

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

COURSE OUTLINE TEMPLATE			
Course Title	ADVANCED POWER SYSTEM ANALYSIS		
Course Code	EE601	No. of Credits	03
Department	EEE	Faculty	Dr. Sishaj P Simon
Pre-requisites Course Code	Power System Analysis, Matrix manipulations, Alternating Machines and Network Analysis		
Course Coordinator(s) (if, applicable)	-		
Other Course Teacher(s)/Tutor(s) E-mail	sishajpsimon@nitt.edu	Telephone No.	0431-2503265
Course Type	<input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course		
COURSE OBJECTIVES			
To perform steady state analysis and fault studies for a power system of any size and 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	1	2	3
1. Construct models of power system components and apply them.	3	2	3
2. Solve ac and dc load flow for single and three phase systems.	3	2	3
3. Analyze the faults in the power system networks.	3	2	3
4. Apply the concepts of optimization in power system.	2	2	2
5. Explain the concept of state estimation in power system and the role of statistics in state estimation.	3	2	3
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	Week	Topic	Mode of Delivery
1	Weeks 4 to 6 (8 contact hours) 21/8 to 8/9	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	Lecture C&T/ PPT or any suitable mode

2	Weeks 7 to 8 (6 contact hours) 11/9 to 12/9	Load flow analysis - 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.	Lecture C&T/ PPT or any suitable mode
3	Week 8 (1 contact hours) 13/9	numerical examples/ problem solving	Group work (exercise)
4	Weeks 10 to 12 (8 contact hours) 3/10 to 19/10	Fault Studies - Analysis of balanced and unbalanced three phase faults – Fault calculations – Short circuit faults – Open circuit faults.	Lecture C&T/ PPT or any suitable mode
5	Weeks 12 to 15 (7 contact hours) 20/10 to 8/11	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.	Lecture C&T/ PPT or any suitable mode
6	Week 15 (1 contact hours) 9/11	numerical examples/ problem solving	Group work (exercise)
7	Weeks 16 to 19 (8 contact hours) 13/11 to 8/12	State Estimation – Method of least squares – Statistics – Errors – Estimates – Test for bad data – Structure and formation of Hessian matrix – Power system state estimation.	Lecture C&T/ PPT or any suitable mode

Mode of Assessment

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	1 st Mid Semester Examination (Written test) (1 st and 2 nd Units)	10 th Week	60 Minutes	20
2	2 nd Mid Semester Examination (Written test) (3 rd and 4 th Units)	15 th Week	60 Minutes	20
3	Take Home / Team Task	3 rd to 18 th week	Work will be carried out along with the course	10
4	Retest (Written Test) (1 st to 4 th Unit)	19 th week	60 Minutes	20
5	End Semester Examination (Written test)	21 st week	180 Minutes	50

Note:

1. Attending all the assessments (Assessment 1-3 and 5) are MANDATORY for every student.
2. If any student is not able to attend Assessment-1 (1st Mid Sem) / Assessment-2 (2nd Mid Sem) due to genuine reason, student is permitted to attend the Assessment- 4 (retest) with 20% weightage (20 marks).

3. In any case, retest will not be considered as an improvement test.

ESSENTIAL READINGS :
Reference Books: <ol style="list-style-type: none">1. Grainger, J.J. and Stevenson, W.D., 'Power System Analysis', Tata McGraw Hill, New Delhi, 2003.2. HadiSaadat, 'Power System Analysis', Tata McGraw Hill, New Delhi, 2002.3. 3. Arrillaga, J and Arnold, C.P., 'Computer Analysis of Power Systems', John Wiley and Sons, New York, 1997.4. 4. Pai, M.A., 'Computer Techniques in Power System Analysis', Tata McGraw Hill, New Delhi, 2006.
COURSE EXIT SURVEY
Shall be obtained at the end of the course
COURSE POLICY
<u>ATTENDANCE</u> <ol style="list-style-type: none">1. Attendance will be taken by the faculty in all the contact hours. Every student should maintain minimum 75 % physical attendance in these contact hours to attend the end semester examination.2. Any student, who fails to maintain 75% attendance need to appear for the retest. Student who scores more than 50 % marks in the retest will be eligible for attending the end semester examination.3. Students not having 75% minimum attendance at the end of the semester and also fail in retest (scoring less than 50%) will have to RE-DO the course.
<u>ACADEMIC HONESTY & PLAGIARISM</u> <ol style="list-style-type: none">1. Copying in any form during assessments is considered as academic dishonesty and will attract suitable penalty.
FOR APPROVAL
Course Faculty <u>S109</u> <u>6/9/2023</u> CC-Chairperson <u>Fauz</u> <u>6/9/23</u> HOD <u>Fauz</u> <u>06/09/23</u>