

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

COURSE OUTLINE			
Course Title	FLEXIBLE AC TRANSMISSION SYSTEMS		
Course Code	EE606	No. of Credits	3
Department	EEE	Faculty	Mr. M. SUJIKANNAN
Pre-requisites Course Code	Power System Analysis, Power Conversion techniques or equivalent.		
Faculty E-mail id	mskannan@nitt.edu	Telephone No.	9677197497
Course Type	<input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course		

COURSE OVERVIEW

Students get a broad range of detailed information on the characteristics and applications of FACTS controllers. Students will understand the transmission capability of transmission system by shunt and series compensation using static controllers. Further there will be a discussion on the coordination of FACTS controllers is particularly interesting because of more integrated into conventional transmission networks with FACTS controllers design.

COURSE OBJECTIVES

To familiarize students with the transmission challenges of modern electrical power systems. The course will present the basic concepts, principles and operation of fast high power electronic controllers known as Flexible AC Transmission Systems (FACTS) that enhance power system stability and effectively increase transmission capacity thus yielding significantly higher flexibility of operation. The course will focus on concepts and applications various configurations of FACTS controllers. Both thyristor based and also voltage source converters based FACTS Controllers are discussed

COURSE OUTCOMES (CO)

Outcomes	Aligned Programme Outcomes (PO)														
	CO no.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
1. Identify the conditions in conventional power system where the installation of FACTS controllers or Devices becomes vital.		H	H	M	L	H	L	M	M	N A	N A	M	H	L	N A
2. Analyze the performance of a conventional transmission system and apply the principles of reactive power compensation for improvement.		H	H	H	M	H	M	H	H	L	N A	N A	M	M	N A
3. Illustrate the modes of operation of thyristor based and voltage source converter based FACTS controllers and explains the capabilities and modeling aspects.		H	H	M	M	H	L	M	M	M	M	L	M	N A	L
4. Analyze different series, shunt or combined series-shunt FACTS controllers and compute the performance when installed in a given transmission system.		H	H	M	M	H	H	M	M	M	M	L	L	N A	L
5. Compare the characteristics of different FACTS controllers and defend the choice of a particular controller to suit the given system/ scenario.		H	H	M	H	H	H	M	M	M	M	L	L	H	L

COURSE TEACHING AND LEARNING ACTIVITIES			
S.No	Week	Topic	Mode of Delivery
1.	Week 1 4 th Jan'17 to 6 th Jan'17 (1 Contact Hour)	Introduction about FACTS	Lecture C&T/ PPT or any suitable mode
2.	Week 2 9 th Jan'17 to 13 th Jan'17 (3 Contact Hours)	UNIT-1 Fundamentals of ac power transmission	Lecture C&T/ PPT or any suitable mode
3.	Week 3 16 th Jan'17 to 20 th Jan'17 (3 Contact Hours)	Transmission problems and needs	Lecture C&T/ PPT or any suitable mode
4.	Week 4 23 rd Jan'17 to 27 th Jan'17 (3 Contact Hours)	Emergence of FACTS, FACTS control considerations, FACTS controllers	Lecture C&T/ PPT or any suitable mode
5.	Week 5 23 rd Jan'17 to 27 th Jan'17 (3 Contact Hours)	UNIT-2 Principles of shunt compensation, Variable Impedance type Static Synchronous Compensator (STATCOM) configuration	Lecture C&T/ PPT or any suitable mode
6.	Week 6 6 th Feb'17 to 10 th Feb'17 (3 Contact Hours)	Switching converter type Static Synchronous Compensator (STATCOM) configuration	Lecture C&T/ PPT or any suitable mode
7.	Week 7 13 th Feb'17 to 17 th Feb'17 (3 Contact Hours)	Static Synchronous Compensator (STATCOM) Characteristics and control	Lecture C&T/ PPT or any suitable mode
		Assessment -1	1st Cycle Test
8.	Week 8 20 th Feb'17 to 24 th Feb'17 (3 Contact Hours)	UNIT-3 Principles of static series compensation using GCSC, TCSC	Lecture C&T/ PPT or any suitable mode
9.	Week 9 27 th Feb'17 to 3 rd Mar'17 (3 Contact Hours)	Principles of static series compensation using TSSC, Applications, Static Synchronous Series Compensator (SSSC)	Lecture C&T/ PPT or any suitable mode
10.	Week 10 6 th Mar'17 to 10 th Mar'17 (3 Contact Hours)	UNIT-4 Principles of operation - static voltage regulators and phase shifters	Lecture C&T/ PPT or any suitable mode
11.	Week 11 13 th Mar'17 to 17 th Mar'17 (3 Contact Hours)	Steady state model and characteristics of a static voltage regulators and phase shifters, Power circuit configurations	Lecture C&T/ PPT or any suitable mode
12.	Week 12 20 th Mar'17 to 24 th Mar'17 (3 Contact Hours)	UNIT-5 UPFC Principles of operation and characteristics	Lecture C&T/ PPT or any suitable mode
		Assessment -2	2nd Cycle Test

