Choice Based Credit System (CBCS)
Name of the Programme (UG): B.E

Syllabus for III - Semester and IV - Semester

With effect from 2017 - 2018

Specialization /Branch:
Electrical & Electronics Engineering

Chaitanya Bharathi Institute of Technology (A)
Chaitanya Bharathi (P.O), Gandipet
Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
Choice Based Credit System

B.E (Electrical and Electronics Engineering)

SEMESTER – III

S.No.	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16MT C05	Engineering Mathematics-III	3	-	3	30	70	3
2	16EE C02	Electrical Circuits-I	3	-	3	30	70	3
3	16EE C03	Electrical Measurements and Instruments	3	-	3	30	70	3
4	16EC C16	Electronics Engineering	4	-	3	30	70	4
5	16ME C11	Prime Movers and Pumps	3	-	3	30	70	3
6	16MB C01	Engineering Economics and Accountancy	3	-	3	30	70	3
PRACTICALS								
6	16EE C04	Circuits and Measurements Lab	0/1	2	3	25	50	2
7	16EC C17	Electronics Engineering Lab	-	3	3	25	50	2
8	16ME C12	Prime Movers and Pumps Lab	0/1	2	3	35	50	2
Total			**21**	**7**	**-**	**255**	**570**	**25**

L: Lecture T: Tutorial P: Practical D: Drawing

CIE - Continuous Internal Evaluation SEE - Semester End Examination

Assessment Procedures for Awarding Marks

The distribution of marks is based on CIE by concerned teacher and the Semester end examination shall be as follows:

Course (in terms of credits)	CIE	Semester end Examination(Marks)	Remarks	Duration of SemesterEnd Examination
Three(3) Credits/ Four(4) Credits	30*	70**	Theory Course/ Engg.Graphics	3 Hours
Two(2) Credits	20*	50***	Theory	2 Hours
Two(2) Credits	25	50	Lab Course/ Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
Two(2) Credits	50	—-	Project Seminar/ Seminar	——
Six(6) Credits	50	100	Project	Viva-Voce
One(1) Credit	—-	50***	Environmental Studies,Professional Ethics and Human values	2 Hours
One(1) Credit	50		Mini Project	——-

CIE: Continuous Internal Evaluation

*Out of 30/20 sessional marks(CIE), 10/5 marks are allotted for slip-tests (Three slips test will be conducted, each of 10/5 marks, best two average is considered) and the remaining 20/15 marks are based on the average of two tests, weightage for each test is 20/15 marks.

**The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

***The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 15 marks. Part-B carries 35 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

Note: A course that has CIE (sessional marks) but no semester end examination as per scheme, is treated as Pass/Fail for which pass marks are 50% of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/grade as prescribed. Minimum pass marks for theory course is 40% of total marks i.e., CIE plus semester end examinations where as for the lab course/project is 50%.

16MT C05

ENGINEERING MATHEMATICS-III

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

1. To study the expansion of functions in various intervals.
2. To form P.D.E and to find its solution.
3. To solve Wave, Heat & Laplace equations
4. To learn Differentiation and Integration of complex valued functions.
5. To evaluate Complex Integration.
6. To evaluate Real definite integrals.

Course outcomes:

On the successful completion of this course the student will be able to

1. Expand functions in the given intervals.
2. Solve linear and non linear PDEs.
3. Solve one-dimension, two-dimension, Heat steady state equations and also one-dimension wave equation.
4. Solve problems on Analytic functions, Cauchy's theorem and Cauchy's integral formula.
5. Expand functions by using Taylor's and Laurent's series.
6. Solve Real and Complex integrals by using Cauchy Theorems.

UNIT – I

Fourier series: Definition of Periodic, Single valued, finite maxima and minima of functions. Euler's Formulae, Dirichlets Conditions for Fourier expansion, Functions having points of discontinuity, Change of interval, Expansion of odd and even functions, Half-range sine series and cosine series.

UNIT-II:

Partial Differential Equations: Formation of partial differential equations by eliminating the arbitrary constants or arbitrary functions, solutions of linear partial differential equation of first order by using Lagrange's Method, solution of Non-linear partial differential equations of first order by using standard types, Charpit's Method.

