NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	**M.Tech. – Power Electronics**		
Course Title	**SOFT SWITCHING POWER CONVERTERS**		
Course Code	**EE701**	**No. of Credits**	**03**
Course Code of Pre-requisite subject(s)	**Power Electronics**		
Session	**September 2021**	**Section (if, applicable)**	
Name of Faculty	**Dr. Shelas Sathyan**	**Department**	**EEE**
Official Email	**Shelassathyan @nitt.edu**	**Telephone No.**	**9561450634**
Name of Course Coordinator(s) (if, applicable**)**	**NA**		
Official E-mail	**NA**	**Telephone No.**	**NA**
Course Type (please tick appropriately**)**	☐ **Core course**	☑ **Elective course**	

Syllabus (approved in BoS)

Evaluation of switching loss in hard switched converters, Introduction to soft switching schemes, Comparison between hard switched and soft switching converters, Resonant switches, zero voltage switching (ZVS), zero current switching (ZCS), zero voltage zero-current switching (ZVSZCS), Parameters and selection of semiconductor switches for soft switching.

Concept of resonance, Classification of Quasi-Resonant Switches, Non isolated Zero-Current- Switching Quasi-Resonant Converters, Non isolated Zero-Voltage-Switching Quasi-Resonant Converters, Series-Loaded Resonant Converters, Parallel- Series-parallel resonant converters, isolated high order resonant converters.
PWM Soft switched converter, Active clamp power converters with soft switching, design of active clamp ZVS fly back converter, high voltage gains ZVS converters, high voltage gains ZVS/ZCS converters.

Soft switched PWM Full bridge converters, Theoretical Basis of Soft Switching for PWM Full- Bridge Converters, Classification of Soft-Switching PWM Full-Bridge Converters, Zero-Voltage- Switching PWM Full Bridge Converters, Modulation of the Lagging Leg, Modulation of the Leading Leg, Dual active bridge (DAB) converters and modulation strategy.
Application of resonant and PWM soft switched converters I renewable energy, on board
battery charging, wireless power transfer, power factor correction, DAB converters in solid state transformer.

COURSE OBJECTIVES

To evaluate various soft switching techniques, Design and control of soft switching converters, Soft switching PWM converters, resonant power converters, applications of soft switched converters in renewable energy, electric vehicle and power supplies.

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Course Outcomes: Upon completion of the course, the student will be able to	**Programme Outcomes (PO)**
Understand various soft switching techniques	**1,2,6,11**
Select suitable soft switching scheme for different semiconductor switches according to the applications	**1,2,6,11**
Analysis, design of various soft switched converters	**1,2,6,11**

COURSE PLAN – PART II

COURSE OVERVIEW

This course deals with soft switching techniques and the design of soft switching converters for power electronics applications.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	(September 6th Onward) 2nd week of September to 4th week of September	Introduction to the course, Evaluation of switching loss in hard switched converters, Introduction to soft switching schemes, Comparison between hard switched and soft switching converters, Resonant switches,	Online lecture
2	1st week of October	Zero voltage switching (ZVS), zero current switching (ZCS), zero voltage zero-current switching (ZVSZCS), Parameters and selection of semiconductor switches for soft switching.	

3	2nd week of October to 4th week of October	PWM Soft switched converter, Active clamp power converters with soft switching, design of active clamp ZVS fly back converter, high voltage gains ZVS converters, high voltage gains ZVS/ZCS converters.	Online lecture
4	1st week of November to 3rd week of November	Concept of resonance, Classification of Quasi-Resonant Switches, Non isolated Zero-Current- Switching Quasi-Resonant Converters, Non isolated Zero-Voltage-Switching Quasi-Resonant Converters, Series-Loaded Resonant Converters, Parallel-Series-parallel resonant converters, isolated high order resonant converters.	
5	4th week of November	Application of resonant and PWM soft switched converters I renewable energy, on board battery charging, wireless power transfer, power factor correction, DAB converters in solid state transformer.	
6	1st week of December to 2nd week of December	Soft switched PWM Full bridge converters, Theoretical Basis of Soft Switching for PWM Full-Bridge Converters, Classification of Soft-Switching PWM Full-Bridge Converters, Zero-Voltage-Switching PWM Full-Bridge Converters, Modulation of the Lagging Leg, Modulation of the Leading Leg, Dual active bridge (DAB) converters and modulation strategy.	Online lecture

Course Assessment Methods				
S.No.	**Mode of Assessment**	**Week/Date**	**Duration**	**% Weightage**
1	Assessment-1 (Mini Project)	October 2nd week	-	15
2	Assessment-2 (Mini Project)	November 2nd Week	-	15
3	Assessment-3 Assignment	Through Out the Semester	-	15
4	Class Test	Fourth week of November	1 hour	25
(CPA)	Compensation Assessment* (Online Written Test)	2nd Week of December	1 Hr	25
5	Assessment-5 (End sem) (Written Test)	3rd week of December	2 Hr	30

***Mandatory; refer to guidelines on page 4**

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

- Feedback from students during class committee meetings
- Feedback through questionnaire

COURSE POLICY (including compensation assessment to be specified**)**

- The above course has 5 assessments in total and one compensation (A1, A2, A3 , A4, CPA.,A5)
- There will be no compensation assessment for Assessment-A1, A2 and A3
- The compensation assessment will include the complete syllabus

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

- The faculty is available for consultation at times as per the information given by the faculty.
- Queries and feedback may also be emailed to the faculty directly: email: **shelassathyan@nitt.edu**

FOR APPROVAL

Course Faculty_____ **CC- Chairperson** Dr. S. Kayalvizhi **HOD** Approved by HoD

Guidelines

a) The number of assessments for any theory course shall range from 4 to 6.

b) Every theory 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.
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.