GIET University

School of Engineering & Technology

Bachelor's Degree Programme

B.Tech

Electrical & Electronics Engineering

Course Structure & Syllabus

For students admitted in

2019-20

Academic Session

ACADEMIC CURRICULA

2019-2023

[Regulation – 2019]

I Semester [First Year]

Branch/Course Common to all branches of UG Engineering & Technology

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	ISA	ESA
				L	T	P			
1	BS		Mathematics-I	3	1	0	4	30	70
2	BS		Physics	3	0	0	3	30	70
			Chemistry						
3	ES		Basic Electronics/ Basic Electrical Engineering	3	0	0	`3	30	70
4	ES		Programming forProblem Solving	2	0	0	2	30	70
5	HS & M		Communicative English -I	2	0	0	2	30	70
Labs /Internships / Projects / Mandatory courses									
6	ES		Engineering Graphics & Design	1	0	2	2	70	30
			Workshop (Branch Specific)						
7	ES		Programming forProblem Solving	0	0	4	2	70	30
8	BS		Physics Lab	0	0	2	1	70	30
			Chemistry Lab						
9	ES		Basic Electronics / Basic Electrical Engineering Lab	0	0	2	1	70	30
10	HS & M		Communicative English -I lab	0	0	2	1	70	30
11	MC		Induction Program	-	-	-	0	100	
			Total Credits& Marks:	**14**	**1**	**12**	**21**	**600**	**500**
			Total (Internal +External)					**1100**	

II Semester [First Year]

Branch/Course Common to all branches of UG Engineering & Technology

Sl. No.	Category	Course Code	Course Title	Hours per week			C	ISA	ESA
				L	T	P			
1	BS		Mathematics-II	3	1	0	4	30	70
2	BS		Physics / Chemistry	3	0	0	3	30	70
3	ES		Basic Electrical Engineering / Basic Electronics	3	0	0	3	30	70
4	ES		Data Structure & Algorithms	2	0	0	2	30	70
5	HS & M		Communicative English -II	2	0	0	2	30	70
Labs /Internships / Projects / Mandatory courses									
6	ES		Engineering Graphics & Design / Workshop (Branch Specific)	1	0	2	2	70	30
7	BS		Physics/ Chemistry Lab	0	0	2	1	70	30
8	ES		Basic Electrical Engineering / Basic Electronics Lab	0	0	2	1	70	30
9	ES		Data Structure & Algorithms Lab	0	0	4	2	70	30
10	HS & M		Communicative English -II	0	0	2	1	70	30
11	MC		NCC/NSS/Yoga	-	-	-	0	100	0
			Total Credits:	**14**	**1**	**12**	**21**	**600**	**500**
			Total (Internal +External)					**1100**	

III Semester [Second Year]

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	ISA	ESA
				L	T	P			
1	BS		Engineering Mathematics – III	3	1	0	4	30	70
2	ES		Object Oriented Programming/ Data Base Management Systems	3	0	0	3	30	70
3	PC		Electrical Machines - I	3	0	0	3	30	70
4	PC		Network theory	3	0	0	3	30	70
5	PC		Analog and Digital Circuits	3	0	0	3	30	70
6	HS&M		Organizational Behavior / Optimization in Engineering	2	0	0	2	30	70
Labs/Internships / Projects /Mandatory course									
7	PC		Object Oriented Programming lab/ Data Base Management Systems lab	0	0	2	1	70	30
8	PC		Electrical Machines – I Lab	0	0	2	1	70	30
9	PC		Network theory Lab	0	0	2	1	70	30
10	PC-Project		Summer Industry Internship	-	-	2	1	100	--
11	MC		Environmental Sciences	-	-	-	0	100	--
			Total Credits:	**17**	**1**	**8**	**22**	**590**	**510**
			Total (Internal +External)					**1100**	

IV Semester [Second Year]

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	ISA	ESA
				L	T	P			
1	ES		Object Oriented Programming/ Data Base Management Systems	3	0	0	3	30	70
2	PC		Electrical Machines – II	3	0	0	3	30	70
3	PC		Control Systems	3	0	0	3	30	70
4	PC		Electromagnetic Fields	3	0	0	3	30	70
5	PC		Electrical power Transmission & Distribution	3	0	0	3	30	70
6	HS&M		Organizational Behavior / Optimization in Engineering	2	0	0	2	30	70
Labs/Internships / Projects /Mandatory course									
7	ES		Object Oriented Programming lab/ Data Base Management Systems lab	0	0	2	1	70	30
8	PC		Electrical Machines – II lab	0	0	2	1	70	30
9	PC		Control Systems Lab	0	0	2	1	70	30
10	PC		Electrical power Transmission & Distribution	0	0	2	1	70	30
11	MC		Constitution of India / Essence of Indian Traditional Knowledge	-	-	-	0	100	--
			Total Credits:	**17**	**0**	**8**	**21**	**560**	**540**
			Total (Internal +External)					**1100**	

V Semester [Third Year]

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	ISA	ESA
				L	T	P			
1	PC		Power Electronics	3	0	0	3	30	70
2	PC		Microprocessors and Microcontrollers	3	0	0	3	30	70
3	PC		Signals & Systems	3	0	0	3	30	70
4	PC		Electric & Electronic Measurements	3	0	0	3	30	70
5	PE		Professional Elective - 1	3	0	0	3	30	70
6	OE		Open Elective - 1	3	0	0	3	30	70
Labs/Internships / Projects /Mandatory course									
7	PC		Industrial Lab 01: Renewable Energy Lab	0	0	2	1	70	30
8	PC		Power Electronics Lab	0	0	2	1	70	30
9	PC		Microprocessors and Microcontrollers Lab	0	0	2	1	70	30
10	PC-Project		Summer Industry Internship	-	-	2	1	100	-
			Total Credits:	**18**	**0**	**8**	**22**	**490**	**510**
			Total (Internal +External)					**1000**	

VI Semester [Third Year]

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	ISA	ESA
				L	T	P			
1	PC		Switch Gear & Protection	3	0	0	3	30	70
2	PC		Power System operation & Control	3	0	0	3	30	70
3	PC		Communication Engineering	3	0	0	3	30	70
4	PE		Professional Elective - 2	3	0	0	3	30	70
5	PE		Professional Elective - 3	3	0	0	3	30	70
6	OE		Open Elective - 2	3	0	0	3	30	70
Labs/Internships / Projects /Mandatory course									
7	PC		Industrial Lab -2: Energy Management and Auditing Lab	0	0	2	1	70	30
8	PC		Advanced Lab: IOT Lab / Green Technologies Lab	0	0	2	1	70	30
			Total Credits:	**18**	**0**	**4**	**20**	**320**	**480**
			Total (Internal +External)					**800**	

VII Semester [Fourth Year]

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	ISA	ESA
				L	T	P			
1	Professional Core		Power station Engineering & Economy	3	0	0	3	30	70
2	Professional Elective		Professional Elective - 4	3	0	0	3	30	70
3	Professional Elective		Professional Elective - 5	3	0	0	3	30	70
4	Open Elective Courses		Open Elective - 3	3	0	0	3	30	70
5	Humanities and Social Sciences including Management Courses		Entrepreneurship Development / Human Resource Management	2	0	0	2	30	70
Labs/Internships / Projects /Mandatory course									
6	Project		Summer Industry Internship	-	-	2	1	100	
7	Project		Project Work-I	0	0	8	4	100	
			Total Credits:	**14**	**0**	**10**	**19**	**350**	**350**
			Total (Internal +External)					**700**	

VIII Semester [Fourth Year]

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	ISA	ESA
				L	T	P			
1	Professional Elective		Professional Elective - 6	3	0	0	3	30	70
2	Open Elective		Open Elective –4	3	0	0	3	30	70
Labs/Internships / Projects /Mandatory course									
3	Project		Project Work-II & Dissertation	0	0	16	8	100	100
			Total Credits:	**6**	**0**	**16**	**14**	**160**	**240**

Note: On-line MOOC courses may contribute up to 20% of the credits, with in-house examination being conducted.

