

PCEL4301 **POWER ELECTRONICS** (3-0-0)

Module-1 **12 Lecturers**

1. Power semiconductor devices: Switching and V-I characteristic of devices
Thyristor family: SCR, TRIAC, GTO, RCT, MCT, and Transistor Family: BJT, IGBT, and MOSFET. Ch: (1.3, 1.4, 4.2.2, 4.2.3, 4.3.2, 4.6, 4.10, 7.2, 7.4, 7.5).
2. (a) Triggering Methods: SCR: UJT and R-C triggering scheme, Power Transistor: MOSFET Gate drive, BJT base drive, IGBT gate drive, Isolation of gate and base drive. Ch: (17.2, 17.3, 17.4, 17.5).
(b) Protection of Devices: SCR: Over voltage, over current, dv/dt , di/dt , Gate Protection. Transistor: protection of power BJT, IGBT and power MOSFET, dv/dt & di/dt limitation. Ch: (18.4, 18.5, 18.6, 18.7, 18.8, 4.8, 7.9, 7.10)

Module-2 **12 Lectures**

- 3(a). AC to DC converter: Un controlled Diode rectifier : Single phase half wave and full wave rectifiers with R-L and R-L-E load ,3 phase bridge rectifier with R-L and R-L-E load Ch: (3.2, 3.3, 3.4, 3.5, 3.8)
Controlled rectifiers : Principle of phase controlled converter operation, single phase full converter with R-L and R-L-E load, 3 phase full converter with R-L and R-L-E load ,single phase semi converter with R-L and R-L-E load, 3 phase semi converter with R-L and R-L-E load.
Ch: (10.2, 10.3, 10.6, 10.9, 10.10)
Single phase PWM rectifier, Three phase PWM rectifier.
Ch: (10.8.3, 10.8.4, 10.8.5)
- 3(b). AC –AC converter : AC voltage controller: Single phase bi-directional controllers with R and R-L load, single phase cycloconverters, ac-voltage controllers with PWM control. Ch: (11.4, 11.5, 11.9.1, 11.10)

Module 3 **12 Lectures**

- 3(c). DC to DC converter: Classification: First quadrant, second quadrant, first and second quadrant, third and fourth quadrant, fourth quadrant converter.
Switching mode regulators: Buck regulators, Boost regulators, Buck-Boost regulators, Cuk regulators, Isolated Types: Fly Back Converters, Forward converters, Push Pull Converters, Bridge Converter.
Ch: (5.7, 5.8.1, 5.8.2, 5.8.3, 5.8.4)
- 3(d) DC to AC converter: Inverters: PWM inverters, Single phase Bridge Inverters, 3-Phase Inverters-180 deg. conduction, 120 deg. conduction. voltage control of 3-Phase Inverters: Sinusoidal PWM , space vector modulation, Current Source Inverter, Zero Current Switching resonant inverters, Zero Voltage Switching resonant inverter. Ch: (6.4, 6.5, 6.8.1, 6.8.4, 6.10, 8.8, 8.9)
4. Applications: UPS, SMPS, Battery Chargers, Electronic Ballast, Static VAR Compensator. Ch: (14.2.1, 14.2.2, 14.2.3, 14.2.4, 14.2.6, 13.6.4)

Text Books:

1. Power Electronics: Circuits, Devices and Applications by M H Rashid, 3rd Edition, Pearson

Reference Books:

1. Power Electronics: Principles and Applications by J. Vithayathil, TMH Edition
2. Power Converter Circuits by W Shepherd and L Zhang, CRC, Taylor and Francis, Special Indian Edition.
3. Power Electronics: Converters , Applications, and Design by Mohan, Undeland and Robbins, Wiley Student Edition.