CHOICE BASED CREDIT SYSTEM
EVALUATION SCHEME
AND
COURSE OF STUDY
ACCORDING TO AICTE MODEL CURRICULUM
IN
B.TECH – II YEAR
ELECTRICAL ENGINEERING APPROVED BY
BOARD OF SYLLABUS
JULY 2024
(w.e.f. Batch 2023 and onwards)

FACULTY OF ENGINEERING AND TECHNOLOGY
GURUKUL KANGRI (DEEMED TO BE UNIVERSITY)
HARIDWAR-249404

Website: https://www.gkv.ac.in/departments/ee/

(Effective from the academic session 2024-25)

GURUKULA KANGRI VISHWAVIDYALAYA, HARIDWAR

Faculty of Engineering & Technology

Electrical Engineering

B. Tech. Second Year

Syllabus in accordance with AICTE Model Curriculum

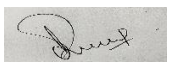
SEMESTER-III

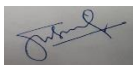
S. No	COURSE CODE	COURSE TITALE	PERIODS			EVALUATION SCHEME					SUBJECT TOTAL
						SESSIONAL EVALUATION				ESE	
THEORY											
			L	**T**	**P**	**CREDIT**	**CT**	**TA**	**TOTAL**		
1	BEM-C302	Engineering Mathematics-III	3	1	0	4	20	10	30	70	100
2	BEE-C 305	Electrical Machine-I	3	0	0	3	20	10	30	70	100
3	BEE-C 308	Electrical Circuit Analysis	3	0	0	3	20	10	30	70	100
4	BEE-C 309	Electromagnetic Field Theory	3	0	0	3	20	10	30	70	100
5	BET-C 307	Analog Circuit	3	0	0	3	20	10	30	70	100
6		MOOCS-1				3					
PRACTICAL											
7	BEE-C 351	Electrical Machine-I Lab	0	0	2	1	10	05	15	35	50
8	BEE-C 352	Electrical Circuit Analysis and Simulation Lab	0	0	2	1	10	05	15	35	50
9	BEE-C 353	Seminar Based on New Technologies	0	0	2	1	10	05	15	35	50
10	BET-C 351	Analog Circuit Lab	0	0	2	1	10	05	15	35	50
		TOTAL	**15**	**1**	**4**	**23**	**140**	**70**	**210**	**490**	**700**

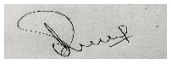
List of MOOC courses shall be decided by the departmental committee in each semester depending upon the list from SWAYAM/NPTEL and other recognized online platforms. Students have to study from Online Platform doubt sessions shall be held by internal teachers. Student has to give exam S WAYAM/NPTEL Platform for certification and credit transfer. SWAYAM courses to run every year from July onwards (Odd Semester) are declared in the month of May and for courses to run every year from January onwards (Even Semester) are declared in the month of December. For more detail, please visit https://nptel.ac.in/courses and https://swayam.gov.in/. The duration of the course must be 12 weeks.

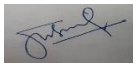
Notice: The SWAYAM course coordinator will ensure that the students are informed about MOOCs courses well before time. So that students get registered in the course decided by the departmental committee.

L	**Lecture**	**T**	Tutorial	**C**	Discipline Specific Course
CT	Cumulative Test	**TA**	Teacher Assessment	**ESE**	End Semester Examination
BEE	Electrical Code	**BET**	Electronics Code	**BEM**	Mathematics Code









Batch 2023-2024 and onwards

Effective from the academic session 2024-25

GURUKULA KANGRI VISHWAVIDYALAYA, HARIDWAR
Faculty of Engineering & Technology
Electrical Engineering
B. Tech. Second Year
Syllabus in accordance with AICTE Model Curriculum

SEMESTER-IV

S. No	COURSE CODE	COURSE TITALE	PERIODS			EVALUATION SCHEME					SUBJECT TOTAL
							SESSIONAL EVALUATION			ESE	
THEORY											
			L	**T**	**P**	**CREDIT**	**CT**	**TA**	**TOTAL**		
1	BEE-C 410	Electrical Machine-II	3	0	0	3	20	10	30	70	100
2	BEE-C 411	Power Electronics	3	0	0	3	20	10	30	70	100
3	BEE-C 412	Electrical Measurement and Measuring Instrument	3	0	0	3	20	10	30	70	100
4	BEE-C 413	Signal and System	3	0	0	3	20	10	30	70	100
5	BET-C 414	Digital System Design	3	0	0	3	20	10	30	70	100
6	BKT-A 403	Indian Knowledge Tradition	2	0	0	0	20	10	30	70	100
7		MOOCS-II				3					
PRACTICAL											
8	BEE-C 461	Electrical Machine-II Lab	0	0	2	1	10	05	15	35	50
9	BEE-C 462	Power Electronics Lab	0	0	2	1	10	05	15	35	50
10	BEE-C 463	Electrical Measurement and Measuring Instrument Lab	0	0	2	1	10	05	15	35	50
11	BET-C 464	Digital System Design Lab	0	0	2	1	10	05	15	35	50
		TOTAL	**17**	**0**	**8**	**22**	**160**	**80**	**240**	**560**	**800**
Note: Summer Training and Internship Program-I / Mini Project (3-4 Weeks), To be pursued during summer vacation, submit a certificate of completion in the department (in summer break after IV semester exam and will be assessed during V semester)											

Note:

1) The students have to undergo an industrial training/mini project/internship program during summer vacation (June –July) after IV semester examination. The report and certificate of completion of training program has to be submitted in the department, which will be evaluated in V semester. Also the students have to present PPT of the industrial training/mini project/internship.

2) List of MOOC courses shall be decided by the departmental committee in each semester depending upon the list from SWAYAM/NPTEL and other recognized online platforms. Students have to study from Online Platform doubt sessions shall be held by internal teachers. Student has to give exam SWAYAM/NPTEL Platform for certification and credit transfer. SWAYAM courses to run every year from July onwards (Odd Semester) are declared in the month of May and for courses to run every year from January onwards (Even Semester) are declared in the month of December. For more detail please visit https://nptel.ac.in/courses and https://swayam.gov.in/. The duration of the course must be 12 weeks.

Notice: The SWAYAM course coordinator will ensure that the students are informed about MOOCs courses well before time. So that students get registered in the course decided by the departmental committee.

L	**Lecture**	**T**	Tutorial	**C**	Discipline Specific Course
CT	Cumulative Test	**TA**	Teacher Assessment	**ESE**	End Semester Examination
BEE	Electrical Code	**BET**	Electronics Code	**A**	Ability Enhancement Compulsory Course

Course Code: BEM- C302
Course Name: Engineering Mathematics-III
MM: 100
Time: 3 Hr.
L T P
3 1 0

Sessional examination : 30
End Semester Examination: 70
Credit : 4

Prerequisites: Engineering Mathematics I, Engineering Mathematics II

Objectives: This course provides an introduction to the basic concepts and techniques of:

1. Laplace transform and its application to the solution of ordinary differential equations.
2. Fourier transform and its application to solve partial differential equations.
3. Z transform of elementary sequences both from the definition and by using tables and use the appropriate theorems to calculate Z transforms and inverse Z transforms.
4. Basic theory of function of a complex variableand theory of contour integration using residue calculus.
5. Errors and numerical solution of algebraic and transcendental equations.

Course Coordinator	Dr Lokesh Kumar Joshi
Course Faculty	Dr. Lokesh Kumar Joshil, Dr Vivek Goel
Lectures	40 Hours

NOTE:	The question paper shall consist of two sections (Section-A and Section-B). Section-A shall containten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus

UNIT	Module	Course Content	No. of Hours	POs mapped
UNIT-I	Module-I	**Laplace Transform:** Definition, Laplace transform of elementary functions, Shifting theorems, Transform of derivatives, Differentiation and Integration of transforms.	04	PO1/PO2/PO3/PO4/PO5/PO6/PO7,PO09, PO11/PO12

13/10/2023 (OP Chamola) 13.10.23 13.10.23 13/10/2023

	Module-2	Heaviside unit step and Dirac Delta functions, Convolution theorem.	02	
	Module-3	Solution of ordinary linear differential equations used in Mechanics, Electric circuits and Bending of beams.	02	
UNIT-2	Module-3	**Fourier Transform:** Definition of Fourier transform, Fourier sine and cosine transforms, Fourier integral formula, Parsevel's identity	06	PO1/PO2/PO3/PO4/PO5/PO6/PO7,PO09, PO11/PO12
	Module-4	Applications of Fourier transform in solving heat equations.	02	
UNIT-3	Module-5	**Z Transform:** Definition, Linearity property, Z transform of elementary functions, Shifting theorems, Initial and final value theorem, Convolution theorem.	04	PO1/PO2/PO3/PO4/PO5/PO6/PO7,PO09, PO11/PO12
	Module-6	Inversion of Z transforms, Solution of difference equations by Z transforms.	03	
UNIT-4	Module-7	**Function of Complex Variable:** Definition, Limit and Continuity of functions of Complex Variables; Analytic Functions, Harmonic Conjugate, Cauchy-Riemann Equations (without proof), Line Integral, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof).	05	PO1/PO2/PO3/PO4/PO5/PO6/PO7,PO09, PO11/PO12
	Module-8	Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integral (UnitCircle).	04	
UNIT-5	Module-9	**Errors and Roots of equations:** Absolute, relative, round-off and truncation errors, Significant digits, Algebraic and Transcendental Equations, Numerical solution, Method of bisection, Newton-Raphson method, Direct iterative method, convergence.	08	PO1/PO2/PO3/PO4/PO5/PO6/PO7,PO09, PO11/PO12
Total No. of Hours			40	

Course Outcome:	On completion of this course, the students will be able to 1. apply Laplace transform in various engineering problems and solve the differential equations arising in mechanics and electrical circuits(L2, L3, L5, L6) 2.understand the concept of Fourier transform and use it to solve partial differential equations having initial and boundary values(L1, L2, L3, L4). 3. apply Z transform to convert discrete-time signals to the Z-domain, analyze system behavior, and use these techniques in digital signal processing and control systems. (L1, L2, L3, L4). 4.learn the functions of complex variables and apply it to solve the

13/10/2023 (BP Chamola) 13.10.23 13.10.23 13.10.2023

problems of complex differentiation and integration(L1, L2, L3, L5).
5. solve algebraic and transcendental equations by applying iterative methods and analyze their convergence.(L2,L3, L4,L5)

Suggested books:

S. No.	Name of Authors /Books /Publisher	Year of Publication
1.	Kreyszig E., Advanced Engineering Mathematics 10 edition, Wiley India Pvt. Ltd. ISBN- 9788126554232	2015
2.	Gerald, C.F., Wheatley P.O., Applied Numerical Analysis, Pearson, 2007. ISBN-ISBN-10 032119019X	2007
3.	Grewal B.S., Higher Engineering Mathematics, Khanna, New Delhi, ISBN-978817409l956	2000
4.	Jain R. K., Iyenger S.R.K., Jain M.K., Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, ISBN-812242001X	2010