Structure of Undergraduate Engineering program:

Basket	Basket Category	%	Credits to be acquired		
			Theory Course	Practice Course	Total Credits
1	Humanities and Social Sciences including Management courses	**7.5**	10	02	**12**
2	Basic Science courses	**12.5**	18	02	**20**
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	**17.5**	18	10	**28**
4	Professional core courses	**34.37**	45	10	**55**
5	Professional Elective courses relevant to chosen specialization/branch	**11.25**	18	00	**18**
6	Open subjects – Electives from other technical and /or emerging subjects	**7.5**	12	00	**12**
7	Project work, seminar and internship in industry or elsewhere	**9.4**	00	15	**15**
8	Mandatory Courses: [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge]	**0**	00	00	**0**
	Total		**121**	**39**	**160**

SL. NO.	COURSE WORK - SUBJECTS AREA	CREDITS / SEMESTER								TOTAL CREDITS
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Sciences including Management Courses	3	3	2	2	-	-	2	-	**12**
2	Basic Science Courses	8	8	4	-	-	-	-	-	**20**
3	Engineering Science Courses including workshop, drawing, basics of electricalmechanical/computer etc.	10	10	4	4	-	-	-	-	**28**
4	Professional Core Courses	-	-	11	15	15	11	3	-	**55**
5	Professional Elective Courses relevant to chosen specialization / branch	-	-	-	-	3	6	6	3	**18**
6	Open subjects - Electives from other technical and/or emerging Subjects	-	-	-	-	3	3	3	3	**12**
7	Project work, Seminar and Internship in industry or elsewhere	-	-	1	-	1	-	5	8	**15**
8	Mandatory Courses [Environmental Sciences, Induction Training, Indian Constitution,Essence of Indian Traditional Knowledge]	0	0	0	0	-	-	-	-	**0**
	TOTAL	**21**	**21**	**22**	**21**	**22**	**20**	**19**	**14**	**160**

CREDIT REPRESENTATION

Lectures (hrs/wk/Sem.)	Tutorials (hrs/wk/Sem.)	Practical Work (hrs/wk/Sem.)	Credits (L: T: P)	Total Credits
3	0	0	3:0:0	3
3	1	0	3:1:0	4
0	0	2	0:0:2	1
0	0	4	0:0:4	2
0	0	6	0:0:6	3
0	0	12	0:0:12	6

DISTRIBUTION OF CREDITS AND MARKS

Semester	THEORY				PRACTICAL / SESSIONAL/Mandatory courses							Total	
	No. of Subjects	Credits	ISA	ESA	No. of Labs	Internships	Projects	MC (NC)	Credits	ISA	ESA	Credits	Marks
I Sem	5	14	150	350	5			1	7	450	150	21	1100
II Sem	5	14	150	350	5			1	7	450	150	21	1100
III Sem	6	18	180	420	3	1		1	4	410	90	22	1100
IV Sem	6	17	180	420	4			1	4	380	120	21	1100
V Sem	6	18	180	420	3	1		-	4	310	90	22	1000
VI Sem	6	18	180	420	2				2	140	60	20	800
VII Sem	5	14	150	350	-	1	1		5	200	-	19	700
VIII Sem	2	6	60	140	-		1		8	100	100	14	400
	41	119	**1230**	**2870**	22	3	2	4	41	**2440**	**760**	160	**7300**

III Semester [Second Year]

Sl. No.	Category	Subject Code	Course Title	Hours per week			Credits
				L	T	P	
1	Basic Science		Engineering Mathematics – III	3	1	0	4
2	Engineering Science		Object Oriented Programming/ Data Base Management Systems	3	0	2	4
3	Professional Core		Electrical Machines - I	3	0	2	4
4	Professional Core		Network theory	3	0	2	4
5	Professional Core		Analog and Digital Circuits	3	0	0	3
6	Humanities and Social Sciences including Management Courses		Organizational Behavior / Optimization in Engineering	2	0	0	2
7	Project		Summer Industry Internship	-	-	2	1
8	Mandatory Courses		Environmental Sciences	-	-	-	0
			Total Credits:	**17**	**1**	**8**	**22**

Subject Code	Name of the Subject	L	T	P	C
	ENGINEERING MATHEMATICS - III	3	1	0	4

Course Educational Objectives

CEO1	Understand special functions and its applications
CEO2	Analyze complex analytic functions

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Understand special functions and its applications
CO2	Analyze complex analytic functions
CO3	Applying Taylors series and other functions for evaluation
CO4	Applying and analyzing numerical methods

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2													
CO2	2	2													
CO3	2	2													
CO4	2	2													
Avg.	2	2													

SYLLABUS

Unit – I **[12 Hrs]**

SPECIAL FUNCTIONS:

Beta and Gamma functions, relation between Beta and Gamma functions, Error function, Series solution of differential equations (up to second order), Legendre equation, Legendre polynomials and their properties, Bessel's function.

Unit - II **[12 Hrs]**

Complex Analysis:

Analytic function, Cauchy-Riemann equations, Laplace equation, Complex integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions

Unit – III[12 Hrs]

Taylor's series, Laurent's series, Singularities and zeros, Residue integration, evaluation of real integrals.

Unit – IV **[18 Hrs]**

PROBABILITY:

Numerical methods:

Approximation and round of errors, Roots of equation: fixed point iteration, the Newton-Raphson method.

Interpolation: Lagrange Interpolation, Newton divided difference interpolation, Newton's forward and backward interpolation. Numerical Differentiation, Numerical integration: The trapezoidal rule, The Simpson's rules, Ordinary differential equation: Euler's method, modified Euler's method,fitting of straight line by least square method.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. E. Kreyszig," Advanced Engineering Mathematics:, Eighth Edition, Wiley India

2. Numerical method for Engineers by M. K. Jain and Iyenger.

Reference Book:

1. Higher Engineering Mathematics by B S Grewal : Khanna Publishers, New Delhi.
2. Numerical Analysis by Dutta and Jena

Subject Code	Name of the Subject	L	T	P	C	QP
	Object Oriented Programming	3			3	A

Course Educational Objectives

CEO1	Programming in the Java programming language
CEO2	Knowledge of object-oriented paradigm in the Java programming language, the use of Java in a variety of technologies and on different platforms.

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Knowledge of the structure and model of the Java programming language, (knowledge)
CO2	Use the Java programming language for various programming technologies (understanding)
CO3	Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
CO4	Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			2		2										
CO2			2		2										
CO3			2		2										
CO4			2		2										
Avg.			2		2										

SYLLABUS

Unit – I **[11Hrs]**

An introduction Object Oriented Programming, Features of Object Oriented Programming Introduction to Java. Difference between C/C++ and Java, Features of Java, First Java Program, Writing the java program, Compiling the program, JVM and its significance in executing a program?, Architecture of JVM. Understanding, Java Tokens, Datatypes, Operators, Control Structures and Arrays, Conditional Statements, Loops/ Iterators, Jumping Statements, Java Arrays, Multidimensional Arrays, Taking Input from keyboard, Command Line Arguments, Using Scanner Class, Using Buffered Reader class.

