SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology

Bachelor of Technology (B. Tech.)
Instrumentation and Control

B.Tech. III Year: Semester – V

Subject Name: Power Electronics **Subject Code: BTIC13504**

Type of course: Professional Core Course
Prerequisite (if any): Basic Electronics

List of Courses where this course will be prerequisite :Industrial Drives & Control

Rationale: (should also include Description of the relevance of this course in the Program)

Power electronics is responsible for the conversion and control of electric power, with converters modifying the primary characteristics of electrical power such as voltage, current, frequency, and the basic form of AC or DC.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
2	0	2	3	60	25	15	30	20	150

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

BSC: basic science course /ESC: Engineering Science Course /HSM: Humanities and management /PCC: Professional Core course /PEC: professional Elective course /OEC: Open Elective course/ MD: mandatory noncredit course

Content:

Sr. No.	Content	Total Hrs	
1	**Power devices** Power devices, Working, Characteristics, specifications and applications of diode, BJT, SCR,TRIAC, DIAC, Power MOSFET,IGBT and UJT. SCR gate triggering and commutation circuits. Series and Parallel connection of SCR and its triggering arrangement	6	22%
2	**Rectifiers** Single Phase and Three Phase Half controlled and fully Controlled rectifiers, (Half wave, full wave and bridge Configuration) with R and R-L Load. Single Phase uncontrolled rectifiers	8	26%
3	**DC-DC Converters** Introduction, DC Choppers, Step-Down (Buck) Converter, Step-Up (Boost)Converter, Buck-Boost Converter.	8	26%
4	**Inverters** Introduction,Single-Phase Voltage Source Inverters,Three-Phase Voltage Source Inverters .Voltage control in single phase inverters, 3-phase bridge inverters, Pulse width modulated inverters.Current Source Inverters.	8	26%

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	**25**	**25**	**15**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy) Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

Sr no.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Power Electronics - Circuits, Devices and Applications	Rashid M. H	Prentice Hall, New Delhi, ISBN: 978-8120345317	2013	4th Edition
2.	Power Electronics	P. S. Bimbhra	Khanna Publishers ISBN: 978-8174092793	2012	5th Edition
3.	Power Electronics	M.D.Singh K Khanchandani	**McGraw Hill Education** ISBN: **978-0070583894**	2017	2nd Edition
4.	Thyristorised Power Controllers	Dubey G. K, Doradla S.R, Joshi and Sinha R.M	New Age International Publishers,New Delhi, ISBN: **978-8122434224**	2012	2nd Edition

Course Outcomes:

Sr. No.	CO statement At the end of the course the student will be able to:	Marks % weightage
CO-1	learn the basic principle of operation of semiconductor devices and list their applications.	25%
CO-2	analyze and compare the performance of various line commutated converters.	25%
CO-3	analyze & design various DC-DC converters.	25%
CO-4	analyze & design DC-AC converter..	25%

Mapping of CO-POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	**3**	**2**	**2**			**1**	**1**	**1**			**2**		**3**	**2**	**1**
CO2	**3**	**2**	**2**			**1**	**1**	**1**			**2**		**3**	**2**	**1**
CO3	**3**	**2**	**2**			**1**	**1**	**1**			**2**		**3**	**2**	**1**
CO4	**3**	**2**	**2**			**1**	**1**	**1**			**2**		**3**	**2**	**1**

List of Open learning website:

NPTEL lectures on Power Electronics

https://nptel.ac.in/

List of Open Source Software: GeckoCIRCUITS

FOR LAB SESSIONS:

List of Experiments:

1. Study of MOSFET, SCR, TRIAC, DIAC Characteristics.
2. Study of SCR Characteristics.
3. Study of TRIAC, DIAC Characteristics
4. Study of Single Phase Half Controlled Bridge Converter.
5. Study of Single Phase Fully Controlled Bridge Converter .
6. To study DC-DC converter-Buck converter.
7. To study DC-DC converter-Boost Converter.
8. To study single phase inverter-Half-bridge inverter.
9. To study single phase inverter -Full-bridge inverter.
10. Simulation of Power EC circuits in PSIM and SIMULINK.

Major Equipment Needed:

Power electronics trainer, Bread board trainer, Power Supply, Function generator, DSO