L1 – Remember, L2 – Understand, L3 – Apply, L4 – Analyze, L5 – Evaluate, L6 – Create

Scheme of Evaluation

- Attendance required: 75 %
- End semester exam: 70 marks (complete syllabus)
- Sessional Exam: 20 marks
- Assignment/seminar/tutorial: 10 marks(Each student in small groups will apply these concepts to solve practical problems)

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Course Code: BEE-C305

Course Name: ELECTRICAL MACHINE-I

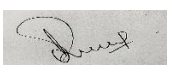
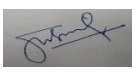
MM: 100 **Time: 4 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 0**

Prerequisites:	Basic Electrical Engineering, Basics of Physics and Mathematics
Objectives:	1: To introduce the Principles of Electro-Mechanical Energy Conversion. 2: To understand the basic concepts of the electrical machines working in the modern power system. 3: To understand and analyze the functioning of various types of electrical machines like transformer, generators and motors etc.
Course Coordinator	Mr.Yogesh Kumar

NOTE:	The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus

UNIT	Module	Course Content	No. of Hours	POs mapped	PSOs mapped
UNIT-1	*Module-1*	Principles of Electro-Mechanical Energy Conversion: Introduction, Flow of Energy in Electromechanical Devices, Energy in magnetic systems (defining energy & Co-energy), Singly Excited Systems; determination of mechanical force, mechanical energy, torque equation, Doubly excited Systems; Energy stored in magnetic field, electromagnetic torque, Generated EMF in machines; torque in machines with cylindrical airgap.	**08**	PO1/PO2/PO6/PO7/PO8/PO10/PO12	PSO1
UNIT-2	*Module-2*	D.C. Machines-Generators: Construction of DC Machines, Armature	08	PO1/PO2/PO6/PO7/PO8/PO10/PO12	PSO1/PSO2/PSO3

		winding, EMF and torque equation, Armature Reaction, Commutation,			
		Interpoles and Compensating Windings, Performance Characteristics of D.C. generators, losses and efficiency.			
UNIT-3	*Module-3*	D.C. Machines- Motors: Performance Characteristics of D.C. motors, Starting of D.C. motors; Concept of starting (3 point and 4 point starters), Speed control of D.C. motors; Field Control, armature control and Voltage Control (Ward Lenonard method) Efficiency and Testing of D.C. machines (Hopkinson's and Swinburn's Test).	09	PO1/PO2/PO4/PO6/PO7/PO8/PO10/PO12	PSO1/PSO2/PSO3
UNIT-4	*Module-4*	**Transformer:** Review of Single-phase transformer, Three phase transformer Construction, Three–phase unit transformer and Bank of three single phase transformers with their advantages, Three-phase transformer Groups (Phasor groups) and their connections, Y-Δ connection, Open delta connection, Three-phase/ 2 - phase Scott connection and its application.	**07**	PO1/PO2/PO4/PO6/PO7/PO8/PO10/PO12	PSO1/PSO2/PSO3
UNIT-5	*Module-5*	Transformer: All day efficiency, Sumpner's test, polarity test Excitation Phenomenon in Transformers, Harmonics in Single phase and 3-phase	08	PO1/PO2/PO4/PO6/PO7/PO8/PO10/PO12	PSO1/PSO2/PSO3

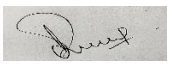
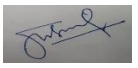



		transformers, Parallel operation and load sharing of Single phase and three phase transformers. Auto Transformer: Single phase Auto transformer, Volt-Amp relation, efficiency,			
		Copper saving, Advantages, disadvantages and applications of autotransformers.			
Total No. of Hours			**40**		

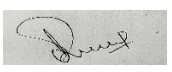
Course Outcomes:	**CO1:** To define and Introduce the Flow of Energy in Electromechanical Devices, Energy in magnetic systems. **CO2:** To explain the Singly Excited Systems; determination of mechanical force, mechanical energy, torque equation, Doubly excited Systems; Energy stored in magnetic field, Construction of DC Machines, Armature winding, EMF and torque equation, Armature Reaction, Performance Characteristics of D.C. motors, Starting of D.C. motors; Concept of starting (3 point and 4 point starters), **CO3:** To extend the Three-phase transformer Groups (Phasor groups) and their connections, Y-Δ connection, Open delta connection, Three-phase/ 2 - phase Scott connection and its application, Single phase Auto transformer, Volt-Amp relation, efficiency, Copper saving, Advantages, disadvantages and applications of autotransformers. **CO4:** To illustrate the electromagnetic torque, Generated EMF in machines; torque in machines with cylindrical airgap. Review of Single-phase transformer, Three phase transformer Construction, Three–phase unit transformer and Bank of three single phase transformers with their advantages. **CO5:** To apply the Speed control of D.C. motors; Field Control, armature control and Voltage Control (Ward Lenonard method) Efficiency, All day efficiency, Parallel operation and load sharing of Single phase and three phase transformers. **CO6:** To analyze the Testing of D.C. machines (Hopkinson's and Swinburn's Test), Sumpner's test, polarity test Excitation Phenomenon in Transformers, Harmonics in Single phase and 3-phase transformers.

Suggested books:

S. No.	Name of Authors /Books /Publisher	Year of Publication
1.	I.J. Nagrath & D.P. Kothari, Electrical Machines, Tata McGraw Hill.	2004
2.	Hussain Ashfaq, Electrical Machines, Dhanpat Rai & Sons.	2016
3.	Irving L. Kosow, Electric Machine and Transformers, Prentice Hall of India.	1991
4.	P.S. Bimbhra, Generalized Theory of Electrical Machines, Khanna Publishers.	1981
5.	Fitzerald, A.E., Kingsley and S.D.Umans, Electric Machinery, MC Graw Hill.	1990

6.	A.E. Fitggerald, C.Kingsley Jr. and Alexander Kusko, Electric Machinery, McGraw Hill,International Student Edition.	1990
7.	M. G. Say, Alternating Current Machines, Pitman & Sons.	1957
8.	O.C. Taylor, The performance & design of A.C. Commutator Motors, A.H. Wheeler &Co(P) Ltd.	1988
9.	Langsdorf, Theory of Alternating Current Machinery, Tata McGraw Hill.	1999



Batch 2023-2024 and onwards

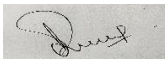
BEE-C305

ELECTRICAL MACHINE-I

CO-PO/PSO MAPPING

Course Outcomes (COs)	Action Verb (CO)	Bloom's Level	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
			Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Indidual and Team Work	Communication	Project Management and Finance	Life Long Learning			
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Define	Remember L1	3	3				2	2	2				2	3		
CO2	Explain	Understand L2	3	3				2	2	2		2		2	3	3	
CO3	Extend	Understand L2	3	3				2	2	2		2		2	3	3	3
CO4	Illustrate	Understand L2	3	3		3		2	2	2		2		2	3	3	3
CO5	Apply	Apply L3	3	3		3		2	2	2		2		2	3	3	3
CO6	Analyse	Analyse L4	3	3		3		2	2	2		2		2	3	3	3
	Average		3	2		3		2	2	2		2		2	3	3	3

Mapping %age	*0 - 5 = --*	*6 - 40 = 1*	*41 - 60 = 2*	*61 - 100 = 3*
Manpping Correlation	*No correlation*	*Low/ Slight*	*Moderate*	*Substantial / High*



Course Code: BEE-C308

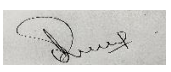
Course Name: Electrical Circuit Analysis

MM: 100 **Time: 3 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

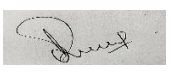
Prerequisites:	Basic Electrical Engineering , Mathematics
Objectives:	*1.* Concept of graphical solution to electrical network *2.* Methodical approach to problem solving. *3.* Network Theorem *4.* AC circuit analysis, series and parallel resonance, Three phase circuit *5.* Two-port network analysis using network parameters *6.* Network Synthesis
Course Coordinator	Mr.Yogesh Kumar

NOTE:	The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus

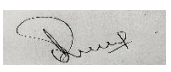
UNIT	Module	Course Content	No. of Hours	POs mapped	PSOs mapped
UNIT-1	Module-1	Graph Theory: Graph of a network, definitions, tree, co-tree, link. basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix, Duality, Loop and Node method of analysis.	**07**	PO1/ PO2/ PO3/ PO4	PSO1/ PSO2
UNIT-2	Module-2	Network Theorems: Application to ac network- Superposition theorem, Thevenin's Theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Millman's theorem, Compensation theorem, Tellegen's theorem.	**08**	PO1/ PO2/ PO3/ PO4/PO10	PSO1/ PSO3
UNIT-3	Module-3	Network function for one-port and two-port, calculation of network	**08**	PO1/ PO2/ PO3/ PO5	PSO1/ PSO2/PSO3



		function for ladder and general networks, poles and zeros with restrictions for driving			



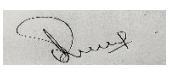
		point functions and transform functions, two-port parameters, stability by Routh-Harwitz criterion..			
UNIT-4	Module-4	Two port networks: Characterization of LTI two port networks, Z,Y, ABCD and h parameters, reciprocity and symmetry, interrelationship between the parameters, interconnections of two port networks, Ladder and Lattice networks, Image parameters and characteristic impedance.	**08**	PO1/ PO2/ PO3/ PO4	PSO1/ PSO3
UNIT-5	Module-5	Network Synthesis: Positive real function, definition and properties, properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.	**08**	PO1/ PO2/ PO4/ PO5/PO10	PSO2/ PSO3
Total No. of Hours			**40**		



Course Outcomes:	**CO1:** To define the Tree, Co-Tree, link, basic loop and basic cut set, Network Theorems: applications to ac networks, Positive Real Function, Definition and Properties LC, RC, RL. **CO2:** Explain the Incidence matrix, Tie Set Matrix, Cut Set Matrix, Ladder Networks, Lattice Networks, Driving Point Function, Application to AC Networks, Idea Transformer. **CO3:** Illustrate the Graph of a Network, Duality, Image Parameters and Characteristic of impedance, Synthesis of LC, RC, RL in Foster and Cauer form. **CO4:** To relate the Interrelations between parameters and Interconnection of Two Port Networks **CO5:** To apply the Loop and Node Method Analysis, Superposition Theorem, Thevenin Theorem, Norton Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem, Millman Theorem, Compensation Theorem, Tellegen Theorem, Series and Parallel Resonance, Three Phase AC Circuit, Effective or RMS Value, Average and Complex Power, Reciprocity and Symmetry. **CO6:** To analyze Impedance and Admittance, Mutual and Dot Convention Coupled Circuits, AC Circuit Analysis, Representation of Sine function as rotating phasor, Phasor Diagram, Characterization of LTI Two Port Networks, Z, Y, ABCD, h Parameters.

