Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology

Fourth Year Bachelor of Engineering (Electrical Branch)

With effect from: Academic Year 2020-21

Subject Code: EE805-N-A	Subject Title: Advanced Power Electronics-II

Course Objective:

The educational objectives of this course are

- To understand Advanced power electronic circuits and their role in power conversion
- To study basic topologies of various converter.

A. Teaching / Examination Scheme

Teaching scheme				Total Credit	Evaluation Scheme					Total Marks
L	T	P	Total		Theory		IE Marks	CIA Marks	Pract. Marks	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks				
4	0	2	6	5	3	70	30	20	30	150

B. Outline of the Course:

Multi-level converters:

Bridge inverters, Need for multi-level inverters, Concept of multi-level, Topologies for multi-level: Diode Clamped, Flying capacitor and Cascaded multilevel configurations; Features and relative comparison of these configurations; Switching device currents; DC-link capacitor voltage balancing, features of multilevel converters, Applications.

Design of DC to DC Converter

Introduction, Full-Bridge DC-DC Converter design, Design of LC filter, Transformer Desig, Selection of Transformer Core, Number of Turns, Conductor Selection, Transformer Parameters, Heat Sink Design,Thermal Resistance Calculation, Loss Calculation, Conduction Loss, Switching Loss, Heat Dissipation Area.

AC Drives

Induction motor drives, Characteristics, Stator voltage control, Rotor voltage control, Frequency control, Voltage, Voltage and Frequency control

DC Drives

Basic Characteristic of DC motor, Operating Modes, Single-Phase Half-Wave converter drives, Semi converter drives, Full- converter drives, Dual converter Drives, Regenerative Brake control, Rheostetic Brake control, Two and Four quadrant DC-DC Converter Drives

FACTS

Introduction, Shunt compensators, Thyristor controlled Reactor, Thyristor switched Capacitor, Static VAR compensator, series compensation, Thyristor switched series Capacitor, Thyristor controlled series Reactor, series Static VAR compensator, Phase angle compensator.

C. Lesson Planning

SR No.	Lectures (Hours)	Weightage in % in Exam	Topic
1	06	20	**Multi-level converters:** Bridge inverters, Need for multi-level inverters, Concept of multi-level, Topologies for multi-level: Diode Clamped, Flying capacitor and Cascaded multilevel configurations; Features and relative comparison of these configurations; Switching device currents; DC-link capacitor voltage balancing, features of multilevel converters, Applications.
2	12	20	**Design of DC to DC Converter** Introduction, Full-Bridge DC-DC Converter design, Design of LC filter, Transformer Desig, Selection of Transformer Core, Number of Turns, Conductor Selection, Transformer Parameters, Heat Sink Design,Thermal Resistance Calculation, Loss Calculation, Conduction Loss, Switching Loss, Heat Dissipation Area
3	10	15	**AC Drives** Induction motor drives, Characteristics, Stator voltage control, Rotor voltage control, Frequency control, Voltage, Voltage and Frequency control
3	10	15	**DC Drives** Basic Characteristic of DC motor, Operating Modes, Single-Phase Half-

			Wave converter drives, Semiconverter drives, Full- converter drives, Dual converter Drives, Regenerative Brake control, Rheostetic Brake control, Two and Four quadrant DC-DC Converter Drives
4	10	15	**FACTS** Introduction, Shunt compensators, Thyristor controlled Reactor, Thyristor switched Capacitor, Static VAR compensator, series compensation, Thyristor switched series Capacitor, Thyristor controlled series Reactor, series Static VAR compensator, Phase angle compensator.
5	12	15	**Simulation** Simulation work related to power electronics and software
	60	100	

D. Instructional Method & Pedagogy

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
- Attendance is compulsory in lectures, which may carries five marks in overall evaluation.
- One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

E. Students Learning Outcomes

On successful completion of the course, student should be able to apply power electronics topology for power conversion.

Reference Books:

1. Ned Mohan, Tore M. Undeland, 'Power electronics: converters, applications, and design', John Wiley &Sons.,3rd edition.
2. Muhammad H. Rashid , "Power Electronics - circuits, devices and applications", Prentice Hall of India, 2nd edition.
3. P. S. Bimbhra, "Power Electronics", Khanna Publishers, New Delhi.
4. M.D. Singh, K B Khanchandani, 'Power Electronics', second edition, TATA McGraw Hill.