Unit - II **[12Hrs]**

Introduction to Classes and Objects. Constructors, static Keyword, this Keyword, Array of Objects, Access Modifiers (Public, Private, Protected, Default). Inheritance, Types of Inheritance and Java supported Inheritance, super, Polymorphism, Method Overloading, Constructor Overloading, Method Overriding, Dynamic Method Dispatching. String Manipulations. Wrapper classes, Auto boxing and unboxing. Abstract classes, Interfaces, Multiple Inheritance Using Interfaces, Java API Packages, User-Defined Packages, Accessing Packages, Error and Exception Handling, Types of exceptions Hierarchy of Exception classes, try, catch, finally,

throw, throws, Commonly used Exceptions and their details ,User defined exception classes.

Unit – III [12 Hrs]

Multithreading , Thread in Java, Thread execution prevention methods. (yield(), join(), sleep()), Concept of Synchronization, Inter Thread Communication, Basics of Deadlock, Demon Thread, Improvement in Multithreading, Inner Classes, Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class. IO Streams (java.io package) ,Byte Stream and Character Stream, Files and Random Access Files, Serialization, Collection Frame Work (java.util), Util Package interfaces, List, Set, Map.

Unit – IV **[12 Hrs]**

Applet Introduction, Life Cycle of an Applet, GUI with an Applet, Abstract Window Toolkit (AWT), Introduction to GUI, Description of Components and Containers, Component/Container hierarchy, Understanding different Components/Container classes and their constructors, Event Handling, Different mechanisms of Event Handling, Listener Interfaces, Adapter classes.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Book:

1. Programming in Java. Second Edition. Oxford higher education. (Sachin Malhotra/ SauravChoudhary)
2. Core Java for beginners. (RashmiKanta Das), Vikas Publication

Reference Book:

1. *JAVA Complete Reference (9th Edition) HerbaltSchelidt.*

Subject Code	Name of the Subject	L	T	P	C	QP
BEEES3050	**Data Base Management Systems**	3	0	0	3	A

Course Educational Objectives	
CEO1	To understand the different issues involved in the design and implementation of a database system
CEO2	To study the physical and logical database designs, database modeling, relational, hierarchical, and network models.
CEO3	To understand and use data manipulation language to query, update, and manage a database
CEO4	To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
Course Outcomes: ***Upon successful completion of this course, students should be able to:***	
CO1	Interpreting the Database Management concepts, different Data models and architectures with ER to Relational mapping
CO2	Applying and executing the SQL, relational algebra and calculus commands to create and manipulate Database
CO3	Differentiate normal forms for normalization process to construct the consistent Database.
CO4	Design the Database by inspecting concurrency and recovery strategies to make complete DB without confliction and consistent DB in concurrent environment
CO-PO & PSO Mapping	

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			1		2										
CO2			1		2										
CO3			1		2										
CO4			2		2										
Avg.			1.25		2										

SYLLABUS

UNIT:1 **(15 Hours)**

Introduction to database Systems, advantages of database system over traditional file system, Basic concepts & Definitions, Database users, Database Language, Database System Architecture, Schemas, Sub Schemas, & Instances, database constraints, 3-level database architecture, Data Abstraction, Data Independence, Mappings, Structure, Components & functions of DBMS, Data models

UNIT:2 **(13 Hours)**

Entity relationship model, Components of ER model, Mapping E-R model to Relational schema, Relational Algebra, Tuple & Domain Relational Calculus, Relational Query Languages: SQL and QBE. Database Design :-Database development life cycle (DDLC), Automated design tools, Functional dependency and Decomposition, Join strategies, Dependency Preservation & lossless Design, Normalization, Normal forms:1NF, 2NF,3NF, and BCNF, Multi-valued Dependencies, 4NF & 5NF. Query processing and optimization: Evaluation of Relational Algebra Expressions, Query optimization, Query cost estimation.

UNIT:3 **(10 Hours)**

Network and Object Oriented Data models, Storage Strategies: Detailed Storage Architecture, Storing Data, Magnetic Disk, RAID, Other Disks, Magnetic Tape, Storage Access, File & Record Organization, File Organizations & Indexes, Order Indices, B+ Tree Index Files, Hashing Data Dictionary.

UNIT:4 **(12 Hours)**

Transaction processing and concurrency control: Transaction concepts, properties of transaction, concurrency control, locking and Timestamp methods for concurrency control schemes. Database Recovery System, Types of Data Base failure & Types of Database Recovery, Recovery techniques. Fundamental concepts on Object-Oriented Database, Object relational database, distributed database, Parallel Database, introduction to Data warehousing & Data Mining.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Book:

1. Sudarshan, Korth: Database System Concepts, 6th edition, McGraw-Hill Education

Reference Books:

1. Elmasari&Navathe: Fundamentals of Database System, Pearson Education.
2. Ramakrishnan: Database Management Systems, McGraw-Hill Education.
3. Andrew S. Tanenbaum: Modern Operating Systems, 3rd Edition, Pearson Education.
4. Terry Dawson, Olaf Kirch: Linux Network Administrator's Guide, 3rd Edition O'Reilly edia

Subject Code	Name of the Subject	L	T	P	C	QP
BEEPC3020	**Electrical Machines-I**	3	0	0	3	A

Course Educational Objectives	
CEO1	To know basic construction of DC generators, motors and transformers
CEO2	To analyze the working principle the DC generators, motors and transformers.
CEO3	Draw the different characteristic curves of DC generators and motors.
CEO4	To conduct various types test on DC generators, motors and transformers.
Course Outcomes: ***Upon successful completion of this course, students should be able to:***	
CO1	Analyse the constructional features and operation of DC machines
CO2	Investigate the characteristics of DC generators and motors
CO3	Analyse the differences in operation of different DC machine configurations.
CO4	Understand the concepts of single phase and three phase transformers
CO5	Conduct different tests on DC generators, motors and transformers.
CO6	Understand the concepts of 3-phase transformers and various configuration of connections

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1											1		
CO2	1	1											2		
CO3	2	1											1		
CO4	1	2													
CO5	2	2													
CO6	2	2											2		
Avg.	1.67	1.5											1.5		

SYLLABUS

UNIT:1 **(10 Hours)**

Basic construction and operation of a DC machine, induced EMF in an armature coil. Armature winding– Elementary armature coil and commutator, lap and wave windings, construction features of commutator, linear commutation, Derivation of back EMF equation, armature, armature reaction, air gap flux density distribution with armature reaction

UNIT:2 **(12 Hours)**

Armature circuit equation for motoring and generation, Types of field excitations - separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines

UNIT:3 **(14 Hours)**

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses Three-phase transformer - construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding

transformers. Cooling of transformers.

UNIT:4 **(14 Hours)**

Three phase transformers: Constructional features, As a single unit and as a bank of three single phase transformers. Three-Phase Transformer connections, The per unit system for Three Phase Transformer, Transformer Ratings and Related problems, Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating. T-Connection (Scott Connection) of Two Single-Phase Transformers. Transformer Three phase Connections: Various Phase Displacements (0o, 180o, +30o and -30o), Connection Diagrams and Phasor Diagrams of various Vector Groups (Yy0, Dd0, Dz0, Yy6, Dd6, Dz6, Yd1, Dy1, Yz1, Yd11, Dy11, and Yz11)

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books/References:

1. *A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.*
2. *A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.*
3. *M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.*
4. *P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.*
5. *I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.*

Subject Code	Name of the Subject	L	T	P	C
BEEPC3030	**Network Theory**	3	0	0	3

Course Educational Objectives

CEO1	Prepare the students to have a basic knowledge in the analysis of Electric Networks.
CEO2	Solve the given circuit with various theorems and methods.

