



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	M.Tech and Power System		
Course Title	ADVANCED POWER SYSTEM ANALYSIS		
Course Code	EE601	No. of Credits	3
Pre-requisite (s)	A basic knowledge on the subjects viz., Power System Analysis, Matrix manipulations, alternating machines and network analysis		
Session	July 2021	Section (if, applicable)	-
Name of Faculty	Dr. Sishaj P Simon	Department	Electrical and Electronics Engineering
Email	sishajpsimon@gmail.com	Telephone No.	0431-2503265
Name of Course Coordinator(s) (if, applicable)	-		
E-mail		Telephone No.	
Course Type	<input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course		
Syllabus (approved in BoS)			
<p>Network modeling – Single phase and three phase modeling of alternators, transformers and transmission lines, Conditioning of Y Matrix – Incidence matrix method, Method of successive elimination, Triangular factorization – Sparse matrix- Load flow analysis</p> <p>Newton Raphson method, Fast Decoupled method, AC-DC load flow –Single and three phase methods – Sequential solution techniques and extension to multiple and multi-terminal DC systems.</p> <p>Fault Studies -Analysis of balanced and unbalanced three phase faults – fault calculations – Short circuit faults – open circuit faults.</p> <p>System optimization - strategy for two generator systems – generalized strategies – effect of transmission losses - Sensitivity of the objective function - Formulation of optimal power flow-solution by Gradient method-Newton’s method.</p> <p>State Estimation – method of least squares – statistics – errors – estimates – test for bad data – structure and formation of Hessian matrix – power system state estimation.</p> <p>Reference Books</p> <ol style="list-style-type: none"> 1. Grainger, J.J. and Stevenson, W.D. ‘Power System Analysis’ Tata McGraw hill, New Delhi, 2003 2. Hadi Saadat, ‘Power System Analysis’, Tata McGraw hill, New Delhi, 2002. 3. Arrillaga, J & Arnold, C.P., ‘Computer analysis of power systems ‘John Wiley & Sons, New York, 1997. 4. Pai, M.A., ‘Computer Techniques in Power System Analysis’, Tata McGraw Hill, New Delhi, 2006 			
COURSE OBJECTIVES(CB)			
To perform steady state analysis and fault studies for a power system of any size and also to explore the nuances of estimation of different states of a power system.			

COURSE OUTCOMES (CO)															
Course Outcomes	Aligned Programme Outcomes (PO)														
Upon completion of the course, the students will be able to 1. Construct models of power system components and apply them. 2. Solve ac and dc load flow for single and there phase systems. 3. Analyse the faults in the power system networks. 4. Apply the concepts of optimization in power system. 5. Explain the concept of state estimation in power system and the role of statistics in state estimation.	CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14
	1	H	H	M	M	M	M	M	M	M	M	M	M	M	M
	2	H	H	H	H	H	H	H	H	H	H	H	M	M	M
	3	H	H	H	H	H	H	H	H	H	H	M	M	M	M
	4	H	H	H	H	H	H	H	H	H	H	H	M	M	M
	5	M	M	H	H	H	H	H	H	H	H	H	H	H	H

COURSE PLAN – PART II

COURSE OVERVIEW

Students get exposure Construct models of power system components and apply them. Further they will be exposed to Solve ac and dc load flow for single and there phase systems. Students will able to analyze the faults in the power system networks. They will learn to apply the concepts of optimization in power system. Concept of state estimation in power system and the role of statistics in state estimation are also focused in this course.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	Week-1 (6 th -Sep-21, 9 th -Sep-21)	Network modeling – Single phase and three phase modeling of alternators	Lecture C&T/ PPT or any Suitable online mode
2	Week-2 (13 th - Sep -21, 17 th -Sep-21)	transformers and transmission lines, Conditioning of Y Matrix	Lecture C&T/ PPT or any Suitable online mode
3	Week-3 (20 th - Sep-21, 24 th -Dec-21)	Incidence matrix method, Method of successive elimination, Triangular factorization – Sparse matrix	Lecture C&T/ PPT or any Suitable online mode
4	Week-4 (27 th - Sep -21, 1 st - Oct -21)	Load flow analysis	Lecture C&T/ PPT or any Suitable online mode
5	Week-5 (4 th - Oct -21, 8 th - Oct -21)	Newton Raphson method, Fast Decoupled method, AC-DC load flow	Lecture C&T/ PPT or any Suitable online mode
6	Week-6 (4 th - Oct -21, 14 th - Oct -21)	Single and three phase methods – Sequential solution techniques and extension to multiple and multi-terminal DC systems. numerical examples/ problem solving	Lecture C&T/ PPT or any Suitable online mode
7	Week-7 (18 th -Oct-21, 22 nd -Oct-21)	Fault Studies Analysis of balance three phase	Lecture C&T/ PPT or any Suitable online mode

