National Institute of Technology Raipur												
Course of Study and Scheme of Examination							B. Tech. 4th Semester				Branch:Electrical	
S. No.	Subject Code	Subject Name	Periods per Week			TA	Examination Scheme				Total Marks	Credits
							MSE/MTR		ESE/ESVE			
			L	T	P		Theory	Prac.	Theory	Prac.		
1	EL104101EL	Electrical Circuits & Network Analysis	3	1	0	20	30		50		100	4
2	EL104102EL	Electrical Machine -1	3	1	0	20	30		50		100	4
3	EL104103EL	Power Electronics	3	1	0	20	30		50		100	4
4	EL104104EL	Signals & Systems	3	1	0	20	30		50		100	4
5	EL104105EL	Utilization of Electrical Energy	3	1	0	20	30		50		100	4
6	MA104006MA	Mathematics-IV	3	1	0	20	30		50		100	4
7	EL104401EL	Electrical Machine -1 Laboratory	0	0	2	40		20		40	100	1
8	EL104402EL	Power Electronics Laboratory	0	0	2	40		20		40	100	1
												26

Electrical Circuit & Network Analysis

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Electrical Engineering	3-1-0, (4)	Program Core	EL104101EL

[Pre-requisites: Basic Electrical Engineering EL10I022EL]

Course Outcomes

On successful completion of the course, students will be able to

1. Explain basic Electric Circuit concepts.
2. Define various Circuit Theorems and illustrate their applications to solve circuit problems.
3. Make use of network reduction methods for calculation of various circuit parameters.
4. Analyze circuit problems using two port network parameters.
5. Apply basic concepts of coupled circuits and evaluate network performance under resonant condition.
6. Evaluate steady state and transient analysis of AC circuits and to design Filters

Course Content

UNIT-I

Network theorems solutions of A.C. Network equations Kirchhoff s laws to network analysis, choice between loop and nodal analysis, concept of super loop and super mesh. A.C. circuit analysis-Network Theorems and their application to AC and DC circuits; Concept of duality and dual networks. Classical solution of first and second order differential equations for Series and parallel R-L, R-C, R-L-C circuits, initial and final conditions in network elements, forced and free response, time constants steady state and transient state response.

UNIT-II

Sinusoidal steady state and Transient analysis-Representation of sine function as rotating phasor, stead state response using phasor, frequency response plot of electrical network (magnitude and phase plot). Analysis of electrical circuits using Laplace Transform for all standard input cases, convolution integral, inverse Laplace transform, transformed network with initial conditions.

UNIT-III

Tr.vo Port Network and Network Functions: Terminal pairs, relationship of two port variables, Z, Y. transmission parameters and hybrid parameters, interconnections of two port networks. Network Functions for one pon and two port, calculations of network functions for ladder and general network, poles and zeros, restrictions on pole and zero locations for driving point and transfer functions. time domain behavior from pole and zero plot, stability of active network.

UNIT-IV

Coupled Circuits: Electrostatic and electromagnetic coupling, self-inductance, mutual inductance, coupling coefficient, Dot convention for coupled circuits, complete network with conductive and inductive coupling, Series and parallel resonance, quality factor, band width, selectivity, half power frequencies.

UNIT-V

Filter Design: Filters Low pass filters, high pass filters, band pass filters, band Equalizer and delay equalizers, Butterworth filters, m-derived filters, constant filters. Reject filters, Cain k-filters, and design of filters.

Course Materials

Reference Books:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 3rd Edition.
2. Alexander and Sadiku, "Electric Circuits", Mc GrawHill Education, 6th Edition.
3. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 2nd Edition.
4. William H. Hayt, Jack E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Iinternational, 5th Edition.
5. K.V.V. Murthy and M.S.Kamath, "Basic Circuit Analysis", Jaico Publishing, 1st Edition.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3				2				3		1
CO2	3	3	3	3								1
CO3	3	3	3	3	2							2
CO4	3	3		3	2							
CO5	3	3	3	3	2							2
CO6		3	3	3	3			2	3	2		3