Suggested books:

S. No.	Name of Authors /Books /Publisher	Year of Publication
1.	M.E.Van Valkenburg, Network Analysis, Prentice Hall of India.	2019
2.	D.Roy Chaudhary, Networks and Systems, Wiley Eastern Ltd.	2010
3.	A. Chakrabarti, Circuit Theory (Analysis And Synthesis), Dhanpat Rai.	2013
4.	K.M. Soni , Circuit Analysis and Synthesis, S.K. Kataria & Sons.	2012

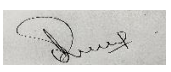


BEE-C308/BEE-C406
Electrical Circuit Analysis

CO-PO/PSO MAPPING

Course Outcomes (COs)	Action Verb (CO)	Bloom's Level	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
			Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team Work	Communication	Project Management and Finance	Life Long Learning			
			PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	**Define**	**Remember L1**	**3**	**3**	**3**			**3**	**2**	**3**	**3**	**3**		**3**	**3**		**3**
CO 2	**Explain**	**Understand L2**	**3**	**3**	**3**			**3**	**2**	**3**	**3**	**3**		**3**	**3**		**3**
CO 3	**Illustrate**	**Understand L2**	**3**	**3**	**3**	**3**		**3**		**3**	**3**	**3**		**3**	**3**		**3**
CO 4	**Relate**	**Understand L2**	**3**	**3**	**3**	**3**	**2**	**3**		**3**	**3**	**3**		**3**	**3**		**2**
CO 5	**Apply**	**Apply L3**	**3**	**3**	**3**	**3**	**2**	**3**		**3**	**3**	**3**		**3**	**3**	**2**	**2**
CO 6	**Analyse**	**Analyse L4**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**		**3**	**3**	**2**	**3**
	Average		**3**	**3**	**3**	**3**	**2**	**3**	**2.33**	**3**	**3**	**3**		**3**	**3**	**2**	**2.66**

Mapping %age	**0 - 5 = --**	**6 - 40 = 1**	**41 - 60 = 2**	**61 - 100 = 3**
Manpping Correlation	**No correlation**	**Low/ Slight**	**Moderate**	**Substantial/ High**



Batch 2023-2024 and onwards

Course Code: BEE-C309

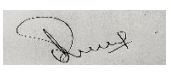
Course Name: Electromagnetic Field Theory

MM: 100 **Time: 3 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	Engineering Mathematics, Engineering Physics, Basic Electrical Engineering
Objectives:	*1.* Familiarize the students with the concepts pertaining electric and magnetic fields. *2.* Study the Conductor's Dielectric, Inductance, Capacitance. *3.* Concept of different Law's and Theorems like Gauss Law, Biot Savart law, Divergence theorem, Stokes theorem, Ampere's law, Poynting theorem. *4.* Study of Electromagnetic waves and Maxwell's equations
Course Coordinator	Dr. Ashish Dhamanda

NOTE:	The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus

UNIT	Module	Course Content	No. of Hours	POs mapped	PSOs mapped
UNIT-1	*Module-1*	**Electrostatics Fundamentals:** Electric charges, Coulomb's Law, Electric Field Intensity, Linear, Surface and Volume charge density, Gauss Law and its application, electric Scalar Potentials and potential difference, Potential due to uniformly charged disc and uniformly charged line, Electric field lines and equipotential contours, Potential gradient and electric field due to electric dipoles, Conservative nature of electric field.	**9**	PO1/ PO2/ PO3/ PO4/PO5/ PO6/PO7/ PO8/ PO9/ PO10/PO11/PO12	PSO1/PSO2/ PSO3
UNIT-2	*Module-2*	**Dielectrics & Capacitance:** Dielectric boundaries, Capacitance, Capacitance of system of conductors, Overhead lines and underground cables, Electrostatic energy and energy density, Force between charged conductors, dielectric strength and breakdown. Divergence and curl of vector fields, Divergence theorem, Stokes theorem.	**8**	PO1/ PO2/ PO3/ PO4/PO5/ PO6/PO7/ PO8/ PO9/ PO10/PO11/PO12	PSO1/PSO2/ PSO3
UNIT-3	*Module-3*	**Magnetic Fields Fundamentals:** Magnetic field intensity and magnetic flux density, Biot Savart law, Force	**7**	PO1/ PO2/ PO3/ PO4/PO5/ PO6/PO7/ PO8/	PSO1/PSO2/ PSO3

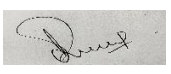


		between current carrying wires. Torque on closed circuits, Ampere's law, Magnetic scalar and vector potentials, Boundary conditions at magnetic surfaces.		PO9/ PO10/PO11/PO12	
UNIT-4	*Module-4*	**Magnetic Circuits and Inductance:** Faraday's law of electromagnetic induction, Inductor and inductance, Inductance of solenoids, toroids, transmission lines and cables, Mutual inductance, Inductors in series and parallel, energy stored in magnetic field, magnetic circuits.	**8**	PO1/ PO2/ PO3/ PO4/PO5/ PO6/PO7/ PO8/ PO9/ PO10/PO11/PO12	PSO1/PSO2/ PSO3
UNIT-5	*Module-5*	**Electro Magnetic Waves:** Maxwell's equations, Equation of continuity, displacement current, Maxwell's equation in point and integral forms, The wave equations, Uniform plane wave, relation between electric and magnetic field intensities in a uniform plane wave, Poynting vector, Poynting theorem.	**8**	PO1/ PO2/ PO3/ PO4/PO5/ PO6/PO7/ PO8/ PO9/ PO10/PO11/PO12	PSO1/PSO2/ PSO3
Total No. of Hours			**40**		

Course Outcomes:	**CO1:** To define the Electric charges, Coulomb's Law, Electric Field Intensity, Linear, Surface and Volume charge density, Gauss Law and its application, Capacitance, Capacitance of system of conductors, Magnetic field intensity and magnetic flux density, Biot Savart law, Ampere's law, Faraday's law of electromagnetic induction, Inductor and inductance, magnetic circuits. **CO2:** To demonstrate the Maxwell's equation in point and integral forms, Uniform plane wave, relation between electric and magnetic field intensities in a uniform plane wave. **CO3:** To explain the electric Scalar Potentials and potential difference, Potential due to uniformly charged disc and uniformly charged line, Electric field lines and equipotential contours, Potential gradient and electric field due to electric dipoles, Dielectric boundaries, Overhead lines and underground cables, Electrostatic energy and energy density, Force between charged conductors, dielectric strength and breakdown. **CO4:** To extend the Force between current carrying wires. Torque on closed circuits, Magnetic scalar and vector potentials, Boundary conditions at magnetic surfaces, Inductance of solenoids, toroids, transmission lines and cables, Mutual inductance, Inductors in series and parallel, energy stored in magnetic field. **CO5:** To illustrate the Conservative nature of electric field, Divergence and curl of vector fields, Divergence theorem, Stokes theorem, Maxwell's equations, Equation of continuity, displacement current, The wave equations, Poynting theorem.

Suggested books:

S. No.	Name of Authors /Books /Publisher	Year of Publication



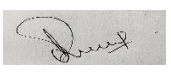
1.	Huseyin R. Hiziroglu, Electromagnetic Field Theory Fundamentals, Cambridge University Press.	2009
2.	Jean G. Van Bladel, Electromagnetic Fields, 2nd Edition, Wiley-IEEE Press.	2007
3.	Gangodhar, K.A., Field Theory, Khanna Pub. Delhi 11th edition.	*1994*
4.	William H. Hayt, Engineering electromagnetics, Tata- McGraw Hill, 5th edition.	1992
5.	Sarwate, V.V., ' Electromagnetic Fields and Waves', Wiley Eastern Limited, New Delhi.	1993
6.	Mahajan, A.S. and Rangawala, A.A. 'Electricity and Magnetism, Tata-McGraw Hill Publishing Company, Ltd, New Delhi.	1989
7.	Joseph, a. Edminister, Electromagnetic, Schaum's outline Series', International Edition, McGraw Hill Inc., New York.	1993
8.	Narayana Rao, N., 'Elements of Engineering Electromagnetics', Prentics Hall of India.	1991
9.	Ruth V. Buckley, Electromagnetic Fields Theory, Worked Examples and Problems, Red Globe Press London, Macmillan Publishers Limited.	1981

BEE-C 309

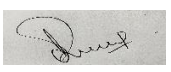
Electromagnetic Fields

CO-PO/PSO MAPPING

Course Outcomes (COs)	Action Verb (CO)	Bloom's Level	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
			Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Modern Tool Usage	The Engineer and Society	Environment and stainability	Ethics	Indidual and Team Work	Communication	Project Management and Finance	Life Long Learning			
			PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**Define**	**Remember L1**	**3**	**3**				**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**1**	**2**
CO5	**Demonstrate**	**Understand L2**	**3**	**3**	**2**	**2**		**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**1**	**2**
CO2	**Explain**	**Understand L2**	**3**	**3**	**2**			**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**1**	**2**
CO3	**Extend**	**Understand L2**	**3**	**3**	**2**	**2**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	1	**2**
CO4	**Illustrate**	**Understand L2**	**3**	**3**	**2**	**2**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**1**	**2**



	Average	**3**	**3**	**2**	**2**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**1**	**2**



Effective from the session 2024-25

Course Code: BET-C307
Course Name: ANALOG CIRCUITS

MM: 100 **Time: 3 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	Basic Electronics
Objectives:	The course is aimed at: [1] Imparting knowledge about multistage amplifiers, oscillators, active filters, regulators and IC OP-Amp applications. [2] Teaching about the different applications of op-amp, waveform generators, BJT and FET circuits and solving various quality parameters.
Course Coordinator	VIVEK ARYA

NOTE:	The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus

UNIT	Module	Course Content	No. of Hours	POs mapped	PSOs mapped
UNIT-1	Module-1	Multistage Amplifier: Effect of coupling and by-pass capacitors, types of coupling (DC, RC and TC), Darlington connection, cascode amplifier, coupling schemes for multistage amplifier and frequency response of transistor amplifier. Power amplifiers: ClassA, Class B, Class C and Class AB amplifiers and their efficiencies, harmonic distortion, push-pull amplifier. Basic idea of tuned amplifier.	**08**	PO1/ PO2/ PO3/ PO4	PSO1/ PSO2