UNIT - III

Applications of Partial Differential Equations: Solution of partial differential equations by using method of separation of variables, solution of vibration of a stretched string (1D-Wave equation), one dimensional heat equation, Two dimensional heat equation under steady state conditions.

UNIT - IV

Theory of Complex variables: Analytic functions, Cauchy Riemann equations (Cartesian and polar forms), construction of Analytic functions by using Milne-Thomson's method. Harmonic function. Complex line integrals, Cauchy's theorem, Cauchy's Integral formula and its derivatives and problems related to the above theorems.

UNIT - V

Expansion of functions, Singularities & Residues: Taylor's and Laurent's series Expansions (Only statements). Zeros, types of singularities, Residues and Cauchy's Residue theorem, Evaluation of real integrals by Cauchy's residue theorem. Evaluation of improper real integrals of the type: $\int_{-\infty}^{\infty} f(x)dx$ Where f(x) has no poles on real axis and.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2015.
2. M.D. Raisinghania, Advanced Differential equations, S Chand publishers, 7th Edition, 2013.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, McGraw Hill publishers, 7th Edition 2003.

Suggested Reading:

1. N P Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi publishers, 9th Edition, 2016.
2. Alan Jeffrey, Mathematics for Engineers and Scientists, Chapman & Hall/CRC publishers, 6th Edition, 2013.
3. A R Vasistha and R K Gupta, Integral transforms, Krishna prakashan publishers, 2004.
4. R.K.Jain & S.R.K.Iyenger, Advanced Engineering Mathematics, Narosa Publications, 3rd Edition,2007.

16EE C02

ELECTRICAL CIRCUITS – I

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To understand the nature of different circuit elements, fundamental circuit laws and network theorems.
2. To be acquainted with electrical circuit analysis, which is the foundation for all subjects of the Electrical Engineering discipline.
3. To Study transient response of circuits with initial conditions & forcing functions and also basics of network topology.
4. To understand poly-phase circuits and measurement of three phase power.

Course Outcomes: The student will be able to

1. Acquire concepts of the nature of different circuit elements, network theorems and electrical circuit analysis.
2. Analyze R-L-C circuits under steady state condition.
3. Analyze the behavior of circuits under transient conditions.
4. Analyze balanced and unbalanced 3-phase AC circuits.
5. Acquire the knowledge of resonance, coupled circuits and network topology.
6. Acquire knowledge to apply the Electrical Circuits concepts to Electrical Engineering.

UNIT –I

Circuit Analysis: Loop, mesh, supermesh analysis, node, supernode analysis with DC and AC excitations.

UNIT – II

Network Theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer, Reciprocity, Milliman's and Tellegen's Theorems.

UNIT – III

Resonance: Definitions and computations of series and parallel resonance, Bandwidth and Q-factor; Locus diagrams; Coupled circuits, Analysis of circuits with mutual inductance, Linear and ideal transformers.

Network Topology: Network Graph concept, Oriented graph, Node, Branch, Complete incidence matrix, Tree and its properties, Cotree, Tie-

set, Fundamental tie-set matrix, Cut-set, Fundamental cut-set matrix; Duality.

UNIT – IV

Transient Response: Initial Conditions in zero-input response of RC, RL and RLC networks, Definitions of Unit Impulse, Unit Step and Ramp functions; Zero state response with Impulse and Step inputs; Complete response of circuits with initial conditions and forcing functions such as Step and Sinusoidal functions.

UNIT – V

Poly Phase Circuits: 3-phase circuit analysis, Star and delta connected systems, Calculations of voltage, current and power in 3-phase circuits with star and delta connected loads and generator, Balanced and unbalanced loads. Measurements of 3-phase power by two wattmeter method.

Text Books:

1. M. E. Van Valkenburg, Network Analysis, Prentice Hall of India Publications, 3rd Edition, 1995.
2. W. H. Hayt, J .E. Kemmerly, Engineering Circuit Analysis, McGraw Hill Publications, 8th Edition, 2013.
3. Charles K. Alexander & Matthew N. O. Sadiku, Fundamentals of Electric Circuits, TMH Publications, 5th Edition, 2013.