13.	Week 13 27 th Mar'17 to 31 st Mar'17 (3 Contact Hours)	Independent active and reactive power flow control	Lecture C&T/PPT or any suitable mode
14.	Week 14 03 rd Apr'17 to 7 th Apr'17 (3 Contact Hours)	Comparison of UPFC with the controlled series compensators and phase shifters	Lecture C&T/PPT or any suitable mode
15.	Week 15 10 th Apr'17 to 13 th Apr'17	Compensation Assessment(CPA)	Written Test
16.	(24 th Apr'17 to 14 th May'17) or date decided by class committee/ Dean office	End Semester Examination	Written Test

C&T- Chalk and Talk, PPT- Power Point Presentations

COURSE ASSESSMENT METHODS

S.No	Mode of Assessment	Week/Date	Duration	% Weightage
1.	1st Cycle test (Written examination covering units 1&2)	7 th Week	60 Minutes	20
2.	2nd Cycle test (Written examination covering units 3&4)	12 th Week	60 Minutes	20
3.	Assignment	Work will be carried out during the contact hours		10
4.	Compensation Assessment (Written examination covering all 4 units)	15 th Week	60 Minutes	Please refer course policy for details
5.	End Semester (Written examination)	17 th Week	180 Minutes	50

ESSENTIAL READINGS: Textbooks, reference books.

1. Song, Y.H. and Allan T. Johns, 'Flexible AC Transmission Systems (FACTS)', Institution of Electrical Engineers Press, London, 1999.
2. Hingorani ,L.Gyugyi, 'Concepts and Technology of Flexible AC Transmission System', IEEE Press New York, 2000 ISBN –078033 4588.
3. Mohan Mathur R. and Rajiv K.Varma, 'Thyristor - based FACTS controllers for Electrical transmission systems', IEEE press, Wiley Inter science , 2002.
4. Padiyar K.R., 'FACTS controllers for Transmission and Distribution systems', New Age International Publishers, 1st Edition, 2007.
5. Enrique Acha, Claudio R.Fuerte-Esqivel, Hugo Ambriz-Perez, Cesar Angeles-Camacho, 'FACTS – Modeling and simulation in Power Networks', John Wiley & Sons, 2002.

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

Anonymous feedback through questionnaire

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 the email id specified by the teacher.

ATTENDANCE

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 CPA. Student who scores more than 60 % marks in the CPA 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.

ACADEMIC HONESTY & PLAGIARISM

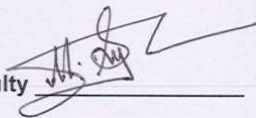
1. All the students are expected to be genuine during the course work. Talking of information by means of copying simulations, assignments, looking or attempting to look at another student's paper or bringing and using study material in any form for copying during any assessments is considered dishonest.
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 marks on that assessment. Additionally, the names of those students so penalized will be reported to the class committee chairperson and HoD of the concerned department.

ADDITIONAL COURSE INFORMATION

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

FOR APPROVAL

Course Faculty



CC-Chairperson



HOD