UNIT-2	Module-2	IC OP-AMP Applications: OP-AMP Fundamentals (brief review of differential amplifier, current mirror, active load, level shifter, output stage; ac and dc characteristics) Basic building blocks using OP-AMPS. Inverting/ Non-inverting VCVS, Integrators, Differentiators, CCVS and VCCS, Instrumentation Amplifiers.	08	PO1/ PO2/ PO3/ PO4	PSO1/ PSO2
UNIT-3	Module-3	Waveform Generator: Square wave generators: 555Timer, Triangle generator, sawtooth generator, Sine wave generator, Wien-bridge and twin-T oscillators. Function Generators: Multi op-amp function generators, IC function generators, Non-linear Circuits: Logarithmic Amplifiers, Log/Antilog Modules, Precision Rectifier, Peak Detector, Sample and Hold Circuits. OP-AMP as Comparator, Schmitt Trigger, Square and Triangular Wave Generator, Monostable multivibrator. IC Analog Multiplier applications OTA	08	PO1/ PO2/ PO3/ PO4	PSO1/ PSO2
UNIT-4	Module-4	Active Filters: Introduction to filtering: Frequency response, Characteristics and terminology, Active versus passive filters, Low pass filter: First order low pass active filter, second order active filter model, second order low pass filter characteristics, Higher order filters. High pass active filter. Band pass filter: single op-amp band pass filter; multistage band pass filter, State variable filter.	08	PO1/ PO2/ PO3/ PO4	PSO1/ PSO2
UNIT-5	Module-5	Oscillators: Positive feedback, Berkhausen criterion for sinusoidal oscillation, Phase-shift oscillator, Weinbridge oscillator, Tuned oscillator, Hartley, Colpitts and Crystal oscillator. Voltage Regulators: OP-AMP Regulators, IC Regulators, Fixed Voltage Regulators (78/79, XX), SMPS.	08	PO1/ PO2/ PO3/ PO4	PSO1/ PSO2

Total No. of Hours	**40**		

Learning Outcomes:	At the end of the course, a student will be able to: 1. Understand the characteristics of amplifiers 2. Design and analyze various amplifier circuits 3. Design sinusoidal and non-sinusoidal oscillators 4. Understand the different wave from generators and active filters 5. Understand the functioning of OP-AMP and design OP-AMP based circuits

Suggested books:

1.	Sedra and Smith, Microelectronic Circuits", Oxford University Press, 5th Edition	2005
2.	J. Michael Jacob, Applications and design with Analog Integrated Circuits', PHI, 2nd Edition	2004
3.	Gayahwad, R.A., Op-Amp and Linear Integrated Circuits, PHI	2015

BET-C307
ANALOG CIRCUITS
CO-PO/PSO MAPPING

CO-PO/PSO MAPPING

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)	
	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	PSO 2
CO1	3		3	3								3	3	2
CO2	3		3	3								3	3	3
CO3	3		3	3								3	3	3
CO4	3		2	1								3	3	3
CO5	3		2	1								3	3	3
CO6	3		1	1								3	3	1
CO7	3		1	3								3	3	3
CO8	3		1	3								3	3	3
CO9	3		1	3								3	3	3
CO10	3		1	1								3	3	3

M. Rai

Effective from the session 2024-25

Course Code: BET-351
Course Name: Analog Circuit Lab

MM: 50 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit: 1**

Prerequisites:	Analog Circuit (BET-C307), Basic Electronics
Objectives:	Students will find frequency response curve of RC Coupled Amplifier, efficiency of A, B & AB Push pull Amplifier, CMRR of differential amplifier etc. by Experiments.
Course Coordinator	Anuj Kumar Sharma
Notes	1. In practical examination the student shall be required to perform one experiment. 2. A teacher shall be assigned 20 students for daily practical work in laboratory. 3. No batch for practical class shall consist of more than 20 students. 4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students. 5.Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.

LIST OF EXPERIMENTS:

1. To draw the frequency response curve of RC Coupled Amplifier.
2. To draw the frequency response curve of Transformer Coupled Amplifier.
3. To find the efficiency of A, B & AB Push pull Amplifier.
4. To find the frequency of oscillation of various Oscillator.
5. To find the CMRR of differential amplifier.
6. To study the gain and frequency response of Inverting Amplifier and Non Inverting Amplifier.
7. To study the operational amplifier as Differentiator and Integrator.
8. To study the Op-Amp as summer and subtractor.
9. To study the OP-AMP as square wave generator.
10. To study 2nd order Low Pass active Filter and High Pass active Filter.
11. To study the hysteresis characteristics of the Op- Amp based Schmitt trigger.
12. To study the monostable multivibrator using Timer IC 555.
13. To find the frequency of oscillation for astable multivibrator using Timer IC 555.

Course Outcomes:		Bloom's Knowledge Level
CO1	Understanding the Op-Amp circuit used for summer, subtractor, square wave generator, integrator, differentiator.	L2
CO2	Understanding the concept behind the hysteresis characteristics of the Op- Amp based Schmitt trigger	L2

M. Rai

CO3	Analyze the frequency of oscillation for astable multivibrator using Timer IC 555.	L4
CO4	Evaluate the gain and frequency response of Inverting Amplifier and Non Inverting Amplifier.	L5
CO5	Design 2nd order Low Pass active Filter and High Pass active Filter	L6
CO6	Design monostable multivibrator using Timer IC 555	L6

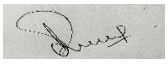
Course Outcomes (COs)	**BET-C351 ANALOG CIRCUITS LAB Program Outcomes (POs)**															
			PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**Understand**	**L2**	3	1	1	3	0	1	0	0	0	0	0	0	3	3
CO2	**Understand**	**L2**	3	0	0	0	0	0	0	0	0	0	0	0	3	3
CO3	**Analyze**	**L4**	3	0	1	0	2	1	0	0	0	0	0	2	2	3
CO4	**Evaluvate**	**L5**	2	0	3	0	1	1	0	0	0	0	0	0	3	2
CO5	**Design**	**L6**	3	3	3	3	2	0	0	0	0	0	0	3	2	3
CO6	**Desgin**	**L6**	3	3	3	3	2	0	0	0	0	0	0	3	3	3

Course Code: BEE-C 351
Course Name: ELECTRICAL MACHINE -I LAB

MM: 50 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit : 1**

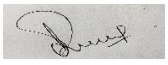
Prerequisites:	Basic Electrical Engineering, Electrical Machine-I
Objectives:	The objective of this lab is to give knowledge and provide hands on experience by performing various test on electrical machine and determining their characteristics.
Course Coordinator	**Mr. Yogesh Kumar**

Experiments	**Lab Content**	**No. of Hours**	**POs mapped**	**PSOs mapped**
Exp. No. 1	To obtain magnetization characteristics of a D.C. shunt generator.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 2	To obtain load characteristics of a D.C. compound generator (a) Cummulatively compounded (b) Differentially compounded.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 3	To obtain load characteristics of a D.C. shunt generator	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 4	To obtain speed-torque characteristics of a D.C. shunt motor.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 5	To obtain speed-torque characteristics of a D.C. series motor	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 6	To obtain efficiency of a D.C. shunt machine using Swinburn's test	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 7	To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 8	To perform open circuit and short circuit tests on a single-phase transformer and	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2



	determine parameters of equivalent circuit.			
Exp. No. 9	To obtain 3-phase to 2-phase conversion by Scott connection.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 10	To obtain efficiency and voltage regulation of a single phase transformer by load test	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 11	To perform Sumpner's test (back-to-back) on single-phase transformers.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 12	To perform parallel operation of single-phase transformers.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2

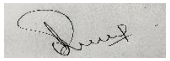
Course Outcomes:	**CO1:** To determine the characteristics of DC Shunt Generator, DC Series and Shunt motor, efficiency, speed control of DC Shunt motor, also the 3-phase to 2-phase conversion by Scott connection. **CO2:** To Justify the open circuit and short circuit tests on a single-phase transformer and determine parameters of equivalent circuit, Sumpner's test (back-to-back) on single-phase transformers, parallel operation of single-phase transformers.

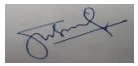


BEE-C351 Electrical Machine-I Lab CO-PO/PSO MAPPING																
CO-PO/PSO MAPPING																
Course Outcomes (COs)	**Action Verb (CO)**	**Bloom's Level**	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**	
			Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Indidual and Team Work	Communication	Project Management and Finance	Life Long Learning			
			PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**Determine**	**Evaluate L5**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**		**3**	**3**	**3**	
CO2	**Justify**	**Evaluate L5**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**		**3**	**3**	**3**	
	Average		**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**		**3**	**3**	**3**	

Mapping %age	***0 - 5 = --***	***6 - 40 = 1***	***41 - 60 = 2***	***61 - 100 = 3***
Manpping Correlation	***No correlation***	***Low/ Slight***	***Moderate***	***Substantial/ High***

Mapping Correlation	***No correlation***	***Low/ Slight***	***Moderate***	***Substantial/ High***
	--	1	2	3



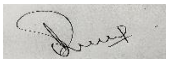


Course Code: BEE-C 352
Course Name: ELECTRICAL CIRCUIT ANALYSIS AND SIMULATION LAB

MM: 50 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit : 1**

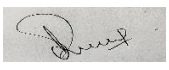
Prerequisites:	Basic Electrical Engineering
Objectives:	The objective of this lab is to provide hands on experience on software platform the verification of different AC theorems, study of RLC circuit, transient response of RL and RC circuits with network parameters.
Course Coordinator	Mr. Yogesh Kumar

Experiments	**Lab Content**	**No. of Hours**	**POs mapped**	**PSOs mapped**
Exp. No. 1	Verification of principle of Superposition theorem with AC source	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2/
Exp. No. 2	Verification of principle of Thevenin's theorem with AC source	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2/
Exp. No. 3	Verification of principle of Norton's theorem with AC source	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2/
Exp. No. 4	Verification of principle of Maximum Power Transfer theorem with AC source.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2/
Exp. No. 5	To study RLC series circuit	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2/
Exp. No. 6	To study RLC parallel circuit	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2/
Exp. No. 7	Determine the transient response of current in RL and RC circuits.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2/
Exp. No. 8	Determine the transient response of current in RLC circuits.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2/
Exp. No. 9	Study T and π networks	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2/



Exp. No. 10	Determination of frequency response of current in RLC Circuit with sinusoidal A.C input.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2/
Exp. No. 11	Determination of Z and h Parameters (D.C only) for a network and computation of Y and ABCD parameters	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2/
Exp. No. 12	Determination of driving point and transfer function of a two port ladder network and verify with theoretical values.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2/
Exp. No. 13	Verification of parameter properties in inter-connected two port networks: series, parallel, and cascade also study loading effect in cascade.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2/
Exp. No. 14	Determination of frequency response of a Twin- t notch filter.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2/

Course Outcomes:	**CO1:** To Explain and verify the Network Theorem in AC Circuits. **CO2:** To determine the transient response of current in RL, RC and RLC Circuit. Determination of frequency response of current in RLC Circuit with sinusoidal A.C input. **CO3:** To determine the Z and h Parameters for a network and also Determination of driving point impedance and transfer function of a two port ladder network. **CO4:** Theory and Study of the RLC Series and Parallel Circuit and Study T and π networks.

