DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OUTLINE			
Course Title	**POWER SYSTEM ECONOMICS AND CONTROL TECHNIQUES**		
Course Code	**EE 401**	**No. of Credits**	**03**
Department	**ELECTRICAL AND ELECTRONICS**	**Faculty**	**Dr. M.P. SELVAN**
Pre-requisites Course Code	**EE 202, EE 204, EE 301**		
Course Coordinator(s) (if, applicable)	**Not Applicable**		
Other Course Teacher(s)/Tutor(s) E-mail	**Research Scholar / Temporary Faculty**	**Telephone No.**	**250 3262**
Course Type	[√] **Core course** [ ] **Elective course**		

COURSE OVERVIEW

Students get exposure to the generation of electrical energy by synchronous and inductions machines in the course “AC Machines”. Then they are introduced to transmission and distribution of electrical energy in the course “Transmission and Distribution of Electrical Energy”, in which he/she learns about the transmision lines, insulators and cables. Subsequently, students are trained in alalysing the power system during normal and abnormal conditions through the course “Power System Analysis”, in which they do many off-line analysis such as load flow, short circuit and stability analysis. However, every student is left out with a surprise: How is a large power system network (with plenty of synchronous machines, induction machines and dynamcially changing loads are connected together) operated with constant frequency and voltage? Does the cost involved in generation affect the operation of power system? How can the share of each generator be decided in real time to meet the given load demand? Intrestingly, a great degree of economy and real time control are involved in operation of power system. In this course, students will be able to understand the economics of power system operation; frequency, voltage and reactive power control objectives and their implemention by conventional and modern technologies.

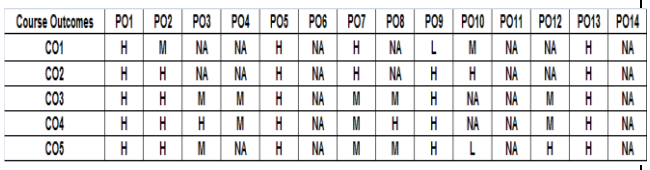
COURSE OBJECTIVES

To understand the economics of power system operation.

To realize the requirements and methods of real and reactive power control in power system.

To recognize the recent advancements in power system operation.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
1. Calculate various factors (such as load factor and demand factor, etc.,) and interpret different tariff structures. 2. Develop generation dispatching schemes for thermal units 3. Apply frequency control schemes on power system 4. Employ reactive power compensation systems 5. Adopt engineering innovations for improved power system operation	

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
CO1	H	M	NA	NA	H	NA	H	NA	L	M	NA	NA	H	NA
CO2	H	H	NA	NA	H	NA	H	NA	H	H	NA	NA	H	NA
CO3	H	H	M	M	H	NA	M	M	H	NA	NA	M	H	NA
CO4	H	H	H	M	H	NA	M	H	H	NA	NA	M	H	NA
CO5	H	H	M	NA	H	NA	M	M	H	L	NA	H	H	NA

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week	Topic	Mode of Delivery
1	2nd Week of July (10 to 14 July) (**2 Contact Hours)**	Course plan details Discussion on fundamentals, prerequisite, etc.	Discussion, Interactive Session
2	3rd Week of July (17 to 21 July) **(3 Contact Hours)**	Load curves-load factor and other factors, Reserve Capacity and requirements. Electrical Tariff-types of tariff	Lecture C&T, PPT
3	4th Week of July (24 to 28 July) **(3 Contact Hours)**	Load Forecasting, Economic Load Dispatch-characteristics of generation unit	Lecture C&T, PPT
4	1st Week of August (31 July to 04 August) **(1 Contact Hour)**	**ASSESSMENT – 1** Co-ordination equation without transmission loss	Flip Class ***(90 Minutes Video lecture)***
5	2nd Week of August (07 to 11 August) **(1 Contact Hour)**	Co-ordination equation with transmission loss *(Doubt clearing)*	Flip Class ***(90 Minutes Video lecture)***
6	3rd Week of August (14 to 18 August) **(1 Contact Hour)**	Unit Commitment *(Doubt clearing)*	Flip Class ***(90 Minutes Video lecture)***
7	4th Week of August (21 to 25 August) **(1 Contact Hour)**	**ASSESSMENT – 2**	
8	5th Week of August (28 Aug to 1 Sep) **(1 Contact Hour)**	Unit Commitment – Dynamic Programming *(Doubt clearing)*	Flip Class ***(90 Minutes Video lecture)***