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Solve complex networks by using various Network Theorems
CO2	Analyzing Laplace transformation and two port networks with steady state and transient analysis
CO3	Identifying the significance of Poles and Zeros in Network functions
CO4	Solving Fourier series analysis and designing the Filter circuits
CO5	Evaluating the electrical networks with Network synthesis

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2											1		
CO2	3	3											1		
CO3	2	2											2		
CO4	3	3											1		
CO5	2	2											1		
Avg.	2.4	2.4											1		

SYLLABUS

Unit – I **[11Hrs]**

Network Theorems: Superposition theorem, Thevenin's theorem, Norton's Theorem, Reciprocity Theorem, Maximum Power transfer theorem, Tellegen's theorem, Millman's theorem, Compensation theorem.

Coupled Circuits: Coupled Circuits, Dot Convention for representing coupled circuits, Coefficient of coupling.

Resonance: Band Width and Q-factor for series and parallel resonant circuits.

Unit - II **[12Hrs]**

Laplace Transform & its Application: Introduction to Laplace Transform, Laplace transform of some basic functions, Laplace transform of periodic functions, Inverse Laplace transform, Application of Laplace transform: Circuit Analysis (Steady State and Transient).

Two Port Network Functions& Responses: z, y, ABCD and h-parameters, Reciprocity and Symmetry, Interrelation of two-port parameters, Interconnection of two-port networks.

Network Functions: Significance of Poles and Zeros, Restriction on location of Poles and Zeros, Time domain behaviour from Pole-Zero plots.

Unit – III [12 Hrs]

Fourier Series& its Application: Fourier series, Fourier analysis and evaluation of coefficients, Steady state response of network to periodic signals, Fourier transform and convergence, Fourier transform of some functions.

Passive Filter: Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response

Unit – IV **[12 Hrs.]**

Network Synthesis: Realizability concept, Hurwitz property,
positive realness, properties of positive real functions, Synthesis of R-L, R-C and L-C driving point functions in Foster and Cauer forms.

Network Topology: Graph of a network, Concept of tree, Incidence matrix, Tie-set matrix, Cut-set matrix, Formulation and solution of network equilibrium equations on loop and node basis

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Book:

1. *Fundamentals of Electric Circuits – Alexander &Sadiku– Tata McGraw Hil,5th Editionl.*
2. *Circuits & Networks: Analysis, Design and Synthesis- Sukhija&Nagsarkar- Oxford*

Reference Book:

1. *Network Analysis – M E Van Valkenburg – Pearson Education, 3rd Edition.*
2. *Network Synthesis – M E Van Valkenburg – Pearson Education.*
3. *Network Analysis and Synthesis – Franklin F. Kuo – Wiley Student Edition.*
4. *Linear Circuits Analysis and Synthesis – A Ramakalyan – Oxford University Press.*
5. *Problems & Solutions in Electric Circuit Analysis – Sivananda&Deepa – Jaico Book.*
6. *Theory and problem of electrical circuits, Schaum's Outline Series, TMH – Joseph A. Edminister, MahmoodMaqvi.*
7. *Electric Circuits – David A.Bell – Oxford, 7th Edition, 2015.*

Subject Code	Name of the Subject	L	T	P	C
	Analog & Digital Circuits	3	0	0	3

Course Educational Objectives

CEO1	To provide concepts that underpins the disciplines of Analog circuits, digital electronics and Microprocessor systems.
CEO2	To provide basic knowledge of designing Analog and digital circuits
CEO3	To provide the concept of various components

Course Outcomes

CO1	Knowledge and Awareness of various components.
CO2	Design of stable Analog circuits and Circuit simulation.
CO3	Binary and hexadecimal calculations and conversions.
CO4	Design of combinational and sequential circuits

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	2												
CO2	1	1	2												
CO3	1	1	2												
CO4	1	1	2												
Avg.	1	1.25	2												

SYLLABUS

Unit – I **[11Hrs]**

Voltage Regulator and components: Zener diode. Series and ShuntRegulator. Regulator ICs 78XX, IC 79XX.Light Emitting diode(LED),Schottky diode, Varactor diode, power diode, Photodiodes, LiquidcrystalDisplays, Solar cells, Thermistor

Biasing of BJT: DC operating point, BJT characteristics & parameters, all biasing circuits, analysis of above circuits and their design, variation of operation point and its stability. Differential Amplifier, constant current source, current mirror. Introduction to FET and comparison with BJT

Unit - II **[12Hrs]**

Operational Amplifiers and linear applications: Block diagram representation, Ideal Op-amp, Equivalent circuit, Open-loop configuration, Transfer characteristics. Op-amp with negative feedback, Frequency response. Op-amp IC 741 specifications. Basic op-amp applications: Adder, Scalar, Subtractor, Difference amplifier, I-V converter, V-I converters, Integrator, Differentiator, Instrumentation amplifier using 2 and 3 op-amp stages. IC 555 Timer, Astable, and MonostableMultivibrator.

Unit – III [12 Hrs]

Number Systems and Codes: Binary, Octal, Decimal and Hexadecimal number Systems and their conversion, Binary Addition and Subtraction ,Gray Code, BCD Code, Excess-3 code, ASCII Code. Boolean Algebra and Logic Gates: Theorems and Properties of Boolean Algebra, Standard SOP and POS form, Reduction of Boolean functions using Algebric method, K -map method (2,3,4 Variable). Basic Digital Circuits: NOT,AND,OR,NAND,NOR,EX-OR,EX-NOR Gates. Combinational Logic Design: Introduction, Half and Full Adder, Half and Full Subtractor, Four Bit Binary Adder, One digit BCD Adder, code conversion, Multiplexers and Demultiplexers,

Decoders, 4-bit Magnitude Comparator IC 7485 and ALU IC74181.

Unit – IV **[12 Hrs]**

Sequential Logic Design: Flip Flops: SR, D, JK, JK Master Slave and T Flip Flop, Truth Tables and Excitation Tables, Flip-flop conversion. Counters: Design of Asynchronous and Synchronous Counters, Modulo Counters, UP- DOWN counter .IC 74193 Shift Registers: Shift Register IC 7496, SISO, SIPO,PIPO,PISO, Bidirectional Shift Register , Universal Shift Register, Ring and Johnson Counter.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Book:

1. *Robert L. Boylestad, Louis Nashelsky, "Electronic devices and circuit Theory", PHI*
2. *Ramakant A. Gaikwad, "Op-amp and linear Integrated circuits", PHI*
3. *R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill.*
4. *M. Morris Mano, "Digital Logic and computer Design", PHI.*
5. *J. Bhasker." VHDL Primer", Pearson Education*

Reference Book:

1. *Martin s. Roden, Gordon L. Carpenter, William R. Wieserman "Electronic Design-From Concept to Reality", Shroff Publishers and Distributors.*
2. *D.royChoudhury,shailB.jain, "Linear integrated Circuits", New age International Publisher.*
3. *SubrataGhosal, "Digital Electronics", Cengage Learning.*
4. *Anil K. Maini, "Digital Electronics Principles and Integrated Circuits", Wiley India*
5. *Donald p Leach, Albert Paul Malvino, "Digital principles and Applications", Tata McGraw Hill.*

Subject Code	Name of the Subject	L	T	P	C
	OPTIMIZATION IN ENGINEERING	3			3

Course Educational Objectives

CEO1	To know the formulation of different optimization problems.
CEO2	To solve the optimization problems by different conventional methods.
CEO3	To apply basic techniques in solving the real-life optimization problems

Course Outcomes: : ***Upon successful completion of this course, students should be able to:***

CO1	Understand the theory of optimization methods and algorithms developed for solving various types of optimization problems.
CO2	Understand and apply the concept of optimality criteria for various types of optimization problems.
CO3	Solve various constrained and unconstrained problems in single variable as well as multivariable.
CO4	Apply the methods of optimization in real life situation.
CO5	To develop and promote research interest in applying optimization techniques in problems of Engineering and Technology.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		2	1	2											
CO2		2	1	2											
CO3		2	2	1											
CO4		2	2	2											
CO5		2	2	2											
Avg.		2	1.6	1.8											

SYLLABUS

UNIT-I **[10 Hours]**

Idea of Engineering optimization problems, Classification of optimization algorithms, modelling of problems and principle of modelling.

