Course Type	CourseCode	Nameof the Course	L	T	P	Credits
DE	NEED505	High Power Converters	3	0	0	3

CourseObjective

- The Syllabus concerns understanding, modelling, operating constraints, and steady-state analysis of high-power converters. However, strong fundamental knowledge about power electronic components and their interfacing are the prerequisite for the course.

LearningOutcomes

Upon successful completion of this course, the students will

- Understand the operating principle, constraints and techniques involved in high power application of different power electronic converters.
- They will be able to perform steady state analysis of such power electronic systems.

Unit No.	Topicsto beCovered	Lecture Hours	LearningOutcome
1	**Introduction:** Technical requirements and challenges, Power converter configurations, Applications.	4	A comprehensive introduction to the course content will be delivered. The challenges in developing large power rating converters will be discussed in detail.
2	**High power semiconductor devices:** Ratings and characteristics of available power semiconductor devices for high power applications, Operations of series connected device, causes of voltage unbalance and voltage balancing.	3	Students will gain knowledge about available power semiconductor devices, operations and configurations, and protection systems for such power converters.
3	**AC to DC conversion:** Multi-pulse Diode Bridge and SCR rectifier (6, 12, 18 and 24 pulse rectifiers) - Circuit configuration, operating principle, influence of line and leakage inductances, PF and THD at AC side, PWM Current source rectifier	8	Students will gain knowledge of DC-AC rectifier topologies for high-power applications and their performance analysis.
4	**AC to AC conversion:**Phase shifting transformers, Matrix converter.	5	Students will gain knowledge of AC-AC conversion.
5	**DC to AC Conversion:** Two level Voltage Source Inverter (VSI), PWM Methods.	6	Students will gain knowledge on basics of voltage source inverter and associated switching strategies.
6	**Multi-level Inverter:** Diode-Clamped Multilevel Inverters, Cascaded H-Bridge Multilevel Inverters, Neutral Point Clamped (NPC) H-bridge Inverter, Flying Capacitor Multilevel Inverter, PWM Methods; PWM current source inverter.	10	Students will gain knowledge on different multilevel-inverter topologies whose application area is in high power rating power electronic systems.
7	**Applications:** Medium Voltage motor drives, HVDC transmission and other suitable applications.	6	Students will gain knowledge on the application potential of high-power converters.
	Total Contact Hours	**42**	

Textbooks:

1. Bin Wu & Mehdi Narimani, High Power Converters and AC Drives, Wiley.
2. D. G. Holmes and T. A. Lipo, Pulse Width Modulation for Power Converters, Wiley.

Reference books:

1. Sixing Du, ApparaoDekka, Bin Wu &NavidZargari, Modular Multilevel Converters: Analysis, Control and Applications, Wiley - IEEE Press.