Suggested Reading:

1. A. Sudhakar & Shyammohan Palli, Network Analysis, Tata McGraw-Hill Publications, 4th Edition, 2010.
2. N.C. Jagan & C. Lakshminarayana, Network Analysis, B. S. Publications, 3rd Edition, 2014.
3. Roy Chowdary, Networks & Systems, Newage Publications, 2nd Edition, 2010.
4. M Nahvi, Joseph Edminister, K. Uma rao, Electric Circuits, Schaum's Outline Series, Tata Mc-Graw Hill Publications, 5th Edition, 2010.

16EE C03

ELECTRICAL MEASUREMENTS AND INSTRUMENTS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To understand the principle behind various instruments.
2. To comprehend the torque equations of instruments.
3. To know the various bridges for measurement of R, L and C.
4. To calibrate the instruments.

Course Outcomes: The student will be able to

1. Identify a suitable instrument to measure a given parameter.
2. Analyze the need of CT/PT for a given system.
3. Illustrate the concept of the instrument with relevant examples and proper justification.
4. Distinguish between electrical and magnetic measurements and their instruments.
5. Recognize the appropriate bridge method of measurement for a given parameter.
6. Specify the right digital instrument for a given requirement.

UNIT- I

Introduction to Measurements: Objectives of measurement, static and dynamic characteristics, errors and their classification.

Introduction to Instruments-1: Types of instruments, classification of instruments based on type of measurement and principle of working (PMMC, MI, Dynamometer, Induction and Electrostatic), types of torques (torque equations for MC, MI and dynamometer type instruments).

UNIT- II

Introduction to Instruments-2: Single phase Induction type energy meter, Driving torque & Braking torque equations, errors and their compensation, Single phase Dynamometer type Power factor meter, Weston type frequency meter. Construction & theory of Instrument Transformers, Equations for ratio and phase angle error of C.T & P.T (Elementary treatment only).

UNIT- III

Resistance, Inductance and Capacitance parameters: Classification of resistance measuring methods Kelvin's double bridge, Wheatstone bridge and meggar. Measurement of inductance using Maxwell's inductance

bridge, Maxwell's Inductance - Capacitance Bridge and Anderson's bridge. Measurement of capacitance using De-Sauty's bridge and Schering bridge. Derivation of bridge balance conditions, merits and demerits, applications and related numerical problems.

UNIT- IV

Measurements of Magnetic and Electric Parameters: Ballistic galvanometer- Principle of operation, construction and applications of Ballistic galvanometer, flux meter its construction and principle of operation. Determination of B-H curve using method of reversals, Epstein square bridge for measuring Iron losses. Potentiometers, Classification - Crompton DC&AC polar type, Applications. Calibration of ammeter, voltmeter & wattmeter.

UNIT-V

Introduction to Digital Instruments (DVM and Transducers): Introduction to digital Instruments, Digital Voltmeters (DVM), Speed reading, Range selection, Over ranging, Common mode rejection, Digital Multi meters, bidirectional meters.

Transducers: Objectives, Introduction, Role of Transducers in measurement system, Guidelines for selecting & using transducers. Strain Gauge, Linear variable Differential transformer (LVDT), Temperature transducers, bimetallic strip, Thermocouples, Resistance Temperature Detectors (RTD), Thermostats, Radiation pyrometers.

Text Books:

1. F.W.Golding and Widdis, Electrical Measurements and measuring Instruments, A.H.Wheeler & Co., 5th Edition, 2007.
2. A.K.Sawhney, A Course in Electrical and Electronics Measurements and Instrumentation, Dhanapat Rai & Sons, NewDelhi, 19th Edition, 2011.
3. CT. Baldwin, Fundamentals of Electrical measurements, Kalyani publications, 2001.

Suggested Reading:

1. Helfrick, Albert D., Cooper, William D., Modern Electronic Instrumentation and Measurement Techniques, PHI Publications, 1990.
2. Stanley Wold, Richard F.M.Smith, Student reference manual for Electronic Instrumentation Laboratories, 2nd Edition, PHI.
3. Alan. S. Morris, Essence of Measurement, PHI, 1996.