9	1st Week of September (04 to 08 Sep) **(3 Contact Hours)**	Load frequency control-Generator, Prime mover, Governor & Load models – LFC of a single area **ASSESSMENT – 3**	Lecture C&T, PPT
10	2nd Week of September (11 to 15 Sep) **(1 Contact Hours)**	LFC of two area system Tie line bias control Tutorial Class	Flip Class ***(90 Minutes Video lecture)***
11	3rd Week of September (18 to 22 Sep) **(2 Contact Hours)**	Tutorial Class **ASSESSMENT – 4-A**	Numerical Problem Solving
12	4th Week of September (25 to 29 Sep) **(1 Contact Hour)**	Automatic Voltage Regulator	Flip Class ***(90 Minutes Video lecture)***
13	1st Week of October (02 to 06 October) **(1 Contact Hour)**	**ASSESSMENT – 4-B**	Numerical Problem Solving
14	2nd Week of October (9 to 13 October) **(3 Contact Hours)**	Load Compensation, Power Factor correction, Voltage regulation, load balancing	Lecture C&T, PPT
15	3rd Week of October (16 to 20 October) **(1 Contact Hour)**	Maximum Loadability Limit, Line Compensation *(Doubt clearing)*	Flip Class ***(90 Minutes Video lecture)***
16	4th Week of October (23 to 27 October) **(3 Contact Hours)**	**ASSESSMENT – 5**	Group Evaluation
17	1st Week of November (30 Oct to 3 Nov) **(3 Contact Hours)**	**ASSESSMENT – 5**	Group Evaluation
18	2nd Week of November (6 to 10 Nov) **(1 Contact Hour)**	SCADA/EMS, Restructuring of power system, Smart Grid *(Doubt Clearing)*	Flip Class **(*90 Minutes Video Lecture)***
19	3rd Week of November (13 to 17 Nov) **(2 Contact Hours)**	**ASSESSMENT – 6**	Descriptive Written Exam

C & T : Chalk and Talk
PPT : Power Point

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Objective Type Test	1st Week of August 2017	30 Minutes	10
2	Techincal Quiz - I	4th Week of August 2017	30 Minutes	10
3	Techincal Quiz - II	1st Week of September 2017	30 Minutes	10
4	Numerical Skill Assessment	3rd Week of September 2017	45 Minutes (Group of 2 members, Open Book)	10
		1st Week of October 2017	45 Minutes	10
5	Simulation Skill Assessment	4th Week of October and 1st week of November 2017	One Month (Group of 3 members)	20
6	Descriptive Type Examination (End Semester)	2nd Week of November 2017	90 Minutes	30

ESSENTIAL READINGS : Textbooks, Reference Books Website addresses, journals, etc.

1. Allen J. Wood, Bruce F. Wollenberg, 'Power Generation, Operation and Control', Wiley India Edition, 2e, 2009.
2. Abhijit Chakrabarti & Sunita Halder, 'Power System Analysis- Operation and Control', PHI New Delhi, 3e, 2010.
3. K. Uma Rao, 'Power System Operation & Control' Wiley India Edition, 1e, 2013.

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

Feedback from the students during class committee meetings

Feedback through online questionnaire (End of the semester)

Institute end semester feedback

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

CORRESPONDENCE

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 selvanmp.psect@gmail.com**

ATTENDANCE

1. **Attendance will be taken by the faculty in all the contact hours.**
2. **Attendance of ALL STUDENTS is EXPECTED for the physical contact hours mentioned. Every student should maintain minimum 75% attendance in these contact hours to attend the end semester examination.**
3. **Any student, who fails to maintain 75% and having above 50% attendance should have scored minimum 30% aggregate marks in the assessments 1, 2, 3, 4 and 5 for attending the end semester examination.**
4. **Any student, who fails to maintain 50% attendance should have scored minimum 60% aggregate marks in the assessments 1, 2, 3, 4 and 5 for attending the end semester examination.**
5. **Students not having sufficient attendance at the end of the semester and also fail to score the required marks (as mentioned in Points : 3 & 4) will have to RE DO the course.**

ASSESSMENT

1. **Attending all the assessments are MANDATORY for every student.**
2. **If any student is not able to attend any of the assessments (1, 2, 3, 4 and 5 only) due to genuine reason, student is permitted to attend the compensation assessment (CPA) within one week from the date of conduct of that assessment. Later he/she will not be permitted to give the compensation assessment.**
3. **At any case, CPA will not be considered as an improvement test.**
4. **The minimum marks for passing this course and grading pattern will adhere to the regulations of the Institute.**

ACADEMIC HONESTY & PLAGIARISM

1. All the students are expected to be genuine during the course work. Taking of information by means of copying simulations, assignments, looking or attempting to look at another student's paper or bringing and using study material in any form for copying during any assessments is considered dishonest.
2. Tendering of information such as giving one's program, simulation work, assignments to another student to use or copy is also considered dishonest.
3. Preventing or hampering other students from pursuing their academic activities is also considered as academic dishonesty.
4. Any evidence of such academic dishonesty will result in the loss of entire marks of that assessment. Additionally, the names of those students so penalized will be reported to the class committee chairperson and HoD of the concerned department.
5. Students who honestly produce ORIGINAL and OUTSTANDING WORK will be REWARDED.

ADDITIONAL COURSE 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 selvanmp.psect@gmail.com

FOR APPROVAL

Course Faculty _____ CC-Chairperson _____ HOD _____ 11/07/2017