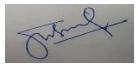


Batch 2023-2024 and onwards

BEE-C352 Electrical Circuit and Simulation Lab																
CO-PO/PSO MAPPING																
Course Outcomes (COs)	**Action Verb (CO)**	**Bloom's Level**	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**	
			Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team Work	Communication	Project Management and Finance	Life Long Learning			
			PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**	**PSO3**
CO1	**Determine**	**Evaluate L5**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**		**3**	**3**	**3**	
CO2	**Explain**	**Evaluate L5**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**		**3**	**3**	**3**	
CO3	**Theory**	**Create L6**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**		**3**	**3**	**3**	
	Average		**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**		**3**	**3**	**3**	

Mapping %age	***0 - 5 = --***	***6 - 40 = 1***	***41 - 60 = 2***	***61 - 100 = 3***
Manpping Correlation	***No correlation***	***Low/ Slight***	***Moderate***	***Substantial/ High***

Mapping Correlation	***No correlation***	***Low/ Slight***	***Moderate***	***Substantial/ High***
	--	1	2	3



BEE-C353
SEMINAR BASED ON NEW TECHNOLOGIES

L T P **MM: 50**
0 0 2
Credit: 1

Objective: To increase the communication ability of the students and to prepare them for presenting seminar on advanced topics of their branch.

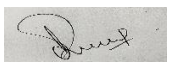
Note:

The students will be required to deliver a seminar on a topic of general interest in or any advanced technical topics related to the theory papers studied. The topic will be decided by mutual consent of the Faculty- in- charge and students.

* Total 50 marks include 15 marks for report and 35 marks for presentation.

Learning Outcomes:

1. Identify important practical concepts and grasp the depth knowledge of the topic.
2. Get in touch with recent technologies.
3. Solve industrial problems as a part of industrial training curriculum.
4. Sharpen their personality and intelligence, develop effective group communication, presentation, self-management and report writing skills.



Batch 2023-2024 and onwards

Course Code: BEE-C410

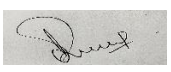
Course Name: ELECTRICAL MACHINE-II

MM: 100 **Time: 4 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 0**

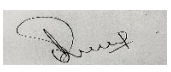
Prerequisites:	Electrical Machines-I
Objectives:	1: To understand the operation of synchronous machines. 2: To understand the Starting and speed control methods of Induction Motor. 3: To understand and analyze of functioning of various electrical machines.
Course Coordinator	Mr.Yogesh Kumar

NOTE:	The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus

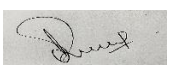
UNIT	Module	Course Content	No. of Hours	POs mapped	PSOs mapped
UNIT-1	*Module-1*	Synchronous Machine-Generator: Constructional features, Armature winding, EMF Equation, Winding coefficients, equivalent circuit and phasor diagram, Armature reaction, O. C. & S. C. tests, Voltage Regulation using Synchronous Impedance Method, MMF Method, Potier's Triangle Method, Parallel Operation of synchronous generators, operation on infinite bus, synchronizing power and torque co-efficient.	9	PO1/PO2/PO4/PO6/PO7/PO8/PO10/PO12	PSO1/PSO2/POS3
UNIT-2	*Module-2*	Synchronous Machine-Motor: Two Reaction Theory, Power flow equations of cylindrical and salient pole machines, operating characteristics, Starting methods, Effect of varying field current at different loads, V-Curves, Hunting & damping, synchronous condenser.	8	PO1/PO2/PO4/PO6/PO7/PO8/PO10/PO12	PSO1/PSO2/POS3



UNIT-3	*Module-3*	Three phase Induction Machine – I: Constructional features, Rotating magnetic field, Principle of operation Phasor diagram, equivalent circuit, torque and power equations, Torque-slip characteristics, no load & blocked rotor tests, efficiency, Induction generator.	9	PO1/PO2/PO4/PO6/PO7/PO8/PO10/PO12	PSO1/PSO2/PSO3
UNIT-4	*Module-4*	**Three phase Induction Machine-II:** Starting, speed control (with and without emf injection in rotor circuit), Deep bar and double cage rotors, Cogging & Crawling.	**7**	PO1/PO2/PO4/PO6/PO7/PO8/PO10/PO12	PSO1/PSO2/PSO3
UNIT-5	*Module-5*	**Single phase Induction Motor:** Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, repulsion motor. **AC Commutator Motors:** Universal motor, Single-phase a.c. series compensated motor, stepper motors.	7	PO1/PO2/PO4/PO6/PO7/PO8/PO10/PO12	PSO1/PSO2/PSO3
Total No. of Hours			**40**		

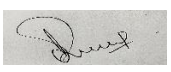


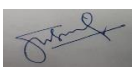
Course Outcomes:	**CO1:** To recall the Constructional features, Armature winding, EMF Equation, Winding coefficients, equivalent circuit and phasor diagram, Armature reaction. **CO2:** To explain the Two Reaction Theory, Power flow equations of cylindrical and salient pole machines, operating characteristics, Constructional features, Rotating magnetic field, Principle of operation Phasor diagram, equivalent circuit, torque and power equations. **CO3:** To extend the Voltage Regulation using Synchronous Impedance Method, MMF Method, Potier's Triangle Method, Universal motor, Single-phase A.C. series compensated motor, stepper motors. **CO4:** To illustrate the Parallel Operation of synchronous generators, operation on infinite bus, synchronizing power and torque co-efficient, V- Curves, Hunting & damping, synchronous condenser, efficiency, Induction generator, **CO5:** To apply the Starting methods, Effect of varying field current at different loads, Starting, speed control (with and without emf injection in rotor circuit), Deep bar and double cage rotors, Cogging & Crawling. **CO6:** To experiments with the O. C. & S. C. tests, Torque- slip characteristics, no load & blocked rotor tests.



Suggested books:

S. No.	Name of Authors /Books /Publisher	Year of Publication
1.	Hussain Ashfaq, Electrical Machines, Dhanpat Rai & Sons.	2016
2.	D.P. Kothari & I.J. Nagrath, Electrical Machines, Tata McGraw Hill.	2004
3.	Irving L. Kosow, Electric Machine and Transformers, Prentice Hall of India.	1991
4.	P.S. Bimbhra, Generalized Theory of Electrical Machines, Khanna Publishers.	1981
5.	Fitzerald, A.E., Kingsley and S.D.Umans, Electric Machinery, MC Graw Hill.	1990
6.	A.E. Fitggerald, C.Kingsley Jr. and Alexander Kusko, Electric Machinery, McGraw Hill,International Student Edition.	1990
7.	M. G. Say, Alternating Current Machines, Pitman & Sons.	1957
8.	O.C. Taylor, The performance & design of A.C. Commutator Motors, A.H. Wheeler &Co(P) Ltd.	1988
9.	Langsdorf, Theory of Alternating Current Machinery, Tata McGraw Hill.	1999





Course Code: BEE-C411
Course Name: POWER ELECTRONICS

MM: 100 **Time: 3 Hr.** **L T P** **3 1 0**	**Sessional: 30** **ESE: 70** **Credit : 4**

Prerequisites:	
Objectives:	• To understand the power semiconductor controlled and uncontrolled switches, working and characteristics. • To familiarize different protection circuit and analysis of DC-DC Converter. • To study and analysis of AC-DC converters. • To study and analysis of AC-AC converters. • To study and analysis of DC-AC converters
Course Coordinator	Mr. Brijesh Kumar

NOTE:	The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus

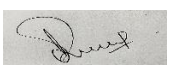
UNIT	Module	Course Content	No. of Hours	POs mapped	PSOs mapped
UNIT-1	Module-1	**Power Semiconductor Devices:** Power semiconductor devices their symbols and static characteristics and specifications of switches, types of power electronic circuits BJTO operation steady state and switch characteristics, switching limits Operation and steady state characteristics of *MOSFET and IGBT* Thyristor – Operation *V- I characteristics*, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC..	**08**	PO1/ PO2/ PO3/ PO6/ PO7/ PO12	PSO1/ PSO2
UNIT-2	Module-2 Module-3	**Power Semiconductor Devices (Contd.):** Protection of devices, Series and parallel operation of thyristors Commutation techniques of thyristor. **DC-DC Converters:** Introduction of Buck, Boost & amp; Buck boost Converters. Principles of step-down chopper, step down chopper with R-L load Principle of step-up chopper, and operation with RL load, Classification of choppers.	**10**	PO1/ PO2/ PO3/ PO6/ PO7/ PO10/ PO12	PSO1
UNIT-3	Module-4	**Phase Controlled Converters**: Single-phase half	**08**	PO1/	PSO1/

		wave controlled rectifier with resistive and inductive loads, effect of freewheeling diode. Single phase fully controlled and half-controlled bridge		PO2/ PO3/ PO4/ PO6/ PO11	PSO2
		converters. Performance Parameters Three phase half wave converters Three phase fully controlled and half controlled bridge converters, Effect of source impedance Single phase and three phase dual converters.			
UNIT-4	Module-5	**AC Voltage Controllers:** Principle of On-Off and phase controls Single phase ac voltage controller with resistive and inductive loads Three phase ac voltage controllers (various configurations and comparison) Single phase transformer tap changer. Cyclo Converters Basic principle of operation, single phase to single phase, three phase to single phase and three phase to three phase cyclo converters, output voltage equation.	**08**	PO1/ PO2/ PO3/ PO6/ PO11/ PO12	PSO1/ PSO2
UNIT-5	Module-6	**Inverters:** Single-phase series resonant inverter Single phase bridge inverters Three phase bridge inverters Voltage control of inverters Harmonics reduction techniques Single phase and three phase current source inverters.	**06**	PO1/ PO2/ PO3/ PO6/ PO7/ PO11/ PO12	PSO1
Total No. of Hours			**40**		

Course Outcomes:	**CO1**. Understanding the different types of power semiconductor switches and their working. **CO2**.Analyze the various types of power electronics converters. **CO3.** Able to Select appropriate power semiconductor switch to design the power electronics converters. **CO4**. Able to explain the application of power electronics converters. **CO5.** Able to explain the importance of power electronics that make human life easy, clean and Eco-friendly.