Mapping of course outcomes with program specific outcomes

	PSO1	PSO2	PSO3
CO1	2	2	1
CO2	3	1	1
CO3	3	1	1
CO4	2	0	0
CO5	3	1	1
CO_6	3	2	2

Electrical Machine –I

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Electrical Engineering	3-1-0, (4)	Program Core	EL104102EL

[Pre-requisites: Basic Electrical Engineering EL10I022EL]

Course Outcomes

On successful completion of the course the students will be able to:

1. Interpret the operating concept and analyze the performance of DC machine and three phase transformer.
2. Acquire knowledge of different industrial and domestic applications of DC machine and three phase transformer.
3. Infer the practical application & advantages of speed control of DC Motor in industries.
4. Appraise the structure of DC Drive systems and their role in various applications

Course Content

UNIT-I Three Phase Transformers

Review of single phase transformers, Three-phase transformers, core and shell type transformer, Different connections and vector groups, three winding transformer connections, Parallel operation of single-phase and three-phase transformer, open delta, Scott connection, back-to back test, excitation phenomenon in transformers.

Unit II DC Generator

Electromagnetic principle of DC machine, constructional details, production of voltage and Torque, classification of DC machine, armature reaction and its effect, commutation, methods of Improving commutation, Operating haracteristics of DC generator, parallel operation.

Unit III DC Motor

DC machine as motor, characteristics of DC motor, starting and speed control of DC motors, losses in DC machines, Testing of DC machines, Swinburne's test, regenerative and retardation test, Braking of DC motor.

Unit IV Electric Drives

Basic concept of electric drives, Requirement of electric drives, drive classification, fundamental torque equation, speed torque converter and multi quadrant operation, equivalent values of drive Parameters, concept of load torque. Steady state stability, closed loop control of drives: current limit control, closed loop torque control, closed loop speed control, closed loop position control.

Unit V DC Motor Drive

DC motor drives, Controlled rectifier fed DC drives: Single phase half wave controlled rectifier fed DC drives, single phase semi controlled rectifier fed DC drives, and single phase fully controlled rectifier fed DC drives. Three phase controlled rectifier fed DC drives.

Course Materials

Text Books:

1. Electric Machines by D P Nagrath & I J Kothari, Mc Graw Hill Education (lndia Private Ltd).
2. Electrical Machinery by A.E. Fitzgerald, Charles Kingsley Jr., Stephen D. Umans Tata McGraw-Hill Education rivate Ltd.
3. Fundamentals of Electrical Drives by GopalK. Dubey, Narosa Publishing House.
4. A textbook of Electrical Technology, Vol. II AC & DC Machines by B.L. Theraja, S. Chandd Company Ltd.
5. Generalized theory of Electrical Machines, by P.S. Bimbhra, Khanna publications

Reference Books:

1. Performance & Design of D.C. Machines by A.E. Clayton & Hancock, C.B.S. Pbs.
2. Performance & Design of A.c. Machines by M.G. Say. c.B.S. Publishers
3. Electrical Drives: Concepts and Applications by Vedam Subrahmanyam, Mc Graw Hill Education (India Private Ltd).

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2					3			3
CO2	3			1		3	2		3			3
CO3	3	3	2	3	3	3			3			3
CO4	3	3	3	1	3	3	3		3			3

Mapping of course outcomes with program specific outcomes

	PSO1	PSO2	PSO3
CO1	3	2	1
CO2	2	3	2
CO3	3	2	1
CO4	3	3	2

Power Electronics

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Electrical Engineering	3-1-0, (4)	Program Core	EL104103EL

[Pre-requisites: Basic Electrical Engineering EL10I022EL]

Course Outcomes

On successful completion of the course the students will be able to:

1. Classify different power electronics devices on the basis of construction, operation and their ratings.
2. Build different techniques of triggering and commutations and compare its application.
3. Develop controlled rectifier under R, RL and RLC load conditions and analyze its industrial applications
4. Design single phase and three phase inverters considering different modulation techniques and discover its industrial applications.
5. Construct switch mode dc-dc converter topologies and discuss its industrial applications

UNIT-I

Power electronics devices-Construction and Characteristics of power devices SCR, DIAC, TRIAC, SCS, GTO, PUJT , MOSFET, IGBT, two transistor model of SCR, Protection of thyristors against over voltage and over current, dv/dt and di/dt. Series and parallel operations of SCRs