Linear programming: Formulation of LPP, Graphical solution, Simplex method, Big-M method, Revised simplex method, Duality theory and its application, Dual simplex method , Sensitivity analysis in linear programming

UNIT-II **[10 Hours]**

Transportation problems: Finding an initial basic feasible solution by Northwest Corner rule, Least Cost rule, Vogel's approximation method, Degeneracy, Optimality test, MODI method, Stepping stone method

Assignment problems: Hungarian method for solution of Assignment problems Integer Programming: Branch and Bound algorithm for solution of integer Programming Problems

UNIT-III **[12 Hours]**

Non-linear programming: Introduction to non-linear programming. Unconstraint optimization: Fibonacci and Golden Section Search method.

Constrained optimization with equality constraint: Lagrange multiplier, Projected gradient method

Constrained optimization with inequality constraint: Kuhn-Tucker condition, Quadratic

programming.

UNIT -IV **[8 Hours]**

Queuing models: General characteristics, Markovian queuing model, M/M/1 model, Limited queue capacity, multiple server, Finite sources, Queue discipline.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert

Text Books:

1. *Operations Research- Principle and Practice, A. Ravindran, D. T. Philips, J. Solberg, Second edition, Wiley India Pvt Ltd.*
2. *Operation Research, PrabhakarPai ,Oxford University Press*
3. *Optimization for Engineering Design, Kalyanmoy Deb, PHI Learning Pvt Ltd.*
4. *OperationsResearch, H.A.Taha, A.M.Natarajan, P.Balasubramanie, A.Tamilarasi, Pearson Education, Eighth Edition.*
5. *Engineering Optimization, S S Rao, New Age International (P) Ltd, 2003.*

Reference Books:

1. *Linear and Non-linear Optimization, Stephen G. Nash, A. Sofer, McGraw Hill, 2ndEdition.*
2. *Engineering Optimization, A.Ravindran, K.M.Ragsdell, G.V.Reklaitis, Wiley India Pvt. Ltd, Second edition.*
3. *Operations Research, F.S.Hiller, G.J.Lieberman, Tata McGraw Hill, Eighth Edition, 2005.*
4. *Operations Research, P.K.Gupta, D.S.Hira, S.Chand and Company Ltd, 2014.*

Subject Code	Name of the Subject	L	T	P	C	QP
	Organisational Behaviour	3	0	0	3	A

Course Educational Objectives

CEO1	To develop an understanding of the behaviour of individuals and groups inside organizations
CEO2	To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
CEO3	To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Course Outcomes: : *Upon successful completion of this course, students should be able to:*

CO1	Define, explain and illustrate a range of organizational behaviour theories.
CO2	Analyse the behaviour of individuals and groups in organizations in terms of organizational behaviour theories, models and concepts.
CO3	To explain group dynamics and demonstrate skills required for working in groups (team building)
CO4	Communicate effectively in oral and written forms about organizational behaviour theories and their application using appropriate concepts, logic and rhetorical conventions.
CO5	To explain organizational culture and describe its dimensions and to examine various organizational designs

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1							2	2							
CO2							2	3							
CO3							2	3							
CO4							2	2							
CO5							2	2							
Avg.							2	2.4							

SYLLABUS

Unit – I **[14Hrs]**

Fundamentals of OB: Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behaviouristic and social cognitive), Limitations of OB.

Attitude: Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behaviour and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes.

Personality and values: Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications.

Perception: Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect).

Motivation: Definition & Concept of Motive & Motivation, The Content Theories of Motivation

(Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.

Unit - II [12Hrs]

Foundations of Group Behaviour: The Meaning of Group & Group behaviour & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development.

Managing Teams: Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building.

Leadership: Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.

Unit – III [14 Hrs.]

Organizational Culture : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.

Unit – IV [8 Hrs.]

Organizational Change: Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change.

Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change &Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert

Text Books/Reference books:

1. *Understanding Organizational Behaviour, Parek, Oxford*
2. *Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.*
3. *Organizational Behaviour, K. Awathappa,HPH.*
4. *Organizational Behaviour, VSP Rao, Excel*
5. *Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.*
6. *Organizational Behaviour, Hitt, Miller, Colella, Wiley*

Subject Code	Name of the Laboratory	L	T	P	C
	Object Oriented Programming	0	0	2	1

Prerequisites:

Course Educational Objectives

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Understand the Loop control structures: do, while, for etc.
CO2	Know the Classes and objects.
CO3	Know the Data abstraction & data hiding, inheritance, polymorphism.
CO4	AnalyseThreads, exception handlings and applet programs

CO-PO & PSO Mapping:

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			1		2										
CO2			1		2										
CO3			2		2										
CO4			2		2										
Avg.			1.5		2										

List of Experiments

1. Introduction, Compiling & executing a java program.
2. Data types & variables, decision control structures: if, nested if etc.
3. Loop control structures: do, while, for etc.
4. Classes and objects.
5. Data abstraction & data hiding, inheritance, polymorphism.
6. Threads, exception handlings and applet programs
7. Interfaces and inner classes, wrapper classes, generics

Subject Code	Name of the Laboratory	L	T	P	C
	Data Base Management Systems lab	0	0	2	1

Course Outcomes: : ***Upon successful completion of this course, students should be able to:***

CO1	Know the procedures and functions of SQL
CO2	Understand the ODBC using either VC++
CO3	Write the programs on database triggers
CO4	Understand the lock operations

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		2			2										
CO2		2			2										
CO3		2			3										
CO4		2			2										
Avg.		2			2.25										

List of Experiments

1. Use of SQL syntax: insertion, deletion, joins, updating using SQL.
2. Programs on join statements and SQL queries including where clause.
3. Programs on procedures and functions.
4. Programs on database triggers.
5. Programs on packages.
6. Programs on data recovery using check point technique.
7. Concurrency control problem using lock operations.
8. Programs on ODBC using either VC++.
9. Programs on JDBC.
10. Programs on embedded SQL using C / C++ as host language.

Subject Code	**Name of the Laboratory**	L	T	P	C
	Electrical machines-I Lab	0	0	2	1

Prerequisites: Calculus, differential equations, and electric and magnetic circuit analysis. Knowledge of KCL and KVL and ability of analyzing Electric Circuits.

Course Educational Objectives

CEO1	To determine efficiency by various types test on DC generators, motorsand transformers.
CEO2	To plot characteristics curve of different machines.
CEO3	To perform different speed control methods of DC motors.

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Analyzelosses of different Electrical machines.
CO2	Understand the characteristics curve of different machines
CO3	Analyze the different speed control methods of DC motors.
CO4	Examine the efficiencies of DC generators, motors and transformers
CO5	Observe the connections of Single phase transformers

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		2	1											2	
CO2		1	1											1	
CO3		2	2											3	
CO4		2	1											3	
CO5		1	1											2	
Avg.		1.6	1.2											2.2	

List of Experiments

Select any 8 experiments from the list:

1. Determination of critical resistance & critical speed from no load test of a DC shunt generator.
2. Plotting of external and internal characteristics of a DC shunt generator.
3. Speed control of DC shunt motor by armature voltage control and flux control method.
4. Determination of efficiency of DC machine by Swinburne's Test
5. Determination of efficiency of DC machine by Brake test
6. Determination of efficiency of DC machine by Hopkinson's Test.
7. Determination of Efficiency and Voltage Regulation by Open Circuit and Short Circuit test on single phase transformer.
8. Polarity test and Parallel operation of two single phase transformers.
9. Back-to Back test on two single phase transformers.
10. Load Test on 1-phase transformer
11. Scott Connection of Single-phase Transformers

Subject Code	Name of the Laboratory	L	T	P	C
	Network Theory Lab	0	0	2	1

Course Educational Objectives

CEO1	Verification of Network Theorems.
CEO2	Study of resonance in R-L-C circuits using oscilloscope.
CEO3	Study of input and output of different filters.
CEO4	Study of DC and AC Transients for R-L, R-C & R-L-C circuits.