Suggested books:

S. No.	Name of Authors /Books /Publisher	Year of Publication
	Text Books	
1.	Dr. P. S. Bimbhra, Power Electronics, Khanna Publishers, Fifth Edition. .	*1990*
2.	M.H. Rashid, Power Electronics: Circuits, Devices & Applications, Prentice Hall of India Ltd. 3rd Edition.	*2004*
3.	M.D. Singh and K.B. Khanchandani, Power Electronics, Tata MC Graw Hill.	*2005*
	References	
1	M.S. Jamil Asghar, Power Electronics, Prentice Hall of India Ltd.	*2004*



2	Abhijit Chakrabarti. Fundamentals of Power Electronics and Drives, Danpat Rai	*2002*
3	Bimal K. Bose, Power Electronics and Motor Drives Advances and Trends, Academic Press is an imprint of Elsevier,	*2006*

Course Outcomes	Action Verb	Bloom's Level	Program Outcomes (POs)											Program Specific Outcome(PSOs)			
			. Engineering knowledge	Problem analysis	Design /development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning			
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Describe	Understanding	3	3	2	2		1	3				1	3	3	3	3
CO2	Analyze	Analyzing	3	3	3	2		1	2				1	2	1	1	1
CO3	Solve	Applying	3	2	3	3		1	3				1	1	2	2	1
CO4	Explain	Understanding	3	2	3	2		1	3				1	1	3	3	3
CO5	Describe	Remembering	3	3	2	2		1	3				1	2	2	2	1

Course Code: BEE-C 412

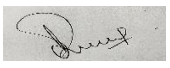
Course Name: ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENTS

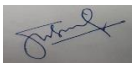
MM: 100 **Time: 3 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	Elements of electrical engineering, electrical circuits, digital & analog electronics
Objectives:	1. To understand the Electrical measurements. 2. To Work with analog & digital electronics principles. 3. To address the underlying concepts & methods behind Electrical measurements 4. To identify & formulate solutions to problems relevant to Electrical measurements
Course Coordinator	Mr. Gaurav Kumar

NOTE:	The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08)long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus

UNIT	Module	Course Content	No. of Hours	POs mapped	PSOs mapped
UNIT-1	*Module-1*	**Philosophy Of Measurement:** Methods of Measurement, Measurement System, Classification of instrument systems , Characteristic of instrument & measurement system, Errors in Measurement & its Analysis , Standards	**06**	PO1/PO2/PO4/PO5/PO6	PSO1/ PSO2/ PSO3
	Module-2	Electrodynamics ,Thermocouple Electrostatic & rectifier type Ammeters & Voltmeters , Electrodynamics Wattmeter, Three Phase Wattmeter, Power in three Phase System , Errors & remedies in Wattmeter and energy meter	**04**	PO1/ PO2/PO6	PSO1/ PSO2
UNIT-2	*Module-3*	**Instrument Transformer** (CT and PT), and their application in the extension of instrument range, Introduction to measurement of speed, Frequency and Power factor, Vibration etc.	06	PO1/ PO2/PO4/PO6	PSO1/ PSO2/ PSO3
UNIT-3	*Module-4*	**Different methods of measuring low,** medium and high resistances, Measurement of Inductance &	06	PO1/ PO2/PO5/PO6	PSO1/ PSO2





		Capacitance with the help of AC Bridges,			
UNIT-4	*Module-5*	**Polar type & Co-ordinate type AC** potentiometer, Application of AC Potentiometers in Electrical measurement. Magnetic Measurement: Ballistic Galvanometer, Flux meter, Determination of Hysteresis loop , Measurement of iron losses..	05	PO1/PO4/PO5/PO6	PSO1/ PSO2
UNIT-5	*Module-6*	**Concept of digital Measurement**, Block Diagram Study of digital voltmeter, frequency meter power analyzer and harmonics analyzer; Electronic Multimeter	08	PO1/PO5/PO6	PSO1
	Module-7	**Electronic multimeter** , Power Analyzer, Harmonics analyzer, , Electronic multimeter , Power Analyzer, Harmonics analyzer , Basic CRO circuit (Block Diagram),Cathode ray tube (CRT) & its component , Application of CRO in measurement ,Lissajous Pattern., Dual trace & dual beam Oscilloscope..	05	PO1/PO5/PO6	PSO1
Total No. of Hours			**40**		

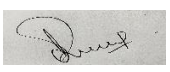
Course Outcomes:	1. **Develop** the knowledge of theoretical and mathematical principles of electrical measuring instruments. 2. **Examine** various real life situations in domestic or industrial scenario where measurements of electrical quantities are essential. 3. **Choose** the proper type and specification of measuring procedure and measuring instruments for different industrial/commercial/domestic applications. 4. **Assess** fault conditions in electrical installations and identify necessary remedial measures. 5. **Design** new sensing and measuring schemes for various electrical and electronic applications. 6. **Recognize** basic supporting tools for applications in other electrical engineering core fields.

Suggested books:

S. No.	Name of Authors /Books /Publisher	Year of Publication
1.	A.K. Sawhney,“ Electrical & Electronic Measurements & Instrumentation `***”, 4th*** `***Ed***, Dhanpat Rai & sons, ISBN- 0070699674	2010
2.	E.W. Golding & F.C. Wides, “Electrical Measurement & Measuring Instruments”,1ST “Wheeler Publishing”, “ISBN- 0132472058	2005
3.	H.S. Kalsi, “Electronic Instruments”, Tata Mc-Graw hill***”,*** 2nd Edition,	2008
4	A.J. Bouwens ,”Digital Instrumentation”, Tata Mc-Graw hill.	1986
5	A.D. Heltric & W.C. Copper, “Modern Electronic instrumentation & Measuring instruments” , Wheeler Publication	1992

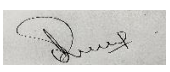
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	Y	Y	-	-	-	-	-	-	-	-	-	Y	Y	Y	Y
2	-	Y	-	Y	-	-	-	Y	-	Y	-	Y	Y	Y	
3	Y	Y	-	-	-	-	-	-	-	-	Y	Y	Y		
4	Y	Y	Y	-	-	-	-	-	-	-	-	Y			
5	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	
6	Y	-	Y	Y	-	-	-	Y	-	-	-	Y	Y	Y	

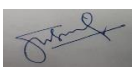
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	-	-	-	-	-	-	-	-	-	2	2	2	1
2	-	3	-	3	-	-	-	3	-	3	-	3	3	2	
3	3	3	-	-	-	-	-	-	-	-	3	2	2		
4	3	3	2	-	-	-	-	-	-	-	-	3			
5	3	3	2	3	-	3	3	3	2	3	2	3	1	3	



6	2	-	2	3	-	-	-	3	-	-	-	3	2	3	

Correlation levels 1, 2 or 3 as defined above: 1: Slight (Low) 2: Moderate (Medium)3: Substantial(High) and "-" if there is no correlation.





Batch 2023-2024 and onwards

Course Code: BEE-C413

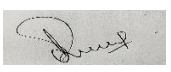
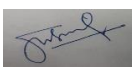
Course Name: Signals and Systems

MM: 100 **Time: 3 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	Engineering Mathematics
Objectives:	To describe various signals and systems mathematically and understand how to perform mathematical operations on them: *1.* Understand mathematical description and representation of continuous and discrete time. *2.* Concept of Fourier Series and Fourier Transform. *3.* Concept of Time and Frequency Characterization of Signals and Systems. *4.* Knowledge of Sampling and Laplace Transform. *5.* Study the Random variable and various functions.
Course Coordinator	Dr. Ashish Dhamanda

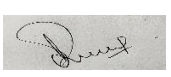
NOTE:	The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT	Module	Course Content	No. of Hours	POs mapped	PSOs mapped
UNIT-1	*Module-1*	**Signals and Systems:** Continuous-time and discrete-time Signals, Transformations of the Independent Variable, Exponential and Sinusoidal Signals, Continuous-Time and Discrete-Time LTI Systems and their properties, convolution sum and convolution integrals, LTI System described by differential and difference equations. **Z-Transform:** Z-Transform, Region of convergence, Inverse Z-transform, analysis and characterization of LTI system, Block diagram representation, Unilateral Z-transform.	**9**	PO1/ PO2/ PO3/ PO4/PO5/ PO6/PO7/ PO8/ PO9/ PO10/PO11/PO12	PSO1/PSO2/ PSO3
UNIT-2	*Module-2*	**Fourier Series and Fourier Transform:** The response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-time Periodic Signals and their Properties, Continuous time and discrete time Fourier Transforms and their properties, System Characterized by Linear Constant Coefficient Differential equations and	**7**	PO1/ PO2/ PO3/ PO4/PO5/ PO6/PO7/ PO8/ PO9/ PO10/PO11/PO12	PSO1/PSO2/ PSO3

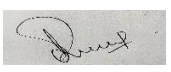
		Difference equations.			
UNIT-3	*Module-3*	**Time and Frequency Characterization of Signals and Systems:** Magnitude Phase Representation of the Fourier Transform, Magnitude Phase Representation of the Frequency response of LTI systems, Time domain Properties of Ideal Frequency Selective filter, Time Domain and Frequency Domain aspects of Non ideal filters, First Order and Second Order Continuous Time and Discrete time Systems.	**8**	PO1/ PO2/ PO3/ PO4/PO5/ PO6/PO7/ PO8/ PO9/ PO10/PO11/PO12	PSO1/PSO2/ PSO3
UNIT-4	*Module-4*	**Sampling and Laplace Transform:** Signal representation by samples, sampling theorem, Impulse train sampling, sampling of discrete time signals, discrete time processing of continuous time signals. Laplace Transform, Region of convergence, inverse Laplace Transform, Analysis and characterization of LTI System, Block diagram representation, Unilateral Laplace transform.	**8**	PO1/ PO2/ PO3/ PO4/PO5/ PO6/PO7/ PO8/ PO9/ PO10/PO11/PO12	PSO1/PSO2/ PSO3
UNIT-5	*Module-5*	Random variable, random process correlation functions, cumulative distribution function, probability density function, joint-cumulative distribution, probability density function. Expectation, mean, variance, covariance, auto-correlation, power spectral density, Gaussian Pdf and Raleigh Pdf.	**8**	PO1/ PO2/ PO3/ PO4/PO5/ PO6/PO7/ PO8/ PO9/ PO10/PO11/PO12	PSO1/PSO2/ PSO3
Total No. of Hours			**40**		

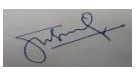
Course Outcomes:	**CO1:** To define the Continuous-time and discrete-time Signals, Signal representation by samples, sampling theorem, Impulse train sampling, sampling of discrete time signals, Random variable, random process correlation functions, cumulative distribution function. **CO2:** To explain the Transformations of the Independent Variable, Exponential and Sinusoidal Signals, Continuous-Time and Discrete-Time LTI Systems and their properties, The response of LTI Systems to Complex Exponentials, Magnitude Phase Representation of the Fourier Transform, probability density function, joint-cumulative distribution, probability density function. **CO3:** To Extend the convolution sum and convolution integrals, LTI System described by differential and difference equations, Fourier Series Representation of Continuous-time Periodic Signals and their Properties, Magnitude Phase Representation of the Frequency response of LTI systems, Expectation, mean, variance, covariance, auto-correlation, power spectral density. **CO4:** To illustrate the Continuous time and discrete time Fourier Transforms and their properties, System Characterized by Linear Constant Coefficient Differential equations and Difference equations, Discrete time processing of continuous time signals. **CO5:** To Relate the Region of convergence, analysis and characterization of LTI system, Time domain Properties of Ideal Frequency Selective filter, Time Domain and Frequency Domain aspects of Non ideal filters, First Order and Second Order Continuous Time and Discrete time Systems, Region of convergence, Analysis and characterization of LTI System, Gaussian Pdf and Raleigh Pdf. **CO6:** To Apply the various block diagram representation of Z-Transform, Laplace Transform, Inverse Z-transform, Unilateral Z-transform, inverse Laplace Transform, Unilateral Laplace transform.



