



**Kadi Sarva Vishwavidyalaya**  
**Faculty of Engineering & Technology**  
**Master of Engineering Semester II**  
**(Electrical Power System)**

(With effect from Academic Year 2017-18 (CBCS))

<b>Subject Code: MEEE204-N</b>	<b>Subject Title: Advanced Power Electronics</b>
<b>Pre-requisite</b>	

**A. Course Objective:**

- To present a problem oriented introductory knowledge of advanced power electronics.
- To focus on the study of electrical parameters & different engineering application based principles.
- To address the underlying concepts & methods of power electronics.

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				
04	00	02	06	05	03	70	30	20	30	150

**B. Outline of the Course:**

Sr. No	Title of the Unit	Minimum Hours
1	<b>Introduction:</b>	<b>6</b>
2	<b>AC-DC converter:</b>	<b>16</b>
3	<b>DC-AC converters:</b>	<b>16</b>
4	<b>Multilevel inverters:</b>	<b>12</b>
5	<b>Advance Electrical Drives:</b>	<b>10</b>

**Total Hours (Theory): 60**

**Total Hours (Lab): 30**

**Total Hours: 90**



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**Detailed Syllabus**

Sr. No	Topic	Lecture Hours	Weight age(%)
1	<p><b>Introduction:</b></p> <p>Review of power semiconductor devices: Thyristor, IGBT, MOSFET, IGCT, GTO and, role of SiC in power semiconductor technology</p>	6	10
2	<p><b>AC-DC converter:</b></p> <p>Uncontrolled rectifier, semi-controlled rectifiers, fully controlled rectifiers with R, RL and RLE load, effect of source inductance on performance of converter, firing schemes and circuits,</p> <p><b>MULTIPULSE CONVERTERS:</b> Multi-pulse converters: 12,18 pulse converters, phase shifting transformers</p> <p><b>POWER FACTOR:</b> power factor improvement techniques,</p> <p>PWM rectifiers: equal area PWM, sine PWM, Single Phase and Three phase boost rectifier circuits</p>	16	25
3	<p><b>DC-AC converters:</b></p> <p><b>Voltage Source Inverter:</b> 120° and 180° conduction modes,</p> <p><b>PWM techniques of voltage fed converters:</b> Selective Harmonic Elimination (SHE), sine modulation, Third harmonic injection, Hysteresis Current Control, Sigma-Delta Modulation, Space Vector Pulse Width Modulation: under modulation and over modulation and their implementation</p> <p><b>Current Source Inverter:</b> Current Source inverters and their role in high power drives,</p>	16	25
4	<p><b>Multilevel inverters:</b></p> <p>Diode Clamped MLI, Flying Capacitor MLI, Cascaded H-Bridge topology: operation with equal and unequal DC voltages,</p> <p>Carrier modulation schemes of multilevel inverter, SVPWM of Multilevel inverter, Neutral Point Balancing schemes</p>	12	20
5	<p><b>Advance Electrical Drives:</b></p> <p><b>Brushless DC motor:</b></p> <p>Sinusoidal and Trapezoidal BLDC motor, Electronic Commutator, Torque production in BLDC motor, Control of Brushless DC drives</p>	10	20
<b>Total</b>		<b>60</b>	<b>100</b>



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**C. Instructional Method and 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.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- One internal exam of 30 marks is conducted as a part of mid semester 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 carries a weight age of five 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.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

**D. Learning Outcome**

On successful completion of the course

- The student can be acquired the basic knowledge of electric circuits, electrical fundamentals, thus being prepared to pursue any area of engineering spectrum in depth as desired.
- The students will be able to effectively employ electrical systems and lead the exploration of new applications and techniques for their use.

**E. Text Books & Reference Books:**

- Rashid, M. H., ‘*Power Electronics Circuits, Devices, and Applications*’, Prentice-Hall of India Pvt. Ltd., New Delhi, 2nd edition, 1999
- Dubey G.K., ‘*Power Semiconductor Controlled Drives*’, Prentice-Hall, Eaglewood Cliffs, New Jersey, 2002
- Ned Mohan, Tore M. Undeland and William P. Robbins, ‘*Power Electronics Converters, Applications, and Design*’, John Willey & Sons, Inc., 2ndEdition, 1999
- Bin Wu, ‘*High power converters and ac drives*’, Wiley-IEEE Press, 2002
  
- Sen P.C., ‘*Thyristor DC drives*’ John wiley and sons, New York, 1981
- B.K. Bose, ‘*Modern Power Electronics and AC drives*’, Prentice-Hall of India Pvt. Ltd., New Delhi