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Design a circuit with various theorems and methods.
CO2	Determine open circuit and short circuit parameters.
CO3	Design different filter circuits.
CO4	Examine transient circuits with various loads
CO5	Design different R-L-C resonance circuits.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1	3										3		
CO2	1	1	1										2		
CO3	2	1	3										3		
CO4	1	1	1										3		
CO5	1	1	3										3		
Avg.	1.4	1	2.2										2.8		

List of Experiments

Select any 8 experiments from the list:

1. Verification of Network Theorems using AC circuits. (Superposition, Thevenin, Norton, Maximum Power Transfer).
2. Study of DC and AC Transients for R-L, R-C & R-L-C circuits using storage oscilloscope.
3. Determination of circuit parameters: Open Circuit and Short Circuit parameters.
4. Determination of circuit parameters: Hybrid and Transmission parameters.
5. Frequency response of Low pass and High Pass Filters.
6. Frequency response of Band pass and Band Elimination Filters.
7. Determination of self-inductance, mutual inductance and coupling coefficient of a single phase two winding transformer representing a coupled circuit.
8. Study of resonance in R-L-C series circuit using oscilloscope.
9. Study of resonance in R-L-C parallel circuit using oscilloscope.
10. Spectral analysis of a non-sinusoidal waveform.

IV Semester [Second Year]

Sl. No.	Category	Subject Code	Course Title	Hours per week			Credits
				L	T	P	
1	Engineering Science Courses		Object Oriented Programming/ Data Base Management Systems	3	0	2	4
2	Professional Core Courses		Electrical Machines – II	3	0	2	4
3	Professional Core Courses		Control Systems	3	0	2	4
4	Professional Core Courses		Electromagnetic Fields	3	0	0	3
5	Professional Core Courses		Electrical power Transmission & Distribution	3	0	2	4
6	Humanities and Social Sciences including Management Courses		Organizational Behavior / Optimization in Engineering	2	0	0	2
7	Mandatory Courses		Constitution of India / Essence of Indian Traditional Knowledge	-	-	-	0
			Total Credits:	**17**	**0**	**8**	**21**

Subject Code	Name of the Subject	L	T	P	C
	Electrical Machines -II	3			3

Course Educational Objectives

CEO1	To understand the concept of three phase synchronous generator
CEO2	To study about the characteristics and parameters of cylindrical rotor type and salient pole type three phase synchronous generators
CEO3	To get concept of parallel operation of three phase synchronous generator
CEO4	To study about principle and properties of synchronous motor
CEO5	To acquire knowledge about working principle and properties of three phase and single phase induction motors

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Working principle and characteristics of synchronous machines
CO2	Interpreting the concept and difference between cylindrical rotor and salient pole type three phase synchronous generator.
CO3	Understand the concept of parallel operation of alternator and its synchronization with infinite bus bar
CO4	Acquiring knowledge about properties and concept of synchronous motor.
CO5	Differentiate properties and concept between three phase and single phase induction motor.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2											2		
CO2	2	3											1		
CO3	1	1											2		
CO4	1	2											2		
CO5	2	2											2		
Avg.	1.6	2											1.8		

SYLLABUS

Unit – I **[14Hrs]**

Three Phase Synchronous Generators: Synchronous Generator Construction (both Cylindrical Rotor and Salient Pole type), the Speed of Rotation of a Synchronous Generator, Induced voltage in A.C Machines, The Internal Generated Voltage of a Synchronous Generator, The Equivalent Circuit of a Synchronous Generator (Armature Reaction Reactance, Synchronous Reactance and Impedance).

Cylindrical Rotor type Three Phase Synchronous Generators: The Phasor Diagram of a Synchronous Generator, Power and Torque in Synchronous Generators (Power Angle Equation and Power Angle Characteristic), Measuring Synchronous Generator Model Parameters (Open Circuit and Short Circuit Tests and Determination of Synchronous Impedance and Reactance, The Short Circuit Ratio), Voltage Regulation and Speed Regulation. Voltage Regulation by Synchronous Impedance Method

Unit - II **[12Hrs]**

Salient Pole type Three Phase Synchronous Generators: Two Reaction Concept, Development of the Equivalent Circuit of a Salient Pole type Three Phase Synchronous Generator (Direct axis and Quadrature axis Reactance, Phasor Diagram for various load power factors,), Torque and Power Equations of Salient Pole Synchronous Generator (Power Angle Equation and Power

Angle Characteristic with stator resistance neglected). Slip Test for determination of direct axis and Quadrature axis Reactance.
Parallel operation of Three Phase A.C. Synchronous Generators
The Conditions Required for Paralleling, The General Procedure for Paralleling Generators,
Three Phase Synchronous Motors: Basic Principles of Motor operation, Steady State Synchronous Motor operation, Starting Synchronous Motors, Operation of synchronous motors connected to bus and phasor diagrams for normal, under and over excited conditions, V and Λ curves, Synchronous Motor Applications.

Unit – III [14 Hrs.]

Three phase induction machines:

Constructional features and types; 3-phase distributed winding production of rotating magnetic field, Principle of Operation, The Effect of Coil Pitch and distribution factor on A.C. Machines, winding factor, Concept of Slip, Slip Speed; Phasor diagram and Development of equivalent circuit and derivation of torque equation; Typical torque-slip characteristic and influence of different parameters on it, No-Load and Blocked Rotor tests,
Determination of Parameters, power flow diagram, Losses and Efficiency, Methods of starting and speed control. Cogging, Crawling.

Unit – IV **[8 Hrs.]**

Single phase induction machines: Double field revolving theory, Methods of starting using auxiliary winding, development of equivalent circuit. No-Load and Blocked Rotor tests,
Determination of Parameters Speed Control of Single Phase Induction Motors.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. *Stephen J. Chapman-'Electric Machinery and Fundamentals'- McGraw HillInternational Edition, (Fourth Edition), 2015.*
2. *M.G.Say-'Alternating Current Machines', English Language Book Society(ELBS)/ Longman, 5th Edition, Reprinted 1990.*

Reference Books:

1. *B.S.Guru&H.R.Hiziroglu-'Electric Machinery & Transformers'-3rd Ed-OxfordPress, 2014.*
2. *P.C.Sen-'Principles of Electric Machines and Power Electronics'-2nd Edition, JohnWiley and Sons, Wiley India Reprint, 2014.*
3. *A.E.Fitgerland, Charles Kingslay Jr. & Stephen D. Umans -Electric machinery – 6thEdition McGraw Hill – Reprint 2015.*
4. *D.P. Kothari & I.J. Nagrath - Electric Machines – 4th Edition McGraw Hill – Reprint2015.*
5. *P S Bimbhra– Electrical Machinery –Khanna Publishers.*

Subject Code	Name of the Subject	L	T	P	C
	Control Systems	3	0	0	3

Course Educational Objectives

CEO1	To know the performance of different control system through design in state space.
CEO2	To understand the stability of linear and nonlinear systems.
CEO3	To understand the principle of digital control system and to analyse it's stability

Course Outcomes: : ***Upon successful completion of this course, students should be able to:***

CO1	Acquiring knowledge about theoretical concept of control system and its application.
CO2	Analysis the concept of control stability of a system in frequency domain and time domain
CO3	Understand the time response analysis and feedback characteristics of control system.
CO4	Analyze about state variable analysis and PID controller.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		2	3										2		
CO2		3	2										3		
CO3		3	2										2		
CO4		1	2										3		
Avg.		2.25	2.3										2.5		

SYLLABUS

Unit – I **[12 Hrs.]**

Introduction to Control Systems: Basic Concepts of Control Systems, Open loop and closedloop systems, Servo Mechanism/Tracking System.

