

COURSE TITLE	CONVERTER CONTROL
COURSE CODE	01EE1708
COURSE CREDITS	3

Objective:

- 1 The objective of this course is to make student capable for designing a control system for power electronics converter by deriving its equivalent circuit model and solving it to find transfer function of converter.

Course Outcomes: After completion of this course, student will be able to:

- 1 Interpret the working of power electronic converters
- 2 Compare various modulation and control methods for converter
- 3 Develop various model of power electronic converter
- 4 Derive transfer function of power electronic converter required for control
- 5 Construct closed loop control system for power electronic converter

Pre-requisite of course:Power Electronics

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	Overview of Power Electronics Converters Non-isolated DC-DC converter: Buck, Boost and Buck-Boost converters,, Isolated DC-DC converters: Forward converter,, Flyback converter and, Push pull converter	6
2	Basic Control Principles Power electronics control targets, Control classification:, Modulation based Controller, Controllers without modulator, Controllers with embedded modulator, Different Modulation methods	9
3	Modelling of Power Electronic Converters Introduction, Types of Models, Switched model, sampled data model, averaged model, large signal, small signal model, switched model of converter, Averaged model of converter, Classical averaged model and Generalised averaged model, State space model of converter	10

Contents : Unit	Topics	Contact Hours
4	Converter Transfer functions Review of bode plot, Analysis of converter transfer functions, Graphical construction of impedances and transfer functions, Series Impedance and parallel impedance and voltage divider transfer function, Measurement of AC transfer functions and impedances	8
5	Control of DC-DC Converters Control goals and associated design methods, Direct output control, Indirect output control, Converter control using dynamic compensation, Digital control issue	9
Total Hours		42

Textbook :

- 1 Fundamentals of Power Electronics, Robert W. Erickson, Dragan Maksimovie, Kluwer Academic Publishers Group, 2004

References:

- 1 Power Electronic Converters Modelling and Control, Power Electronic Converters Modelling and Control, Seddik Bacha, Iulian Munteanu, Antoneta Iuliana Bratcu, ISBN 978-1-4471-5477-8, 2013
- 2 Power Electronics – Converters, Applications and Design, Power Electronics – Converters, Applications and Design, Ned Mohan, Tore M. Undeland and William P. Robbins, John Willey & sons, 2003
- 3 Control of Power Electronic Converters and Systems, Control of Power Electronic Converters and Systems, Frede Blaabjerg, Academic Press an imprint of Elsevier, 2018

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs, etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and classroom.
- 3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, and Virtual Laboratory

Supplementary Resources:

- 1 https://onlinecourses.nptel.ac.in/noc21_ee104/preview
- 2 <https://www.coursera.org/learn/converter-control>