8	Week-8 (25 th -Oct -21, 29 th -Oct-21)	1 st Assessment, Fault Studies Analysis of unbalanced three phase faults – Fault calculations – Short circuit faults – Open circuit faults	Lecture C&T/ PPT or any Suitable online mode
9	Week-9 (1 st -Nov -21)	System optimization - Strategy for two generator systems	Lecture C&T/ PPT or any Suitable online mode
10	Week-10 (8 th -Nov -21, 12 th -Nov -21)	Generalized strategies – Effect of transmission losses -solution by Gradient method-Newton's method	Lecture C&T/ PPT or any Suitable online mode
11	Week-11 (15 th -Nov -21, 18 th -Nov-21)	Sensitivity of the objective function - Formulation of optimal power flow-numerical examples/ problem solving-State Estimation –	Lecture C&T/ PPT or any Suitable online mode
12	Week-12 (22 nd -Nov-21, 26 th -Nov-21)	2 nd Assessment- Statistics – Method of least squares	Lecture C&T/ PPT or any Suitable online mode
13	Week-13 (29 th - Nov -21, 3 rd -Dec -21)	Errors – Estimates – Test for bad data	Lecture C&T/ PPT or any Suitable online mode
14	Week-14 (9 th - Dec -21, 10 th -Dec -21)	Structure and formation of Hessian matrix – Power system state estimation	Lecture C&T/ PPT or any Suitable online mode

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S. No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	1 st Assessment(Online mode)(1 st and 2 nd Units)	6 th Week (25 th -Oct -21 to 29 th -Oct-21)	75 Minutes	25
2	2 nd Assessment(Online mode)(3 rd and 4 th Units)	11 th Week (22 nd -Nov-21 to 26 th -Nov-21)	75 Minutes	25
3	3 rd Assessment - Assignments (1 st unit to 5 th unit)	6 th to 14 th Week (13 th - Sep -21 to 10 th -Dec-21)	Home Work	20
4	Compensation Assessment (1 st unit to 4 th unit)Online Mode	13 th Week (9 th -Dec -21 to 14 th -Dec -21)	75 Minutes	25
5	Final Assessment (Online Mode)(1 st to 5 th unit)	15 th Week (21 st -Dec-21 to 30 th -Dec-21)	90 Minutes	30

* Attending all the assessments (Assessment 1-3 and 5) are MANDATORY for every student.

COURSE EXIT SURVEY

- Feedback from the students during the class committee meetings
- Anonymous feedback through questionnaire (Mid semester & End of the Semester)

COURSE POLICY

MODE OF CORRESPONDENCE

1. All the students are advised to check their NITT WEBMAIL or group email id (if any) regularly. All the correspondence (schedule of classes/schedule of assessment/course material/any other information regarding this course) will be done through email only.
2. Queries if any can be emailed to the course teacher sishajpsimon@gmail.com

COMPENSATION ASSESSMENT POLICY

1. If any student is not able to attend 1st Assessment / 2nd Assessment due to genuine reason, student is permitted to attend the Compensation Assessment with 25% weightage (25 marks).

2. In any case, compensation test will not be considered as an improvement test.

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.**

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION

- Be aware of the M.Tech regulations in the institute website for passing minimum, redo, formative assessment, grades, credits etc.

FOR APPROVAL

Course Faculty  14.09.2021 CC-Chairperson  Dr. S. Kayalvizhi HOD Approved by HoD