Mathematical Models of Physical Systems: Differential Equations of Physical Systems, Transfer functions, Block Diagram Algebra, Signal flow Graphs.

Feedback characteristics of Control Systems: Feedback and Non-feedback System, Reduction of parameter variation by use of feedback, control over System Dynamics by use of feedback, Control of the Effects of disturbance signals by use of feedback, linearizing effect offeedback, regenerative feedback, Regenerative feedback.

Unit - II **[12 Hrs.]**

Time response Analysis: Standard Test Signals, Time response of first order systems, Time Response of Second order systems, Steady State Errors and Static Error Constants of different types of systems, Effect of adding a zero to a system, Design specification of second order system, Performance indices.

Concepts of Stability: The concept of stability, Necessary conditions for stability, Hurwitz Stability Criterion, Routh Stability Criterion, Relative Stability Analysis, More on Routh Stability Criterion.

The Root locus Technique: Introduction, Root locus Concepts, Construction of Root locus, Rout Contours, Systems with transportation lag.

Unit – III [12 Hrs.]

Frequency Response Analysis: Correlation between Time and Frequency Response, Polar plots, Bode plots

Stability in Frequency Domain: Mathematical Preliminaries, Nyquist Stability Criterion,

Assessment of Relative stability using Nyquist Criterion, Closed loop Frequency Response, Closed loop frequency response: Constant M circles, Constant N-Circles, Nichol's chart

Unit – IV **[8 Hrs.]**

Control System and Components: Stepper motor, AC & DC Servomotor, Synchros, AC Tachometer

Design Specifications of a control system: Proportional Derivative Error Control (PD Control), Proportional Integral Controller (PI Control), Proportional, Integral and Derivative Controller (PID Control), Derivative Output Control.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert

Text Book:

1. *Control Systems Engg. by I.J. Nagrath and M.Gopal, 5th Edition, New Age International Publishers (2010)*
2. *Modern Control Engineering by K. Ogata, 5th edition PHI.*
3. *Automatic Control Systems by Benjamin C. Kuo, 7th Edition, Prentice-Hall India publication (1995)*

Reference Book:

1. *Design of Feedback Control Systems by R.T. Stefani, B. Shahian, C.J. Savator, G.H. Hostetter, Fourth Edition (2009), Oxford University Press.*
2. *Control Systems (Principles and Design) by M.Gopal 3rd edition (2008), TMH.*
3. *Analysis of Linear Control Systems by R.L. Narasimham, I.K. InternationalPublications*
4. *Control Systems Engineering by S.P. Eugene Xavier and J. Josheph Cyril Babu,1stEdition (2004), S. Chand Co. Ltd.*
5. *Problems and solutions in Control System Engineering by S.N. Sivanandam and S.N. Deepa, Jaico Publishing House.*
6. *Modern Control Systems by Richard C.Dorf and Robert H. Bishop, 11thEd (2009),Pearson.*

Subject Code	Name of the Subject	L	T	P	C
BEEPC4040	**Electromagnetic Fields**	3	0	0	4

Course Educational Objectives

CEO1	To study about the concept of Co-ordinate systems & Transformation.
CEO2	To study about Vector Calculus
CEO3	To get theoretical concept of calculation and derivation of electrostatic field.
CEO4	Understand the theoretical derivation of magnetostatics field.
CEO5	To acquire knowledge about electromagnetic field and wave propagation

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Relate the vector calculus with electric and magnetic field in space.
CO2	Employ mathematical tools like integral & differential calculus to study electric and magnetic behaviour through a medium.
CO3	Solve electromagnetic relation using Maxwell formulae and analyze moving charges on magnetic fields.
CO4	Formulate the idea of applying properties of electromagnetic waves in transmission lines and design circuits using conductors as well as dielectrics.
CO5	Measure and decide the nature of a wave to propagate in a particular medium

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2											2		
CO2	1	2											2		
CO3	2	1											2		
CO4	2	2											2		
CO5	3	2											2		
Avg.	2	1.8											2		

SYLLABUS

Unit – I **(12 hours)**

Co-ordinate systems & Transformation: Cartesian co-ordinates, circular cylindrical co-ordinates, spherical co-ordinates.

Vector Calculus: Differential length, Area & volume, Line surface and volume Integrals, Del operator, Gradient of a scalar, Divergence of a vector & divergence theorem, curl of a vector &Stoke's theorem, laplacian of a scalar

Unit - II **[12Hrs]**

Electrostatic Fields: Coulomb's Law, Electric Field Intensity, Electric Fields due to point, line, surface and volume charge, Electric Flux Density, Gauss's Law – Maxwell's Equation, Applications of Gauss's Law, Electric Potential, Relationship between E and V –Maxwell's Equation An Electric Dipole & Flux Lines, Energy Density in Electrostatic Fields., Electrostatic Boundary – Value Problems: Possion's&Laplace's Equations, Uniqueness theorem, General procedures for solving possion's or Laplace's Equation.

Unit – III **[12 Hrs]**

Magnatostatic Fields: Magnetic Field Intensity, Biot-Savart's Law, Ampere's circuit law-Maxwell Equation, applications of Ampere's law, Magnetic Flux Density-Maxwell's equations. Maxwell's equation for static fields, Magnetic Scalar and Vector potentials.

Unit – IV **(12 hours)**

Electromagnetic Fields and Wave Propagation: Faraday's Law, Transformer & Motional Electromagnetic Forces, Displacement Current, Maxwell's Equation in Final forms, Time Varying Potentials, Time-

Harmonic Field. Electromagnetic Wave Propagation: Wave Propagation in loss Dielectrics, Plane Waves in loss less Dielectrics, Power & pointing vector.
Teaching Methods: Chalk& Board/ PPT/Video Lectures
Text Books: *1. Matthew N. O. Sadiku, Principles of Electromagnetics, 4th Ed., Oxford Intl. Student Edition.*
Reference Books: *1. C. R. Paul, K. W. Whites, S. A. Nasor, Introduction to Electromagnetic Fields, 3rd, TMH.* *2. W.H. Hyat, Electromagnetic Field Theory, 7th Ed, TMH.*

Subject Code	Name of the Subject	L	T	P	C
	Electric Power Transmission & Distribution	3	0	0	3

Course Educational Objectives

CEO1	To train the students about both the transmission and distribution substations.
CEO2	To engage the students in different software designing tools and to engage them to visit the college campus for different overhead lines during their laboratory hours.
CEO3	To provide knowledge about transmission and distribution through workshops and training by industrial experts.
CEO4	To involve the students in maintenance work in college 11kV transformer and also to detect the fault in the distribution station.

Course Outcomes: : *Upon successful completion of this course, students should be able to:*

CO1	Calculate inductance, capacitance in overhead lines also design overhead conductors for single phase and three phase transmission lines.
CO2	Analyse the performance of different transmission lines and required calculations.
CO3	Configure different types of distribution systems.
CO4	Illustrate the design consideration of underground and overhead lines

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		3	2											2	
CO2		2	3											3	
CO3		2	3											3	
CO4		3	2											2	
Avg.		2	2.5											2.2	

SYLLABUS

Unit – I **[14Hrs]**

Line Constant Calculations: Introduction to per unit system and calculation for transmission system. Magnetic flux Density, Inductors and Inductance Magnetic field Intensity due to long current carrying conductors, Inductance of two wire transmission line, Flux linkages with one conductor in a group of conductors, Transposition of power lines, Composite Conductors, Inductance of Composite Conductors, Inductance of double circuit three phase line, Concept of GMD, Bundled conductors, Skin and Proximity effect.