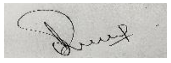
Suggested books:

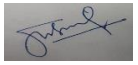
S. No.	Name of Authors /Books /Publisher	Year of Publication
1.	Michael Roberts, Govind Sharma, Fundamentals of Signals and Systems (SIE) e/2, McGraw Hills	2017
2.	V. Oppenheim, A.S. Willsky and S. Hamid Nawab, 2nd Edn, Pearson Education India.	2015
3.	Charles Phillips, John Parr, Eve Riskin, Signals, Systems, & Transforms 5th Edition, Pearson	2013
4.	B. P. Lathi, "Principles of Linear Systems and Signals", Second Edition, Oxford,	2009
5.	Simon Haykin,"Signals and Systems",Secod Edition,John Wiley.	1999
6.	R.E.Zeimer, W.H.Tranter and R.D.Fannin, "Signals & Systems, Continuous and Discrete", Pearson.	2007
7.	John Alan Stuller, ―An Introduction to Signals and Systems‖, Thomson.	2007





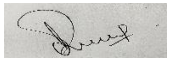
Batch 2023-2024 and onwards

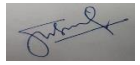




Batch 2023-2024 and onwards

BEE-C 413																
Signals and Systems																
			CO-PO/PSO MAPPING													
Course Outcomes (COs)	**Action Verb (CO)**	**Bloom's Level**	**Program Outcomes (POs)**											**Program Specific Outcomes (PSOs)**		
			Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team Work	Communication	Project Management and Finance	Life Long Learning			
			PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**Define**	**Remember L1**	**3**	**3**	**3**	**3**		**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**		**3**
CO2	**Explain**	**Understand L2**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**		**3**
CO3	**Extend**	**Understand L2**	**3**	**3**	**3**	**3**		**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CO4	**Illustrate**	**Understand L2**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CO5	**Relate**	**Understand L2**	**3**	**3**	**3**	**3**		**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CO6	**Apply**	**Apply L3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**		**3**
	Average		**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**





Effective from the session 2024-25

Course Code: BKT-A403
Course Name: BHARTEEYA JNANAPARAMPARA

MM: 100	**Sessional: 30**
Time: 3 Hr.	**ESE: 70**
L T P	**Credit: 0**
2 0 0	

समस्त स्नातक स्तर की कक्षाओं हेतु
अनिवार्य पाठ्यक्रम
तृतीय / चतुर्थ सत्र Semester III/IV

समय (Time) – 03 घंटे (Hours)
पूर्णांक -100
सत्रान्तपरीक्षा -70
आन्तरिकपरीक्षा – 30
Credit- 0

BKT - A301 / A401 भारतीय ज्ञानपरम्परा
Bharteeya Jnanaparampara

प्रस्तावित पाठ्यक्रम (Prescribed Course)

घटक-1

1 वैदिक एवं लौकिक साहित्य का परिचय एवं उसका उद्देश्य (वैदिक साहित्य,आर्ष साहित्य एवं स्मृति साहित्य)
2 वैदिक प्रार्थनाएं गायत्री, भद्रप्राप्ति, शान्ति, संगठन, सौमनस्य एवं पञ्च महायज्ञ का सामान्य परिचय
3 ब्रह्मचर्य महिमा, वैदिक राष्ट्रभक्ति एवं शिवसंकल्प (ब्रह्मचर्य सूक्त- अथर्ववेद ११.५, पृथिवी सूक्त - अथर्ववेद १२.१, शिवसंकल्प सूक्त - यजुर्वेद ३४.१-६ में वर्णित विषयवस्तु के आधार पर)

घटक-2

1 वैदिक कालीन सामाजिक एवं शिक्षा व्यवस्था
2 संस्कारों की जीवन में उपयोगिता
3 पुरुषार्थ चतुष्टय – धर्म, अर्थ, काम, मोक्ष

घटक-3

1 त्रैतवाद – ईश्वर, जीव एवं प्रकृति का स्वरूप
2 कर्म एवं पुनर्जन्म सिद्धान्त (कर्म- निष्काम कर्मयोग एवं कर्मफल सिद्धान्त)

घटक-4

1 मानव जीवन के विकास में योग की महत्ता
2 अष्टांग योग- यम, नियम, आसन, प्राणायाम, प्रत्याहार ,धारणा, ध्यान, समाधि

घटक-5

1 भारतीय संस्कृति एवं सभ्यता : एक परिचय
2 महर्षि दयानन्द एवं स्वामी श्रद्धानन्द का व्यक्तित्व एवं कृतित्व
3 आर्य समाज की स्थापना, उद्देश्य एवं कार्य (सामाजिक जनजागरण, अछूतोद्धार, महिला शिक्षा, शुद्धि आन्दोलन, सामाजिक कुरीतियों का उन्मूलन, स्वतन्त्रता संग्राम में योगदान)

सहायक पुस्तकें –

1 वैदिक साहित्य एवं संस्कृति, डॉ० कपिल देव द्विवेदी।
2 उपनिषद् दीपिका, डॉ० रामनाथ वेदालंकार।
3 वैदिकदर्शन, डॉ० कपिल देव द्विवेदी, विश्वविद्यालय प्रकाशन, वाराणसी
4 प्राचीन भारत तथा सामाजिक एवं आर्थिक इतिहास, डॉ० देवेन्द्र गुप्ता, भारतीय बुक कॉर्पोरेशन, नई दिल्ली।
5 योगदर्शन, स्वामी रामदेव, पतंजलि योगपीठ, हरिद्वार।
6 सत्यार्थ प्रकाश, स्वामी दयानन्द।
7 आर्यसमाज का इतिहास, डॉ० सत्यकेतु विद्यालंकार।
8 भारतीय नवजागरण के पुरोधा, डॉ० भवानी लाल भारतीय
9 संस्कृत साहित्य का इतिहास, डॉ० कपिल देव द्विवेदी, विश्वविद्यालय प्रकाशन, वाराणसी

M.Rai

Effective from the session 2024-25

Course Code: BET-C306/BET-C414
Course Name: DIGITAL SYSTEM DESIGN

MM: 100 **Time: 3 Hr.** **L T P** **3 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	For this course, no pre-requisites are required. But should have knowledge of Diodes, transistors.
Objectives:	1. To get good knowledge of digital system. 2. Learn about the different number system that have different bases which plays very significant role in computer world. 3. During the course we can learn how to design the digital circuits by using Boolean algebra, K-maps and logic gates. 4. And to enable to implement synchronous state machines using flip-flops.
Course Coordinator	Dr. Tanuj Kumar Garg

NOTE:	The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain Ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08)long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus

UNIT	Module	Course Content	No. of Hours	POs mapped	PSOs mapped
UNIT-1	Module-1	**Number System**: Representation of negative numbers, 9's and 1's complement, 10's and 2's complement, arithmetic using 2's complement. BCD Code, Gray Code, Excess-3 Code, Introduction to Boolean algebra, Truth table verification of various gates, Realization of Switching functions with gates.	3	PO1/ PO2/ PO3/ PO5/ PO10/PO12	PSO1/ PSO2
	Module-2	**K- Map:** Representation up to 4 variables, simplification and realization of various functions using gates, Tabular Method, Combinational logic and design procedure.	3	PO1/ PO2/ PO3/ PO5/ PO10/PO12	PSO1/ PSO2

UNIT-2	Module-3	**Combinational logic Circuits:** Arithmetic circuits, Half and Full adder, Subtractors, BCD adders, Code Conversion, 4 bit Magnitude Comparator (IC -7485), Cascading of IC 7485, Decoder, Multiplexer, Demultiplexers, Encoders. Parallel Binary adder, IC 7483, 4-bit Binary parallel adder/subtractor,	**9**	PO1/ PO2/ PO3/ PO5/ PO10/PO12	PSO1/ PSO2
UNIT-3	Module-4	**Sequential Logic Circuits:** Flip Flops, S-R latch, gated latches, Edge triggered Flip Flops, Master-slave Flip Flops, Conversion of flip flops, Analysis of clocked sequential circuits, Design of synchronous circuits, State transition diagram, state reduction and assignment.	**10**	PO1/ PO2/ PO3/ PO5/ PO10/PO12	PSO1/ PSO2
UNIT-4	Module-5	**Counters:** Design of Asynchronous and Synchronous Counters, Two bits & four bits up & down counters and their design, Shift registers, Serial & Parallel data transfer, Shift left/Right register, Shift Register applications.	**8**	PO1/ PO2/ PO3/ PO5/ PO10/PO12	PSO1/ PSO2
UNIT-5	Module-6	**Logic Families:** Diode switching, Transistors as a switching element, MOS as a digital circuit element, concept of transfer characteristics, input characteristics and output characteristics of logic gates, fan in, fan out, noise margin, Logic families: TTL, IIL, ECL, NMOS, & CMOS, Open collector outputs.	**7**	PO1/ PO2/ PO3/ PO5/ PO10/PO12	PSO1/ PSO2
Total No. of Hours			**40**		

Learning Outcomes:	At the end of this course students will demonstrate the ability to • Design and analyze combinational logic circuits. • Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder . • Design & analyze synchronous sequential logic circuits.

Suggested books:

S. No.	Name of Authors /Books /Publisher	Year of Publication
1.	M.Morris Mano, Digital Design, PHI	XXXX
2.	R.P.Jain, Modern Digital electronics, TMH	XXXX
3.	A.Anand Kumar, Fundamentals of Digital Circuits, PHI	XXXX
4.	Lee S.C, Modern Switching Theory and Digital design, PHI	XXXX
5.	Greenfield J.D., Practical Digital design using ICs, John Wiley.	XXXX

BET-C306/BET-C414
DIGITAL SYSTEM DESIGN
CO-PO/PSO MAPPING

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3		3	3	3							3	3	3	
CO2	3		3	3	3							3	3	3	
CO3	3		3	3	3							3	3	3	
CO4	3		2	1	3							3	3	3	
CO5	3		2	1	3							3	3	3	
CO6	3		1	1	3							3	3	3	
CO7	3		1	3	3							3	3	3	
CO8	3		1	3	3							3	3	3	
CO9	3		1	3	3							3	3	3	
CO10	3		1	1	3							3	3	3	

M. Rai

Effective from the session 2024-25

Course Code: BET-C355/BET-C464
Course Name: Digital System Design Lab

MM: 100 **Time: 3 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit: 1**

Prerequisites:	Basic Electrical Engg.
Objectives:	Students will perform different combinational and sequential digital circuits using gates and ICs.
Course Coordinator	Dr. Ashish Nainwal
Notes	1. In practical examination the student shall be required to perform one experiment. 2. A teacher shall be assigned 20 students for daily practical work in laboratory. 3. No batch for practical class shall consist of more than 20 students. 4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students. 5.Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.

