NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	**B.Tech ELECTRICAL AND ELECTRONICS ENGINEERING**		
Course Title	**POWER ELECTRONICS**		
Course Code	**EEPC21**	**No. of Credits**	**03**
Course Code of Pre-requisite subject(s)	**MAIR32**	**EEPC10**	**EEPC11**
Session	**January 2019**	**Section (if, applicable)**	**B**
Name of Faculty	**G. Saravana Ilango**	**Department**	**EEE**
Official Email	**gsilango@nitt.edu**	**Telephone No.**	**0431-2503259**
Name of Course Coordinator(s)	**----------**		
Official E-mail		**Telephone No.**	
Course Type	☑ **Core course** ☐ **Elective course**		

Syllabus (approved in BoS)

Power Semiconductor Devices –power diodes, power transistors, SCRs, TRIAC, GTO, power MOSFETs, IGBTs-Principles of operation, characteristics, ratings, protection and gate drive circuits.

Controlled rectifiers- single- phase and three-phase- power factor improvement - dual converters.

DC-DC converters- Buck, Boost, Buck-Boost- with circuit configuration and analysis.

DC-AC converters- single-phase/three-phase, VSI, CSI, frequency and voltage control.

AC-AC converters- single/three-phase controllers, phase control, PWM AC voltage controller, Principle of ON-OFF control and cyclo-converters.

COURSE OBJECTIVES

This course aims to equip the students with a basic understanding of modern power semiconductor devices, various important topologies of power converter circuits for specific types of applications. The course also equips students with an ability to understand and

analyze non-linear circuits involving power electronic converters.

MAPPING OF COs with POs

Course Outcomes	**Programme Outcomes (PO)**
At the end of the course students will	
1. be able to explain the working of various power electronic converters	
2. analyze and derive the mathematical relations for typical power converters	
3. have ability to design power converters with given specifications	
4. able to use data sheet and suggest suitable control and other associated circuits for the operation of power converters.	

COs / POs		Course outcomes(COs)			
		1	2	3	4
Programme Outcomes (POs)	1	M	H	L	L
	2	M	H	H	H
	3	M	M	NA	NA
	4	NA	NA	NA	NA
	5	H	H	H	H
	6	M	M	M	M
	7	M	M	M	M
	8	M	M	M	M
	9	L	L	L	L
	10	H	H	H	H
	11	H	H	H	H
	12	H	H	H	H
	13	H	H	H	H
	14	H	H	H	H

COURSE PLAN – PART II

COURSE OVERVIEW

Power electronics is considered as the technology associated with the conversion, control and conditioning of electric power from its available form to the desired electrical form, by the application of power semiconductor devices. Power Electronics is one of the fastest developing technologies today, having gone through dynamic changes in the last several decades.

Application of Power Electronics ranges switch-mode power supplies and uninterruptible power supplies, process control, factory automation, transportation, energy storage, adjustable speed motor drives, power quality and electric power transmission / distribution. Power electronics is also beginning to play a significant role as electric utilities attempt to utilize the existing transmission network to a higher capacity. Potentially, a large application is in the interconnection of photovoltaic and wind-electric systems to the utility grid. Power Electronics will play a dominant role in the 21st century in industrial and utility applications with increased emphasis on energy saving and efficient control of industrial processes thereby helping to preserve the environment.

Aim of this course is to give the exposure to the students on the analysis, operation and control of typical power electronic converters, namely, dc-dc, dc-ac, ac-dc and ac-ac converters. This course also aims to apply the mathematical skills to a number of practical / design problems.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	2nd week of January 19 (7 to 11) **(3 Contact Hours)**	Introduction - Review of power diodes, transistors, MOSFETS, IGBTS and I-V characteristics.	Lecture C&T / Document

2	3rd week of January 19 (14 to 18) **(3 Contact Hours)**	Review of SCRs, TRIAC, GTO, I-V characteristics and ratings.	viewer / PPT or any suitable mode
3	4th week of January 19 (21to 25) **(3 Contact Hours)**	Protection and gate driver circuits	
4	5th week of January 19 to 1st week of Feb. 19 (28.01.19 to 01.02.19) **(3 Contact Hours)**	Buck converter and Boost converter	
5	2nd week of Feb. 19 (04 to 08) **(3 Contact Hours)**	Buck-Boost converter	
6	3rd week of Feb. 19 (11 to 15) **(2 Contact Hours + 1 hour Cycle test)**	Introduction to inverters Single-phase VSI and Three-phase VSI **Assessment – 1**	Lecture C&T / Document viewer / PPT or any suitable mode **I Cycle Test**
7	4th week of Feb. 19 to 1st week of Mar. 19 (25.02.2019 to 01.03.2019) **(3 Contact Hours)**	Frequency and Voltage control and harmonic reduction in inverters-standard PWM techniques	Lecture C&T / Document viewer / PPT or any suitable mode
8	2nd week of March 19 (04 to 08) **(3 Contact Hours)**	Single-phase and Three-phase CSI	
9	3rd week of March 19 (11 to 15) **(2 Contact Hours + 1 hour Cycle test)**	Single-phase fully and semi controlled converters - continuous and discontinuous current conduction **Assessment – 2**	Lecture C&T / Document viewer / PPT or any suitable mode **II Cycle Test**
10	4th week of March 19 (18 to 22) **(3 Contact Hours)**	Three-phase fully continuous and discontinuous current conduction and semi controlled converters - continuous current conduction	Lecture C&T / Document viewer / PPT or any suitable mode
11	5th week of March 19 (25 to 29) **(3 Contact Hours)**	Semi controlled converters discontinuous current conduction, power factor improvement and dual converters	
12	1st week of April 19 (01 to 05) **(3 Contact Hours)**	AC-AC converters-single phase - Phase angle control, on-off control.	
13	2nd week of April 19 (08 to 12) **(3 Contact Hours)**	Three-phase AC voltage controller ON-OFF control	

S.No.	Week/Contact Hours	Topic	Mode of Delivery
14	3rd week of April 19 (15 to 19) **(3 Contact Hours)**	Single and Three phase cyclo converters	
15	4th week of April 19 (22 to 26) – **CPA**	**Compensation Assessment (CPA)**	**Written test**
16	1st week of May 19 or date decided by Class committee / Dean office **(3 Hours written test)**	**End Semester Examination**	**Written test**

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	I Cycle test (Written examination)	3rd week of Feb. 2019	1 Hour	20
2	II Cycle Test (Written examination)	3rd week of March 2019	1 Hour	20
3	Seminar / case study / design examples /Projects	During the contact hours		20
CPA	Compensation Assessment	4th week of April 2019	1 Hour	Please refer course policy for more details
4	Final Assessment (End Semester Examination)	1st week of May 2019	3 Hours	40

COURSE EXIT SURVEY

Feedback from the students during class committee meetings
Anonymous feedback through questionnaire

COURSE POLICY

MODE OF CORRESPONDENCE (email/ phone etc)

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.
2. Queries (if required) may be emailed to me / contact me during 4.00 pm to 5.00 pm on Monday and Friday with prior intimation for any clarifications.

COMPENSATION ASSESSMENT

1. If any student is not able to attend I and / or II Cycle test(s) due to genuine reasons, student is permitted to attend the compensation assessment (CPA) with 20% weightage (20 marks).

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, IF ANY

FOR APPROVAL

Course Faculty _____ **CC- Chairperson** _____ **HOD** _____ 11/5/19