



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

COURSE PLAN – PART I			
<b>Name of the programme and specialization</b>	M.Tech and Power System		
<b>Course Title</b>	ADVANCED POWER SYSTEM ANALYSIS		
<b>Course Code</b>	EE601	<b>No. of Credits</b>	3
<b>Pre-requisite (s)</b>	A basic knowledge on the subjects viz., Power System Analysis, Matrix manipulations, alternating machines and network analysis		
<b>Session</b>	July 2020	<b>Section (if, applicable)</b>	-
<b>Name of Faculty</b>	Dr. Sishaj P Simon	<b>Department</b>	Electrical and Electronics Engineering
<b>Email</b>	sishajpsimon@gmail.com	<b>Telephone No.</b>	0431-2503265
<b>Name of Course Coordinator(s) (if, applicable)</b>	-		
<b>E-mail</b>		<b>Telephone No.</b>	
<b>Course Type</b>	√	<b>Core course</b>	<b>Elective course</b>
<b>Syllabus (approved in BoS)</b>			
<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><b>Reference Books</b></p> <ol style="list-style-type: none"> <li>1. Grainger, J.J. and Stevenson, W.D. ‘Power System Analysis’ Tata McGraw hill, New Delhi, 2003</li> <li>2. Hadi Saadat, ‘Power System Analysis’, Tata McGraw hill, New Delhi, 2002.</li> <li>3. Arrillaga, J &amp; Arnold, C.P., ‘Computer analysis of power systems’ John Wiley &amp; Sons, New York, 1997.</li> <li>4. Pai, M.A., ‘Computer Techniques in Power System Analysis’, Tata McGraw Hill, New Delhi, 2006</li> </ol>			
<b>COURSE OBJECTIVES(CB)</b>			
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.			

<b>COURSE OUTCOMES (CO)</b>															
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 three 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 three phase systems. Students will be 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
1	Weeks 1 to 3 (8 contact hours)	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 / PPT or any Suitable online
2	Weeks 4 to 6 (7 contact hours)	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 / PPT or any Suitable online
3	Week 6 (1 contact hours)	numerical examples/ problem solving	Group work (exercise)
4	Weeks 7 to 8 (6 contact hours)	Fault Studies - Analysis of balanced and unbalanced three phase faults – Fault calculations – Short circuit faults – Open circuit faults.	Lecture / PPT or any Suitable online
5	Weeks 9 to 10 (5 contact hours)	System optimization - Strategy for two generator systems – Generalized strategies – Effect of	Lecture / PPT

		transmission losses - Sensitivity of the objective function - Formulation of optimal power flow-solution by Gradient method-Newton's method.	or any Suitable online mode
6	Week 10 (1 contact hours)	numerical examples/ problem solving	Group work (exercise)
7	Weeks 11 to 12 (6 contact hours)	State Estimation – Method of least squares – Statistics – Errors – Estimates – Test for bad data – Structure and formation of Hessian matrix – Power system state estimation.	Lecture / 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 <sup>st</sup> Assessment(Online mode)(1 <sup>st</sup> and 2 <sup>nd</sup> Units)	6 <sup>th</sup> Week	75 Minutes	25
2	2 <sup>nd</sup> Assessment(Online mode)(3 <sup>rd</sup> and 4 <sup>th</sup> Units)	11 <sup>th</sup> Week	75 Minutes	25
3	3 <sup>rd</sup> Assessment - Assignments (1 <sup>st</sup> unit to 5 <sup>th</sup> unit)	6 <sup>th</sup> to 14 <sup>th</sup> Week	Home Work	20
4	Compensation Assessment (1 <sup>st</sup> unit to 4 <sup>th</sup> unit)Online Mode	13 <sup>th</sup> Week	75 Minutes	25
5	Final Assessment (Online Mode)(1 <sup>st</sup> to 5 <sup>th</sup> unit)	15 <sup>th</sup> Week	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 teachersishajpsimon@gmail.com

**COMPENSATION ASSESSMENT POLICY**

1. If any student is not able to attend 1<sup>st</sup> Assessment / 2<sup>nd</sup> 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 16.09.2020

  
Dr. Ankur Singh Rana  
CC-Chairperson \_\_\_\_\_

HOD \_\_\_\_\_