UNIT-II

Triggering and communication techniques-Turn on circuits for SCR, triggering with single pulse and train of pulses, synchronizing with supply, triggering with microprocessor, commutation techniques

UNIT-III

Controlled rectifiers- Converters, single phase, three phase, half controlled and fully controlled rectifiers, Waveforms of load voltage and line current under constant load current, effect of transformerleakage inductance, dual converter. Applications of Rectifier

UNIT-IV

Inverters-Single Phase Inverters-PWM Principles. Sinusoidal Pulse Width Modulation in SinglePhase Inverters, Choice of carrier frequency in SPWM, Three Phase Inverters: Three Phase Square Wave /Stepped Wave Inverters, Three Phase SPWM Inverters, Choice of Carrier Frequency in Three Phase SPWM Inverters, Industrial Applications of inverter

UNIT-V

Basic principles of switched mode dc-dc power conversion: isolated and non-isolated converter configurations. Industrial applications of converter

Course MaterialsText Books:

1. Muhamed H. Rashid, “Power Electronics Circuits, Devices and Applications”, Prentice Hall International, 3rd Edition, 2004.

2. Singh and Khanchandani: Power Electronics, TMH, 1998.

Reference Books:

1. P S Bhimbhra: Power Electronics, Khanna Publication
2. Sen: Power Electronics, TMH, 1987.
3. Dubey: Thyristorised power controllers, Wiley Eastern 1986.
4. Vithayathil: Power Electronics – Principles and applications McGraw-Hill, 1995.
5. Lander: Power Electronics, 3rd Edition, McGraw-Hill, 1994.
6. Ned Mohan, T. M. Undeland, W. P Robbins: Power Electronic, Converters, Applications and Design, John Wiley & Sons
7. B W Williams, Power Electronics Devices, Drives and Applications, ELBS publication

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		3								
CO2	2	3	3	3	3	2	3		2	2	1	3
CO3	2	3	3	3	3	2	3		2	2	1	3
CO4	2	3	3	3	3	2	3		2	2	1	3
CO5	2	3	3	3	3	2	3		2	2	1	3

Mapping of course outcomes with program specific outcomes

	PSO1	PSO2	PSO3
CO1	1	0	0
CO2	3	3	2
CO3	3	3	2
CO4	3	3	2
CO5	3	3	2

Signals & Systems

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Electrical Engineering	3-1-0, (4)	Program Core	EL104104EL

[Pre-requisites: Basic Electrical Engineering EL10I022EL]

Course Outcomes (COs)

On completion of this course, the students will be able to:

1. Classify the continuous time and discrete time signals and systems
2. Analyze the discrete signals and systems using Fourier analysis.
3. Apply discrete time functions based on their properties to determine the response of LTI systems.
4. Examine the signals and systems based on time and frequency characterization.
5. Discuss the work and performance of discrete systems by signal flow graphs.

Course Content

UNIT-I Introduction

Continuous Time and Discrete Time signals, classification, and Discrete Time Systems, basic System Properties. Continuous and Discrete Time LTI Systems, properties of LTI Systems, Description of LTI Systems using Difference equations.

UNIT-II Fourier Series Analysis of Periodic Signals

Complex Exponential Analysis of LTI Systems, Fourier Series representation of DT periodic Signals, properties of Discrete Fourier Series, Fourier series and LTI Systems, DT Signals Filtering.

UNIT-III Fourier Transform

Representation of a periodic Signals by continuous FT, FT of periodic signals, convolution and multiplication property of continuous FT, Discrete Fourier Transform: Properties of DTFT and DFT, convolution property, multiplication property, Duality, Systems characterized by Linear ConstantCoefficient Difference Equations. FFT algorithms – Radix-2 Decimation in Time & Decimation in Frequency algorithms.

UNIT-IV Time and Frequency Characterization of Signals and Systems

Magnitude and phase representation of FT, Magnitude and phase response of LTI systems, Time domain and Frequency domain aspects of ideal and non-ideal filters.Z-TRANSOFRM: Z-transform, Region of convergence and its properties, Inverse Z transform, properties of ZT, Analysis and characterization of LTI systems using Z-transform.

