analysis and Simulation', *PHI Learning Private Ltd., 2009.*

COURSE OBJECTIVES

This course aims to give basic knowledge about the dynamic mechanisms behind angle and voltage stability problems in electric power systems, including physical phenomena and modeling issues.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
Upon completion of the course the students would be able to:	
1. Understand the basic modeling and stability considerations of power system	**1, 2, 3, 5, 14**
2. Investigate transient stability issues of single and multiple synchronous machines in power systems	**1, 2, 3, 5, 14**
3. Appraise and analyze the small signal stability and the effects of excitation systems on small signal stability	**1, 2, 3, 5, 14**
4. Evaluate the various aspects of voltage stability in power systems	**1, 2, 3, 5, 14**
5. Interpret and devise different schemes for improving transient stability and voltage stability.	**1, 14**

COURSE PLAN – PART II

COURSE TEACHING AND LEARNING ACTIVITIES

S. No.	Week	Topic	Mode of Delivery
1.	Week 1 18th – 20th Jan 2023	Introduction to Power system and power system stability	Chalk and talk

2.	Week 2 23rd - 27th Jan 2023	Power system stability terms and definitions classification of stability - rotor angle and voltage stability	Chalk and talk
3.	Week 3 30th Jan – 3rd Feb 2023	synchronous machine Modeling and load modeling	Chalk and talk
4.	Week 4 6th - 10th Feb 2023	Modeling of excitation systems - modeling of prime movers.	Chalk and talk
5.	Week 5 13th - 17th Feb 2023	Swing equation and equal area criterion solution of swing equation- Numerical methods - Euler method-Runge - Kutte method	Chalk and talk
6.	Week 6 20th – 24th Feb 2023	critical clearing time and angle effect of excitation system and governors	Chalk and talk
7.	Week 7 27th Feb – 3rd Mar 2023	Multimachine stability – extended equal area criterion - transient energy function approach	Chalk and talk
8.	Week 8 6th - 10th Mar 2023	Small signal stability – state space representation – Eigen values - modal matrices	Chalk and talk
9.	Week 9 13th - 17th Mar 2023	small signal stability of single machine infinite bus system – effect of field circuit dynamics -	Chalk and talk
10.	Week 10 20th – 24th Mar 2023	effect of excitation system-small signal stability of multi machine system.	Chalk and talk
11.	Week 11 27th Mar – 31st Mar 2023	Voltage stability – generation aspects - transmission system aspects – load aspects	Chalk and talk
12.	Week 12 3rd - 7th April 2023	PV curve – QV curve – PQ curve – analysis with static loads – loadability limit - sensitivity analysis	Chalk and talk
13.	Week 13 10th - 14th April 2022	Continuation power flow analysis - instability mechanisms – examples	Chalk and talk
14.	Week 14 17th – 21st April 2023	Transient stability enhancement – high speed fault clearing – steam turbine fast valving - high speed excitation systems	Chalk and talk
15.	Week 15 24th - 28th April 2023	Small signal stability enhancement : power system stabilizers voltage stability enhancement : reactive	Chalk and talk

		power control	
16.	Week 16 1st - 4th May 2023	Compensation Test	
17.	Week 17 & Week 18 8th - 18th May 2023	Final Assessment	

COURSE ASSESSMENT METHODS

S. No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Cycle Test-1	Week 6 20th – 24th Feb 2023	75 Minutes	20
2.	Cycle Test-2	Week 11 27th Mar – 31st Mar 2023	75 Minutes	20
3.	Project/Seminar	Throughout Semester	-	30
4.	Compensation Test	Week 16 1st - 4th May 2023	75 Minutes	20
5.	End Semester Examination	Week 17 & Week 18 8th - 18th May 2023	180 Minutes	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

1. Attending all the assessments mandatory for every student
2. One compensation assessment will be conducted for those students who are being physically absent for the assessment 1 and/or 2, only for the valid reason.
3. At any case CPA will not be considered as an improvement test.
4. Absolute/Relative grading will be adopted for the course.

MODE OF CORRESPONDENCE (email/ phone etc)

1. All the students are advised to check their NITT WEBMAIL regularly. All the correspondence (schedule of classes/ schedule of assessment/ course material/ any other information regarding this course) will be done through their webmail only.

2. Queries (if required) to the course teacher shall only be emailed to kayalvizhi@nitt.edu and contacted at 9790050752

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ADDITIONAL INFORMATION

The faculty is available for consultation at times as per the intimation given by the faculty.

Queries may also be emailed to the Course Coordinator directly at Kayalvizhi@nitt.edu

FOR APPROVAL

S. Kayalvizhi

[Dr. S. Kayalvizhi, AP/EEE]
Course Faculty

Class Committee Chairperson

06/02/23

HoD (EEE)