16EC C16

ELECTRONIC ENGINEERING

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course objectives:

Student will be able to understand:

1. The various diodes and transistors.
2. The design and analysis of various rectifiers with filters.
3. The behavioral characteristics of BJT in various configurations.
4. The design and analysis of amplifiers.
5. The behavioral characteristics of JFET and MOSFET.
6. The effect of negative feedback amplifiers and its performance.

Course Outcomes: Student will be able

1. To understand semiconductor devices such as PN junction Diodes, BJT, JFET and MOSFET.
2. To analyze application of diodes.
3. To study V-I characteristics BJT, JFET and MOSFET.
4. To study the switching behavior of BJT, JFET, MOSFET.
5. To study the equivalent model of PN junction diode, BJT, JFET and MOSFET.
6. To analyze transistor amplifier with and without feedback in various configurations - BJT, JFET.

UNIT - I

Diode and its Applications: The p-n junction formation, Diode current components, The Volt-ampere characteristic of p-n diode, Diode as a circuit element, small signal diode models, Breakdown mechanisms of diode - Zener and Avalanche, Zener voltage regulator. Half wave, Full wave and Bridge Rectifiers with and without filters, their operation, performance characteristics.

UNIT - II

BJT Characteristics: The junction transistor, operation of NPN and PNP transistor, current components and current flow in BJT, Modes of transistor operation, Early effect, BJT input and output characteristics - CB, CE CC configuration, h-parameters, BJT as a Switch; BJT biasing techniques, stability factors, Bias compensation techniques, Thermal runway, Thermal stability.

UNIT - III

BJT Amplifiers: BJT as an amplifier, Equivalent model of BJT, Single Stage Amplifiers (CB,CE,CC), exact and approximate analysis, Frequency response, Bandwidth and Multi Stage Amplifiers (CE-CE, CE-CB & CC-CC),Power Amplifiers-Class A, Class B, Efficiency, power dissipation.

UNIT - IV

Field Effect Transistors: The Junction Field Effect Transistor operation, The Pinch-off Voltage VP, V-I characteristics of JFET. JFET biasing-zero current drift biasing, FET as a switch. FET amplifiers(CS,CD,CG Amplifiers) MOSFETs: types of MOSFETs, V-I characteristics.

UNIT - V

Feedback Amplifiers: The feedback concept, General characteristics of negative feedback amplifier, Effect of negative feedback on input and output impedances, Voltage and current, series and shunt feedbacks. Stability considerations.

Text Books:

1. Jacob Millman, Christos C. Halkias, Integrated electronics: analog and digital circuits and systems, 2nd Ed, McGraw-Hill, 2010.
2. Robert L. Boylestad, Louis Nashelsky Electronic Devices and Circuit Theory, 10th Edition, PHI, 2009.

Suggested Reading:

1. David Bell, Fundamentals of Electronic Devices and Circuits, 5th Edition, Oxford University Press 2008.
2. Ben G Streetman and Sanjay Banerjee, Solid State Electronic Devices, 6th Edition, Pearson Education, 2005.
3. Millman and Halkias, Electronic devices and circuits, 2nd Edition, McGraw Hill Publication, 2007.

16ME C11

PRIME MOVERS AND PUMPS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: Student will understand

1. Various equations related to energy head and loss of head due to friction.
2. Working principles of hydraulic turbines.
3. Working principle of various types of boilers.
4. Working principle of various types of steam turbines and gas turbines.
5. Working principle of reciprocating pumps.
6. Working principle of centrifugal pumps.

Course Outcomes: Students will be able to

1. Estimate the loss of head due to friction.
2. Determine power developed by different types of the hydraulic turbines.
3. Differentiate fire tube boilers from water tube boilers.
4. Estimate power developed by different types of the steam turbines and gas turbines.
5. Evaluate the power required by reciprocating pumps.
6. Determine the power required by centrifugal pumps.

UNIT- I

Fluid Mechanics: Newtonian and Non-Newtonian Fluids, viscosity, types of fluid flows, Bernoulli's equation and its applications, laminar and turbulent flows, flow through pipes, friction losses in pipes, Darcy equation, Reynolds number and its significance.