UNIT-V Sampling & Flow Graphs

Sampling and reconstruction of band limited signals. Low pass and band pass sampling theorems. Aliasing. Anti-aliasing filter. Practical Sampling-aperture effect. SIGNAL FLOWGRAPHS: Impulse Response and Transfer function of linear Systems, Block diagrams, Signal flow graphs, Basic properties of SFG, SFG Terms, SFG Algebra, Gain formula, Application of gain formula to block diagrams.

Course Materials

Text/Reference Books:

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, Signals and Systems Prentice Hall India, 2nd Edition, 2009.
2. Robert A. Gable, Richard A. Roberts, Signals & Linear Systems, 3rd Edition, John Wiley, 1995.
3. S.Haykin and B.VanVeen "Signals and Systems, Wiley, 1998.
4. M.Mandal and A.Asif, "Continuous and Discrete Time Signals and Systems,Cambridge, 2007.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2	3					2						1
CO3	3											
CO4	3	3										
CO5	2	3				3						1

Mapping of course outcomes with program specific outcomes

	PSO1	PSO2	PSO3
CO1	1	0	0
CO2	1	1	1
CO3	1	0	0
CO4	1	0	0
CO5	1	1	1

Utilization of Electrical Energy

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Electrical Engineering	3-1-0, (4)	Program Core	EL104105EL

[Pre-requisites: Basic Electrical Engineering EL10I022EL]

Course Outcomes

1. Develop a clear idea on various illumination techniques and hence can design lighting schemes for specific applications
2. Select as well as apply an appropriate method of electric heating or welding for any particular industrial application.
3. Construct an electric connection for any domestic appliances like Refrigerator and Air Conditioner
4. Investigate on the appropriate type of electric supply system as well as can evaluate the performance of a traction unit
5. Identify, formulate, and figure out the need of research and development activities required for the efficient use of electricity

Course Content

UNIT-I

Illumination-Nature of light, important definitions, laws of illumination, principle of production of light-discharge through gases under pressure - incandescence/sources of light-filament lamp, halogen lamp-discharge lamp-sodium discharge lamp, high pressure mercury discharge lamp, dual lamps, fluorescent lamps, modern lamps and their workings, lamp efficiency, requirements of good lighting, illumination level, absence of contrasts, shadows, glare, Color rendering-lamp fittings. Lighting schemes, design of indoor & outdoor lighting system street lighting, flood lighting, photometers.

UNIT-II

Electric Heating and Welding: Advantages of electric heating, classification of heating methods, detailed study of resistance heating, arc heating, electron bombardment heating, induction heating & dielectric heating and their control. Advantages of electric welding, Welding method, Principles of resistance welding, types, Principle of arc production, electric arc welding, characteristics of arc; carbon arc, metal arc, hydrogen arc welding method of and their applications.

UNIT-III

Domestic Utilization of Electrical Energy-induction based appliances, online and OFF line UPS, Power quality aspects - nonlinear and domestic loads. Earthling - domestic, industrial and substation. Refrigeration -Domestic refrigerator and water coolers-Air-Conditioning-Various types of air-conditioning system and their applications, smart air conditioning units.

UNIT-IV

Electrolytic Processes and Train Mechanics-Fundamentals of electro deposition-laws of electrolysis applications of electrolysis, electro deposition, manufacture of chemicals, anodizing, electro-polishing, electro-cleaning, electro-plating, electrometallurgy, electric supply. Types of services, speed time curve, average speed, and schedule speed, attractive effort for propelling a train, power of the traction motor, specific energy output, specific energy consumption, mechanics of train movement, co-efficient of adhesion.

UNIT-V

D.C. & A.C. traction, their characteristics, Starting and speed control of D.C. series motors, shunt transition, bridge transition, drum controller employing shunt transition, energy saving with series parallel starting, Metaldyne control, multiple unit control, braking of traction motors.