LIST OF EXPERIMENTS:

List of Experiments	No of hours	PO mapped	PSO mapped
1. To verify the truth tables of various types of gates using IC 7400.	2	PO1/ PO2	PSO1/PSO2
2. To verify the truth tables of Multiplexer & also implement a function using Multiplexer.	2	PO1/ PO2/ PO3/ PO4	PSO1/PSO2
3. To design & verify the truth table of half & full adder.	2	PO1/ PO2/ PO3	PSO1/PSO2
4. To design & verify the truth table SR flip-flop using NOR/NAND gates.	2	PO1/PO3/ PO4	PSO1/PSO2
5. To design & verify the truth table JK flip-flop using NOR/NAND gates.	2	PO1/ PO2/ PO3	PSO1/PSO2
6. To design & study counters.	2	PO1/ PO2 PO4	PSO1/PSO2
7. To design & study Shift registers.	2	PO1/ PO2/ PO3/ PO4	PSO1/PSO2
8. To verify the truth tables of de Multiplexer.	2	PO1/ PO2/ PO3/ PO4	PSO1/PSO2

M. Rai

Course Outcomes:		Bloom's Knowledge Level
CO1	Understanding of Digital Binary System and implementation of Gates.	L2
CO2	Analyze the Sequential circuits with the help of combinational circuits and feedback element.	L4
CO3	Evaluate and design the counters with the help of sequential circuit and basic Gates.	L5
CO4	Design data selector circuits with the help of universal Gates.	L6
CO5	Design the shift registers using sequential circuit and basic Gates	L6

BET-C355 /BET-C464
Digital System Design Lab
CO-PO/PSO MAPPING

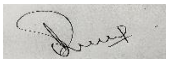
Course Outcomes (COs)			Program Outcomes (POs)													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Define	L1	3												3	3
CO2	Interpret	L2	3	2	2										3	3
CO3	Explain	L2	3	2	2										2	2
CO4	Experiment with	L3	3	3	3	2									2	3
CO5	Analyze	L4	3	3	2	2									2	3

Course Code: BEE-C 461
Course Name: ELECTRICAL MACHINE-II LAB

MM: 50 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit : 1**

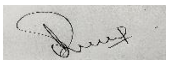
Prerequisites:	Electrical Machine-I
Objectives:	The objective of this lab is to give knowledge and provide hands on experience by performing various test on electrical machine and determining their characteristics.
Course Coordinator	Mr. Yogesh Kumar

Experiments	**Lab Content**	**No. of Hours**	**POs mapped**	**PSOs mapped**
Exp. No. 1	To perform no load and blocked rotor tests on a three phase squirrel cage induction motor and determine equivalent circuit.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 2	To perform load test on a three phase induction motor and draw: (i) Torque -speed characteristics (ii) Power factor-line current characteristics	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 3	To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 4	To study speed control of three phase slip ring induction motor by varying rotor resistance.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 5	To perform open circuit and short circuit tests on a three phase alternator and determine voltage regulation at full load and at unity, 0.8	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2



	lagging and leading power factors by (i) EMF method (ii) MMF method.			
Exp. No. 6	To determine V-curves and inverted V-curves of a three phase synchronous motor.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 7	To determine Xd and Xq of a three phase salient pole synchronous machine using the slip test	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2
Exp. No. 8	To study the synchronization of an alternator with bus bars.	02	PO1/ PO2 PO3/ PO4/PO5/PO6/PO7/PO8/PO9/PO10/PO12	PSO 1/ PSO 2

Course Outcomes:	**CO1:** To determine the V-curves and inverted V-curves of a three phase synchronous motor, and Xd and Xq of a three phase salient pole synchronous machine using the slip test. **CO2:** To explain and study the speed control of three phase slip ring induction motor by varying rotor resistance and the synchronization of an alternator with bus bars. **CO3:** To justify the no load and blocked rotor tests on a three phase squirrel cage induction motor and determine equivalent circuit, Load test on a three phase induction motor and draw: (i) Torque -speed characteristics (ii) Power factor-line current characteristics, No load and blocked rotor tests on a single phase induction motor and determine equivalent circuit Open circuit and short circuit tests on a three phase alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by (i) EMF method (ii) MMF method.



Batch 2023-2024 and onwards

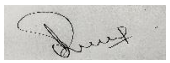
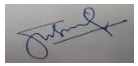
BEE-C461
Electrical Machine II Lab

CO-PO/PSO MAPPING

Course Outcomes (COs)	Action Verb (CO)	Bloom's Level	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
			Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team Work	Communication	Project Management and Finance	Life Long Learning			
			PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**	**PSO3**
CO1	**Determine**	**Evaluate L5**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**		**3**	**3**	**3**	
CO2	**Explain**	**Evaluate L5**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**		**3**	**3**	**3**	
CO3	**Justify**	**Evaluate L5**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**		**3**	**3**	**3**	
	Average		**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**		**3**	**3**	**3**	

Mapping %age	***0 - 5 = --***	***6 - 40 = 1***	***41 - 60 = 2***	***61 - 100 = 3***
Manpping Correlation	***No correlation***	***Low/ Slight***	***Moderate***	***Substantial/ High***

Mapping Correlation	***No correlation***	***Low/ Slight***	***Moderate***	***Substantial/ High***
	--	1	2	3

Course Code: BEE-C462

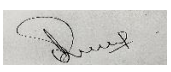
Course Name: POWER ELECTRONICS LAB

MM: 100 **Time: 3 Hr.** **L T P** **3 1 0**	**Sessional: 30** **ESE: 70** **Credit : 4**

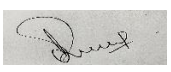
Prerequisites:	About power semiconductor switches and their working.
Objectives:	The course should enable the students to: I. Examine the characteristics of various devices and application of firing circuits used in power electronics. II. Outline the performance characteristics of AC voltage regulators, choppers, inverters, rectifiers and cycloconverters
Course Coordinator	Mr. Brijesh Kumar

Experiment No	Course Content	No. of Hours	POs mapped	PSOs mapped
1	**To study the DC voltage trigger with superimposed AC (SCR triggering circuit)**	**02**	PO1/ PO2/ PO3/ O6/PO7/	PSO1/PSO2/ PSO3
2	**SCR trigger by R and R-C phase shift circuit.**	**02**	PO1/PO2/PO3 /PO6/PO7/	PSO1/PSO2/ PSO3
3	**To study the SCR phase control circuit.**	**02**	PO1/PO2/PO3 /PO6/PO7	PSO1/PSO 2/PSO3
4	**To study the Triac phase control circuit.**	**02**	PO1/ PO2/ PO3/ O6/PO7	PSO1/PSO 2/PSO3
5	**To study the voltage commutated DC Chopper**	**02**	PO1/ PO2/ PO3/ O6/PO7	PSO1/PSO 2/PSO3
6	**To study the current commutated DC Chopper.**	**02**	PO1/ PO2/ PO3/ O6/PO7	PSO1/PSO 2/PSO3
7	**To study the IGBT single-phase Inverter.**	**02**	PO1/ PO2/ PO3/ O6/PO7	PSO1/PSO 2/PSO3
8	**To study MOSFET single-phase Inverter.**	**02**	PO1/ PO2/ PO3/PO6/PO7	PSO1/PSO 2/PSO3
Total No. of Hours		**40**		

Course Outcomes:	**CO1**. Study and **describe** the operation and characteristics of SCR, MOSFET, TRAIC. **CO2**. Study of **design** of DC-to-DC Conversion circuits. **CO3.** Study and the u**nderstanding** the operation of Single phase controlled rectifiers. **CO4**. Study of design and analysis of power electronics converters characteristics. **CO5.** Applying the switching concept for different converter to control the output.



Course Outcomes	Action Verb	Bloom's Level	Program Outcomes (POs)											Program Specific Outcome(PSOs)			
			. Engineering knowledge	Problem analysis	Design /development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning			
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Describe	Understanding	3	3	2			1	2						3	3	3
CO2	design	Analyzing	3	3	2			1	2						1	1	1
CO3	understanding	Applying	3	2	2			1	2						2	2	1
CO4	Explain	Understanding	3	2	2			1	2						3	3	3
CO5	Describe	Remembering	3	3	2			1	2						2	2	1

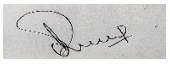
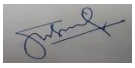


Course Code: BEE-C 463
Course Name: ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENT LAB

MM: 100 **Time: 3 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	Basic knowledge about the elements of Electrical Engineering, Electrical circuits, and Analog Electronics
Objectives:	1. This course deals with basic introduction of system components of electrical systems, and provides hands on practice in assembling, interconnecting, testing, and repairing such system by making use of various tools used in electrical workshop.
Course Coordinator	Mr. Gaurav Kumar, Asst. professor

Experiments	**Lab Content**	**No. of Hours**	**POs mapped**	**PSOs mapped**
Exp. No. 1	Calibration of A.C. voltmeter and A.C. ammeter.	02	PO1/ PO2 PO3/ PO4	PSO 1/ PSO 2/ PSO 3
Exp. No. 2	Measurement of low resistance by Kelvin's double bridge	02	PO1/ PO2 PO3/ PO4	PSO 1/ PSO 2/ PSO 3
Exp. No. 3	Measurement of voltage, current and resistance using D.C. potentiometer	02	PO1/ PO2 PO3/ PO4	PSO 1/ PSO 2/ PSO 3
Exp. No. 4	Measurement of inductance by Maxwell's bridge.	02	PO1/ PO2 PO3/ PO4	PSO 1/ PSO 2/ PSO 3
Exp. No. 5	Measurement of inductance by Hay's bridge.	02	PO1/ PO2 PO3/ PO4	PSO 1/ PSO 2/ PSO 3
Exp. No. 6	Measurement of inductance by Anderson's bridge.	02	PO3/ PO1	PSO 1/ PSO 2/ PSO 3
Exp. No. 7	Measurement of capacitance by Owen's bridge.	02	PO1/ PO3	PSO 1/ PSO 2/ PSO 3
Exp. No. 8	Measurement of capacitance by De Sauty bridge.	02	PO1/ PO3	PSO 1/ PSO 2/ PSO 3
Exp. No. 9	Measurement of capacitance by Schering bridge.	02	PO3/ PO4/ PO1/ PO2	PSO 1/ PSO 2/ PSO 3
Exp. No. 10	Measurement of power and power factor of a single-phase inductive load and to study effect of capacitance connected across the load on the power factor	02	PO3/ PO4	PSO 1/ PSO 2/ PSO 3
Exp. No. 11	Measurement of power and power factor of a three-phase load	02	PO3/ PO4/ PO1/ PO2	PSO 1/ PSO 2/ PSO 3
Exp. No. 12	Measurement of phase difference and frequency of a sinusoidal A.C. voltage using C.R.O.	02	PO3/ PO4	PSO 1/ PSO 2/ PSO 3

Course Outcomes:	1. Identify the functions of various types of electrical measuring instruments. 2. Develop electric circuits for verifying different network theorems. 3. Apply standard procedures for the measurement of resistance, inductance and capacitance. 4. Apply various methods for power measurements in AC circuits and examine the calibration of meters.

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