



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 SWITCHING CONVERTERS		
Course Code	EEHO13	No. of Credits	4
Course Code of Pre-requisite subject(s)	EEPC19 Power Electronics		
Session	January 2022	Section	NA
Name of Faculty	Dr. Shelas Sathyan	Department	Electrical and Electronics Engineering
Official Email	<a href="mailto:shelassathyan@nitt.edu">shelassathyan@nitt.edu</a>	Telephone No.	+91 9561450634
Name of Course Coordinator (if applicable)	--		
Course Type	<input type="checkbox"/> Core course	<input checked="" type="checkbox"/> Honor course	<input type="checkbox"/> Laboratory course
<b>SYLLABUS (approved in BoS)</b>			
<p>Basic converter topologies: Buck, Boost, Buck-Boost converter, steady state converter analysis - Equivalent circuit modelling.</p> <p>State space averaging of converters- Transfer function of converters- Design of feedback compensators-voltage and current loop.</p> <p>Design constraints of reactive elements in Power Electronic Systems: Design of inductor, transformer and capacitors for power electronic applications, Input filter requirement.</p> <p>Isolated converters: forward converter, push-pull converter, fly back converter, half bridge and full bridge converter-operating principles.</p> <p>Soft-switching DC - DC Converters: zero-voltage-switching converters, zero-current switching converters,</p> <p>Multi-resonant converters and Load resonant converters-operating principles</p> <p><u>Text Books:</u></p> <ol style="list-style-type: none"><li>1. Simon Ang, Alejandro Oliva , Taylor &amp; Francis, 3rd Edition, 2010.</li><li>2. Robert W. Erickson, Dragan Maksimovic, Springer Science &amp; Business Media, 2nd Edition, 2007.</li></ol>			
<b>COURSE OBJECTIVES</b>			
This course aims at modeling, analysis and control of various power converter circuits.			

<b>COURSE OUTCOMES (CO)</b>	
<b>Course Outcomes</b> Upon completion of the course, the students will be able to:	<b>Aligned Programme Outcomes (PO)</b>
1. Understand the classification and operation of different types of DC-DC converters.	1,2,3,4,8,14
2. Analyze the Steady-state operation of DC-DC converter circuits	1,8,4,14
3. Develop the transfer function of DC-DC converter circuits	1,4,8
4. Design the compensator and reactive elements of DC-DC converter circuits.	1,2,4,7,14
5. Illustrate different soft switching techniques in DC-DC converter circuits.	1,2,4

### Course Plan – Part II

#### COURSE OVERVIEW

Aim of this course is to introduce various switching power converters, design of DC/DC converters, Magnetic Design and the procedure to develop closed loop controller for the converter system. Course also emphasize on the soft switching techniques for power electronics converters and design of high power factor front end topologies for utility friendly power supplies.

#### COURSE TEACHING AND LEARNING ACTIVITIES

S. No.	Week/ Contact Hour	Topic	Mode of Delivery
1.	3 <sup>rd</sup> and 4 <sup>th</sup> week of January (19 <sup>th</sup> January onwards)	Basic converter topologies: Buck, Boost, Buck-Boost converter, steady state converter analysis – Equivalent circuit modelling	Online lecture mode
2.	1 <sup>st</sup> and 2 <sup>nd</sup> week of February	Basic converter topologies: Buck, Boost, Buck-Boost converter, steady state converter analysis – Equivalent circuit modelling	
3.	3 <sup>rd</sup> and 4 <sup>th</sup> week of February	Isolated converters: forward converter, push-pull converter, fly back converter, half bridge and full bridge, converter-operating principles.	Online lecture mode
4.	1 <sup>st</sup> and 2 <sup>nd</sup> week of March	Design constraints of reactive elements in Power Electronic Systems: Design of inductor, transformer and capacitors for power electronic applications, Input filter requirement	
5.	3 <sup>rd</sup> and 4 <sup>th</sup> Week of March	Soft-switching DC - DC Converters: zero-voltage-switching converters, zero-current switching converters,	

		Multi-resonant converters and Load resonant converters-operating principles	
6.	1 <sup>st</sup> and 2 <sup>nd</sup> Week of April	State space averaging of converters- Transfer function of converters	
7.	3 <sup>rd</sup> and 4 <sup>th</sup> Week of April	Design of feedback compensators-voltage and current loop.	Online lecture mode

**COURSE ASSESSMENT METHODS (Shall Range from 4 to 6)**

S. No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Mini Project -1	2 <sup>nd</sup> Week of February	-	15%
2.	Mini Project-2	3 <sup>rd</sup> Week of March	-	15%
3.	Mini Project-3	3 <sup>rd</sup> week of April	-	15%
4.	Class Test	1 <sup>st</sup> Week of April	1 Hour	25%
CPA	Compensation test (entire syllabus)	4 <sup>th</sup> Week of April	1 hour	25%
4.	End Semester Exam (entire syllabus)	2 <sup>nd</sup> Week of May	2 hours	30%

**COURSE EXIT SURVEY**

1. Students' feedback through class committee meetings
2. Feedback questionnaire from students – twice during the semester
3. Feedback from students on course outcomes shall be collected at the end of the semester.

**COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, academic honesty and plagiarism etc.)**

**Mode of Correspondence**

1. The faculty is available for consultation during the time intimated to the students then and there.
2. All correspondence will be sent to the NITT webmail of the students, if required.
3. The students can contact me in my office or through the email *shelassathyan@nitt.edu* for any academic related issues with respect to this course.

**Compensation Assessment Policy**

1. Flexibility is given to the students to fix the date for each assessment convenient to majority of the students.
2. Only one instance of absence in internal assessment is permitted. Only one compensation assessment for absentees in internal assessments will be conducted.

3. The compensation assessment (CPA) is for entire syllabus and in any case, CPA is not considered as an improvement test.

### **Attendance Policy**

1. All the students are expected to attend all the contact hours. Students should maintain 75% minimum physical attendance by the end of the course to attend the end semester examination.
2. Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' Grade. Student have to REDO the course.
3. A maximum of 10% attendance shall be allowed under On Duty (OD) category. OD is allowed only for the students having minimum attendance of 65%.


### **Academic Honesty & Plagiarism**

1. Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
2. The answer sheet of the student will not be evaluated and ZERO mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
3. 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 minimum marks for passing this course and grading pattern will adhere to the regulations of the institute.

### **FOR APPROVAL**

  
**Dr. Shelas Sathyan, AP/EEE**  
 Course Faculty

  
**S. Magashuocci**  
 CC-Chairperson

Approved By HOD  
**HoD, Dept. of EEE**

### **Guidelines:**

- a) The number of assessments for a course shall range from 4 to 6.
- b) Every course shall have a final assessment on the entire syllabus with at least 30% weightage.
- c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.
- d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in					P.G.
2019	2018	2017	2016	2015	
35% or class average/2 whichever is greater.			Peak/3 or class average/2 whichever is lower		40%

- e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.
- f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.