Course Materials

Text Books:

1. J. B. Gupta, “Utilisation of Electrical Energy and Electric Traction”, S. K. Kataria and Sons, Age International 10th Edition, 2012.
2. N. V. Suryanarayana, “Utilisation of Electrical Power", New Age International Publishers, 2005.

Reference Books:

1. Rajput R. K. “Utilisation of Electrical Power”, Laxmi Publications, 1st Edition, 2006.
2. E. Openshan Taylor, “Utilization of Electric Energy”, Orient Longmans.
3. P. V. Gupta et. al, “A Course in Electrical Power”, DhanpatRai & Sons, Delhi-6.
4. H. Partab, “Modern Electric Traction", Dhanpat Rai & Co'., 3rd Edition, 2012.
5. Energy Efficiency in Electrical Utilities' BEE Guide Book, 2010.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	3	2	3	3	3	3	3
CO2	2	2	1	1	2	2	2	1	2	2	2	2
CO3	2	2	1	1	2	2	1	2	2	2	2	2
CO4	3	3	3	2	3	3	2	3	3	3	3	3
CO5	3	3	3	3	2	3	3	3	3	3	3	3

Mapping of course outcomes with program specific outcomes

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	2	2	2
CO3	2	2	2
CO4	3	3	3
CO5	3	3	3

Mathematics-IV

[4thSemester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Mathematics	4-0-0, (4)	EPR	MA104006MA

[Pre-requisites:Mathematics-I, Mathematics-II]

Course Outcomes (COs)

On successful completion of this course, students will be able to

1. Solve system of linear Equations and Linear Difference equation by numerical method.
2. Solve non-linear equation and find best fit to the curve.
3. Find numerical solution of Ordinary differential equation.
4. Find numerical solution of partial differential equation.

Course Content

UNIT-1: NUMERICAL SOLUTIONS OF SIMULTANEOUS LINEAR EQUATIONSAND LINEAR DIFFERENCE EQUATIONS

Direct Methods - Gauss Elimination, Gauss-Jordan &Crout'sTriangularisation Method, Iterative Methods- Jacobi, Gauss- Seidel, Cholesky's Method, Sufficient Condition For Convergence, Power Method, Solution of Linear Difference Equations with Constant Coefficient.

UNIT-2: NUMERICAL SOLUTIONS OF NON-LINEAR EQUATION AND CURVE FITTING

Bisection Method, Regula-Falsi Method, Secant Method, Newton-Raphson Method, Order of Convergence, Birge-Vieta Method, Bairstow's Method, Principle of Least Squares, Fitting a Straight Line, Fitting a Parabola, Exponential Function, Method of Group Averages.

UNIT-3: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS

Picard's Method, Taylor's Series Method, Euler's Modified Method, Runge-Kutta Method of Fourth Order, Milne's Method, Adams–Bashforth Method to solve ODE.

UNIT-4: NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Numerical Solution of Laplace Equation and Poisson Equation by Liebmann's Method, Solution of One Dimensional Heat Flow Equation, Bender-Schmidt Recurrence Relation, Crank-Nicolson Method, Solution of One Dimensional Wave Equation.

Course Materials

Required Text: Text books

1. M. K. Jain, S. R. K. Iyengar & R. K. Jain Numerical Methods for Scientific and Engineering Computation, New Age International (P) Limited, Publisher.
2. B. S. Grewal, Numerical Method in Engineering and Science, Khanna Publisher.
3. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw-Hill, Inc. Publisher.

Optional Materials: Reference Books

1. P. Kandasamy, K. Thilagavathy, & K. Gunavathi, Numerical Methods, S. Chand Publisher.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons Inc. Publisher.

3. S. S. Sastry, Introductory methods of numerical analysis, PHI, Publisher.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1									1
CO2	3	2	1									1
CO3	3	2	1									1
CO4	3	2	1									1

Mapping of course outcomes with program specific outcomes

	PSO1	PSO2	PSO3
CO1	2	1	1
CO2	2	1	1
CO3	2	1	1
CO4	2	1	1

ElectricalMachine-1 Laboratory

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Electrical Engineering	0-0-2, (1)	Laboratory	EL104401EL

[Pre-requisites: Basic Electrical Engineering EL10I022EL]

Course Outcomes (COs)

On completion of this course, the students will be able to:

1) Utilize measuring instruments (Ammeter, Voltmeter, Multimeter and Tachometer, DSO) for analyzing the operation of transformer and DC motor.
2) Examine the steps involved in the speed control of DC Motor.
3) Examine the working of transformer and DC Motor for different supply and load settings.
4) Demonstrate and analyze the steps involved in the operation of converter-fed DC drives.
5) Infer the effect of variation in controller parameters on the speed profile of DC drives.

