



NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	M.Tech. (Power Systems) M.Tech. (Construction Technology & Management)		
Course Title	SMART GRID TECHNOLOGIES		
Course Code	EE 680	No. of Credits	3
Course Code of Pre/ Co-requisite subject(s)	NONE		
Session	July 2020	Section (if, applicable)	-
Name of Faculty	Dr. M. P. SELVAN	Department	EEE
Email	selvanmp.psect@gmail.com	Telephone No.	9444170638
Name of Course Coordinator(s) (if, applicable)	NA		
E-mail	-	Telephone No.	-
Course Type	<input type="checkbox"/> Core course <input checked="" type="checkbox"/> Elective course		
Syllabus (approved in BoS)			
<p>Introduction - Evolution of Electric Grid, Smart Grid Concept - Definitions and Need for Smart Grid – Functions – Opportunities – Benefits and challenges, Difference between conventional & Smart Grid, Technology Drivers.</p> <p>Energy Management System (EMS) - Smart substations - Substation Automation - Feeder Automation, SCADA – Remote Terminal Unit – Intelligent Electronic Devices – Protocols, Phasor Measurement Unit – Wide area monitoring protection and control, Smart integration of energy resources – Renewable, intermittent power sources – Energy Storage.</p> <p>Distribution Management System (DMS) – Volt / VAR control – Fault Detection, Isolation and Service Restoration, Network Reconfiguration, Outage management System, Customer Information System, Geographical Information System, Effect of Plug in Hybrid Electric Vehicles.</p> <p>Introduction to Smart Meters – Advanced Metering infrastructure (AMI), AMI protocols – Standards and initiatives, Demand side management and demand response programs, Demand pricing and Time of Use, Real Time Pricing, Peak Time Pricing.</p> <p>Elements of communication and networking – architectures, standards, PLC, Zigbee, GSM, BPL, Local Area Network (LAN) - House Area Network (HAN) - Wide Area Network (WAN) - Broadband over Power line (BPL) - IP based Protocols - Basics of Web Service and CLOUD Computing, Cyber Security for Smart Grid.</p> <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Stuart Borlase 'Smart Grid: Infrastructure, Technology and Solutions', CRC Press 2012. 2. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, 'Smart Grid: Technology and Applications', Wiley, 2012. 			



3. Mini S. Thomas, John D McDonald, 'Power System SCADA and Smart Grids', CRC Press, 2015
4. Kenneth C. Budka, Jayant G. Deshpande, Marina Thottan, 'Communication Networks for Smart Grids', Springer, 2014

COURSE OBJECTIVES

1. To understand the need and concept of Smart Grid
2. To study different EMS and DMS functions and smart meters
3. To get familiarized with the communication networks for Smart Grid applications

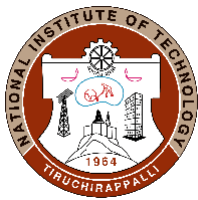
COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
Upon completion of the course, the students will be able to	
1. Get acquainted with the smart resources, smart meters and other smart devices.	1, 2, 7, 8, 11, 12, 13, 14
2. Describe how modern power distribution system functions.	1, 2, 5, 6, 7, 8, 11, 12, 13, 14
3. Identify suitable communication networks for smart grid applications.	1, 2, 6, 7, 8, 9, 10, 11, 12, 13, 14

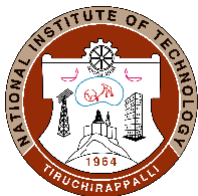
COURSE PLAN – PART II

COURSE OVERVIEW

Students learn about power system in many power system courses such as power system analysis, power system operation and control, power system protection and switchgear, restructuring of power system, etc. All these subjects deal with the modeling, analysis and control of regulated and/or deregulated power system. On the other hand, Smart grid technology is a collection of existing and emerging technologies working together to achieve energy efficiency, automation and financial benefits in the production, transport and consumption of electrical energy. Smart grid technologies involve integration of renewable energy sources into the conventional power grid both at the transmission and distribution level, employing FACTS and HVDC transmission systems, realising wide area monitoring and protection system and adopting information and communication technology for consumer participation in the grid operation. In this course, students learn about the requirement for a smart grid in future. Further, students will be exposed to several modern and evolving technologies that can be applied in transforming the present power grid into smart power grid. They will also be educated about the issues in the implementation of smart grid and present scenario in the national and international levels.



COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	Week 1 15-09-2020 to 18-09-2020 (1 Contact Hour)	Introduction & Course plan details	Online Webex/ MS Teams
2	Week 2 21-09-2020 to 25-09-2020 (3 Contact Hours)	Evolution of electric grid, Smart Grid Concept, Definition and Need for smart Grid, Functions, Benefits and Challenges	Online Webex/ MS Teams
3	Week 3 28-09-2020 to 02-10-2020 (3 Contact Hours)	Difference between conventional & smart grid, Technology drivers. Energy Management System	Online Webex/ MS Teams
4	Week 4 05-10-2020 to 09-10-2020 (3 Contact Hours)	Substation Automation, Feeder Automation, SCADA, Remote Terminal Unit, Intelligent Electronic Devices, Protocols, Phasor Measurement Unit	Online Webex/ MS Teams
5	Week 5 12-10-2020 to 16-10-2020 (3 Contact Hours)	Smart integration of Energy Resources- Renewable, intermittent power sources Energy Storage,	Online Webex/ MS Teams
6	Week 6 19-10-2020 to 23-10-2020 (3 Contact Hours)	Distribution Management System, Volt Var Control, Fault Detection, Isolation and Service Restoration	Online Webex/ MS Teams
7	Week 7 26-10-2020 to 30-10-2020 (2 Contact Hours)	Assessment - 1 Outage management system, Customer Information system, Geographical Information System	Online Webex/ MS Teams
8	Week 8 02-11-2020 to 06-11-2020 (3 Contact Hours)	Effect of plug in hybrid electric vehicles Introduction to Smart Meter	Online Webex/ MS Teams
9	Week 9 09-11-2020 to 13-11-2020 (3 Contact Hours)	AMI, AMI protocols, standards, Demand Side Management, Demand Response	Online Webex/ MS Teams
10	Week 10 16-11-2020 to 20-11-2020 (3 Contact Hours)	Importance and functions of HEMS, Demand Pricing	Online Webex/ MS Teams
11	Week 11 23-11-2020 to 27-11-2020 (3 Contact Hours)	Assessment - 2 Elements of communication and networking	Online Webex/ MS Teams
12	Week 12 30-11-2020 to 04-12-2020 (2 Contact Hours)	PLC, Zigbee, GSM, BPL LAN, HAN, WAN, IP based protocols	Online Webex/ MS Teams
13	Week 13 07-12-2020 to 11-12-2020 (3 Contact Hours)	Web Service and Cloud computing, Cyber security for smart grid	Online Webex/ MS Teams
14	Week 14 14-12-2020 to 18-12-2020 (3 Contact Hours)	Assessment 3 (Group Task) Compensation Assessment	Online Webex/ MS Teams



15	Week 16 21-12-2020 to 25-12-2020 (2 Contact Hours)	Final Assessment	Online
----	--	-------------------------	--------

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage	
1	Surprize Quiz	Week 7	60 Minutes	10	25
	Descriptive			15	
2	Surprize Quiz	Week 11	60 Minutes	10	25
	Descriptive			15	
3	Group Task			20	
CPA	Compensation Assessment		60 Minutes		
4	Final Assessment		90 Minutes	30	

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

Feedback from the students during class committee meetings

Institute end semester feedback

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email/ phone etc)

- All the students are advised to check their NITT WEBMAIL regularly. All the correspondence (schedule of classes/ schedule of assessment/ any other information regarding this course) will be done through their Webmail only. Conduct of course and sharing of course material will be done through Webex/MS Teams. Suitable platform/software tool will be chosen for the conduct of assessments and will be informed to the students.
- Queries (if required) to the course teacher shall only be emailed to selvanmp@nitt.edu.

COMPENSATION ASSESSMENT POLICY

- Attending all the assessments are MANDATORY for every student.
- If any student is not able to attend any of the assessments (1 and 2 only) due to genuine reason, student is permitted to attend the compensation assessment (CPA).
- At any case, CPA will not be considered as an improvement test.



ATTENDANCE POLICY

As directed by the Academic Office.

ACADEMIC DISHONESTY & PLAGIARISM


- Copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark will 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.

ADDITIONAL INFORMATION

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

FOR APPROVAL


Course Faculty _____


Dr. Ankur Singh Rana
CC-Chairperson _____

Approved by email
HOD _____