

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**B. Tech. in Electrical Engineering**  
**Semester – VI**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>

<b>Course Code</b>	<b>2EEDE55</b>
<b>Course Title</b>	<b>Advanced Controllers in Power Electronic Systems</b>

**Course Outcomes (COs):**

At the end of the course, students will be able to-

1. design controllers for power electronic converters
2. implement control techniques for dc-dc converters
3. apply appropriate PWM technique for inverters

**Syllabus:**

**Teaching Hours: 30**

**Unit – 1: Controller design techniques:**

**08**

Transfer function based controller design – Bode plot, State space equation based controller design – full state feedback, full state feedback with estimator- estimator design, output feedback, optimal control – linear quadratic, optimal estimator – Kalman filter

**Unit – 2: Control of dc-dc converters**

**07**

Introduction to voltage mode control and current mode control, Average current control mode – Introduction and transfer functions, design of average current controller, Peak current control mode – introduction, transfer function and design.

**Unit – 3: Current Controlled PWM for Inverters:**

**07**

Advantages, different types of current controlled PWM techniques - Linear Control, Hysteresis Control, Predictive Control, and delta modulation current regulator

**Unit – 4: Voltage Controlled PWM for Inverters:**

**08**

Advantages of voltage controlled PWM techniques, Modulating function techniques- cosinusoidal function, harmonic modulating function, trapezoidal modulating function, Space Vector PWM – Voltage space phasor structure, analysis, overmodulation, random PWM

**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**Laboratory Experiments:**

This shall consist of at least 10 experiments / simulations based on the above syllabus.

**Suggested Readings:**

1. Ned Mohan, Tore M. Undeland and William P. Robbins, Power Electronics: Converters, Applications and Design, John Wiley & Sons, Inc., New York
2. L Umanand, Power Electronics, Essentials & Applications, Wiley India
3. M. D. Singh and K. B. Khanchandani, Power Electronics, Tata McGraw-Hill Publishing Company Ltd., New Delhi
4. D. G. Holmes and T. A. Lipo, Pulse Width Modulation for Power Converters: Principles and Practice, IEEE press and Wiley Interscience, USA
5. L. Corradini, D. Maksimovic, P. Mattavelli and R. Zane, Digital Control of High-frequency Switched-Mode Power Converters, IEEE press and Wiley, USA
6. Research papers and articles from reputed Journals.

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2020-21 and onwards