List of Experiments

1. To perform no load test on DC shunt motor.
2. To perform load test on DC shunt motor.
3. To perform speed control on DC shunt motor by Armature control method and Field control method.
4. To investigate the characteristics and performance of DC shunt motor.
5. To investigate the characteristics and performance of DC series motor.
6. To perform load test on DC shunt generator.
7. To study the magnetization characteristics on separately excited DC generator.
8. To perform following test on single phase transformer
(a) open circuit test and short circuit test.
(b) ratio test and polarity test
9. To study the Scott connection for three-phase to two phase conversion on transformers.
10. To perform load test on a three-phase transformer.
11. To study the operation of bridge type single phase fully controlled converter with motor/lamp load.
12. To study the operation of single-phase semi-controlled converter with motor/lamp load.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	2	1	2	3	3	1	3
CO2	3	3	3	3	3	2	2	1	3	3	1	3
CO3	3	3	3	2	3	2	2	2	3	3	1	3
CO4	3	3	3	3	3	2	2	1	3	3	2	3
CO5	3	3	3	3	3	2	2	1	3	3	2	3

Mapping of course outcomes with program outcomes

	PSO1	PSO2	PSO3
CO1	3	2	2
CO2	3	3	2
CO3	3	3	2
CO4	3	3	2
CO5	3	3	2

Power Electronics Lab.

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Electrical Engineering	0-0-2	Program Core	EL104402EL

[Pre-requisites: Basic Electrical Engineering EL10I022EL]

Course Objectives

1. To introduce students the basic theory of thyristor family members, their constructional detail, their characteristics and applications.
2. To familiarize the operation principle of AC-DC, DC-DC, DC-AC conversion circuits and their applications.
3. To introduce the students the AC-DC motor control using Power Electronics Devices.
4. To familiarize the students the applications of power electronics converters.

List of Experiments

1. To study of V-I Characteristics of SCR (Silicon Controlled Rectifier).
2. To study of different Triggering (RC and UJT) techniques.
3. To study of single phase half wave controlled Converter under R, L and RL loads.
4. To study of single phase semi-controlled Converter under R, L and RL loads.
5. To study of single phase full wave controlled Converter under R, L and RL loads.
6. To study of Various Commutation (Forced) circuits.
7. To study of DC-DC (Bulk and Bust) converter using IGBT/ MOSFET.
8. To study of single phase inverter using IGBT/MOSFET.
9. To study of three phases full wave Controlled Rectifier under R, RL and DC Motor load.
10. To study of single phase single phase cycloconverter.

Course Outcomes:

After the completion of the course the student will be able to

1. Understand the knowledge of various applications of semiconductor switches by understanding their static and dynamic characteristics
2. Experiment with the significance of various triggering circuits and commutation circuits to turn- on devices.
3. Categorise the performance characteristics of single/three phase controlled rectifiers for R, RL & RLE load and their operation under continuous/discontinuous mode of conduction.
4. Conclude basic knowledge on DC-DC converters for different applications.
5. Interpret the principle of DC-AC conversion and the different types of single/three phase inverter circuits.
6. Design different applications of converters

COs and POs mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	2	2	2			3	3
CO2	3	3	3	2	2	2	2	2			3	3
CO3	3	3	3	2	2	2	2	2		2	3	3
CO4	3	3	3	2	2	2	2	2		2	3	3
CO5	3	3	3	2	2	2	2	2			3	3
CO6	3	3	3	2	2	2	2	2		2	3	3

COs and PSOs mapping

	PSO1	PSO2	PSO3
CO1	3	1	2
CO2	3	1	2
CO3	3	2	2
CO4	3	2	2
CO5	3	1	2
CO6	3	2	2