Capacitance of Transmission Lines: Electric Field of a Line of charge, Straight Conductor, The Potential Difference between Two Points due to a line Charge, Two infinite lines of charge, Capacitance

of a Two Wire Line, Capacitance of a Three Phase Line with Unsymmetrical Spacing, Capacitance of a double circuit line, Inductance of three phase un symmetrically spaced transmission, Effect of Earth on the Capacitance of conductors.

Unit - II [12Hrs]

Performance of Lines: Representation of Lines, Short Transmission Lines, The Medium Transmission Lines, The Long Transmission Line: The Long Transmission Line, ABCD constants, Ferranti Effect Hyperbolic Form of The Equations, The Equivalent Circuit of a Long Line, Power Flow Through Transmission Line, Reactive Compensation of Transmission Line. Series and shunt compensation.

Unit – III [14 Hrs.]

Overhead Line Insulators: Insulator Materials, Types of Insulators, Voltage Distribution over Insulator String, Methods of Equalizing the potential Mechanical Design of Overhead Transmission Lines: The catenary curve, Sag Tension calculation, supports at different levels, Stringing chart, sag Template, Equivalent span, Stringing of Conductors, Vibration and Vibration Dampers

Distribution: Comparison of various Distribution Systems, AC three-phase four-wire Distribution System, Types of Primary Distribution Systems, Types of Secondary Distribution Systems, Voltage Drop in DC Distributors, Voltage Drop in AC Distributors, Kelvin's Law, Limitations of Kelvin's Law, General Design Considerations

Unit – IV [8 Hrs.]

Insulated Cables: The Insulation, Extra High Voltages Cable, Insulation Resistance of Cable, Grading of Cables, Capacitance of Single Core Cables, Heating of cables, Current rating of cables, Overhead lines Vs Underground Cables, Types of cable

Power System Earthing: Soil Resistivity, Earth Resistance, Tolerable Step and Touch Voltage, Actual Touch and Step Voltages, Design of Earthing Grid.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert

Text Books:

Power System Analysis- By John J. Grainger & W. D. Stevenson, Jr, Tata Mcgraw-Hill, 2003 Edition, 15th Reprint, 2010**.**

Reference Books:

1. Weedy B.M. and Cory B.J., "Electric Power Systems", 4th Ed., 2008 Wiley India.
2. Electrical Power Systems-C.L.Wadhwa, New Age International Publishers, Sixth Edition.
3. Power System Analysis & Design- By B. R. Gupta, S. Chand Publications, 3rd Edition,Reprint, 2003.

Subject Code	Name of the Laboratory	L	T	P	C	QP
BEEPC4110	**Electrical Machines -II Lab**	0	0	2	1	

Course Educational Objectives

CEO1	To study the voltage regulation and characteristics of alternator
CEO2	To acquire knowledge of characteristics of synchronous motor
CEO4	To study working principle of different type of single phase induction motor
CEO4	To understand the concept of synchronization of an alternator with infinite bus bar

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Acquire practical concept of synchronization of an alternator with infinite busbar
CO2	Apply the knowledge of alternator in generation field.
CO3	Implement the characteristics of three and single phase induction motors in different drives
CO4	Understand the concept and application of synchronous motor in various industrial field.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		2	2										2		
CO2		2	2										2		
CO3		2	2										2		
CO4		2	2										2		
Avg.		2	2										2		

List of Experiments

1. Determination of the voltage regulation of an alternator by synchronous impedance method and zero power factor (zpf) method
2. Study of parallel operation of two alternators
3. Measurement of direct and quadrature axis reactance of a salient pole synchronous machine
4. Determination of the V and inverted V curves of a synchronous motor
5. Determination of parameters of synchronous machine
    a. Positive sequence reactance
    b. Negative sequence reactance
    c. Zero sequence reactance
6. Determination of parameter of a single phase induction motor and study of
    (a) Capacitor start induction motor
    (b) Capacitor start and capacitor run induction motor
    (c) Universal motor
    (d) Shaded pole motor
    (e) Repulsion motor
7. Determination of Efficiency, Plotting of Torque-Slip Characteristics of Three Phase Induction motor by Brake Test.
8. Determination of parameters of three phase induction motor from No load Test and Blocked Rotor Test
9. Speed control of a three phase induction motor using variable frequency drives
10. Performance of grid connected induction generator.

Subject Code	Subject Code	L	T	P	C	QP
BEEPC4120	**Control Systems Lab**	0	0	2	1	

Course Educational Objectives

CEO1	To study the characteristics of AC servomotor
CEO2	To understand the concept of P,PI,PID controller
CEO3	To acquire knowledge of characteristics of different type of transducers.

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Acquire practical concept and application of various transducers in the field of industrial automation and feedback system
CO2	Apply the knowledge of various control system components in automation.
CO3	Implement the characteristics of P , PI , PID controller in advanced control system .
CO4	Understand the concept and application of lag lead compensator.

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1				2	2								**2**		
CO2				2	1								**2**		
CO3				1	1								**2**		
CO4				1	1								**2**		
Avg				1.5	1.25								2		

LIST OF EXPERIMENTS

1. Study of a dc motor driven position control system
2. Study of speed torque characteristics of two phase ac servomotor and determination of its transfer function
3. Obtain the frequency response of a lag and lead compensator
4. To observe the time response of a second order process with P, PI and PID control and apply PID control to servomotor
5. To study and validate the controllers for a temperature control system
6. To study the position control system using Synchros
7. To plot the displacement-voltage characteristics of the given LVDT
8. To study the characteristics of J-type thermocouple and thermistors
9. Use a strain gauge to plot the curve between strain applied to a beam and the output voltage
10. To study on the interface of PLC with PC for data acquisition applications
11. Measurement of speed by using magnetic pick up.

Subject Code	Subject Code	L	T	P	C	QP
BELPC5130	**Electrical power transmission & distribution lab**	**0**	**0**	**2**	**1**	

Course Educational Objectives

CEO1	To learn the usage of passive elements in various Power Transmission Systems... Calculations such as transverse loading, conductor clearances, pole buckling and guying will be discussed in detail.
CEO2	To understand the factors affecting Insulators and also in Under Ground cables.
CEO3	To calculate the various parameters in Distribution System

Course Outcomes: ***Upon successful completion of this course, students should be able to:***

CO1	Apply power system fundamentals to the design of a system that meet specific needs.
CO2	Design a power system solution based on the problem requirements and realistic Constraints
CO3	Develop a major design experience in power a system that prepares them for engineering practice.
CO4	Design a Transmission and distribution electric power system

CO-PO & PSO Mapping

COs	PROGRAMME OUTCOMES												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			2	2											
CO2			2	2											
CO3			1	2											
CO4			2	3											
Avg			1.75	2.25											

LIST OF EXPERIMENTS (Any 8 Experiments)

1. Study and of Ferranti Effect.
2. Determination of ABCD Parameter.
3. Determination of string efficiency.
4. Earth resistance measurement.
5. Series and shunt capacitance computation in transmission line.
6. Transformer oil test.
7. Study of various lightning arresters.
8. Distribution system power factor improvement using switched capacitor.
9. Software based design of the transmission & distribution network of a city.
10. Measurement of ground resistivity and ground electrode resistance.
11. To simulate a small Hydro Plant.
12. Study and Operation of HVDC Link.
13. Study and operation of Static VAR compensator