UNIT- II

Hydraulic Turbines: Classification and working principles of turbines - Pelton, Francis and Kaplan turbines, velocity diagrams for impulse and reaction turbine, calculation of blade angles, work-done, power output and efficiencies, specific speed of turbines. unit testing and model testing of turbines.

UNIT- III

Generation of Steam: Dryness fraction and properties of steam, function of boilers, working principle of Lancashire boiler, Locomotive boiler, Babcock and Wilcox boiler, boiler mounting and accessories.

UNIT- IV

Steam Turbines: Classification of steam turbines, velocity diagrams for simple impulse and reaction turbines, compounding of steam turbines, pressure compounding, velocity compounding, and pressure-velocity compounding, problems on work done, blade angles, power and thermal efficiency of the turbine. Gas turbine: Thermal efficiency of Joule cycle and simple problems.

UNIT-V

Pumps: Reciprocating pumps, working of single and double acting types, effect of acceleration head and friction, use of air vessels, work done and power required without and with air vessels, minimum speed to avoid cavitation Centrifugal pumps: Classification and working of centrifugal pumps, need for priming, workdone and efficiencies, pressure rise, minimum starting speed, specific speed and model testing of pumps, cavitation and its effect on performance.

Text Books:

1. R.K.Rajput, Thermal Engineering, Laxmi Publications Pvt. Ltd, 8th Edition, 2011.
2. P.L. Ballaney, Thermal Engineering , Khanna Publications., 20th Edition, 2004.
3. P.N.Modi & S.M.Seth, Hydraulics and Fluid Mechanics including Hydraulic machines, Standard Book House, 18th Edition, 2011.

Suggested Reading:

1. Mahesh M Rathor, Thermal Engineering, Tata Mc.Graw-Hill Publishers 2013.
2. D.S.Kumar,Thermal Science and Engineering ,S.K.Kataria & Sons, 2009.
3. Jagdish Lal, Hydraulics & Fluid Mechanics, Metropolitan Book Co. Pvt. Ltd., 2004.

16MB C01

ENGINEERING ECONOMICS AND ACCOUNTANCY

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Course Objectives: The Objectives of the course are

1. To introduce managerial economics and demonstrate its importance in managerial decision making.
2. To develop an understanding of demand and relevance of its forecasting in the business.
3. To provide the basics of market structure and the concept of equilibrium in different market structures.
4. To examine the economic analysis of production process, types of inputs and to explain different costs and their relationship with the output.
5. To understand the importance of project evaluation in achieving a firm's objective.
6. To explain the concept of Accountancy and provided knowledge on preparation and analysis of Final accounts.

Course Outcomes: After completion of the course, student will be able to

1. Apply fundamental knowledge of Managerial economics concepts and tools.
2. Understand various aspects of demand analysis and forecasting.
3. Understand price determination for different markets.
4. Study production theory and analyze various costs & benefits involved in it so as to make best use of resources available.
5. Analyze different opportunities and come out with best feasible capital investment decisions.
6. Apply accountancy concepts and conventions, Final accounts and financial analysis.

UNIT-I

Introduction to Managerial Economics : Introduction to Economics and its evolution, Managerial Economics : its scope, importance, Its usefulness to engineers, Basic concepts of Managerial economics.

UNIT-II

Demand Analysis : Concept of demand, determinants, Law of demand, its assumptions, Elasticity of demand, price, income and cross elasticity, Demand Forecasting, Types of Market structures. (Simple numerical problems).

UNIT-III

Production and Cost Analysis : Theory of Production, Firm and Industry, Production function, input-out relations, laws of returns, internal and external economies of scale. Cost Analysis: Cost concepts, fixed and variable costs, explicit and implicit costs, out of pocket costs and imputed costs, Opportunity cost, Cost output relationship, Break-even analysis. (Theory and problems).

UNIT-IV

Accountancy : Book-keeping, principles and significance of double entry book keeping, Journal, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments.

UNIT-V

Capital Budgeting : Introduction to capital budgeting, methods: traditional and discounted cash flow methods. Introduction to Working capital management. (Numerical problems).

Text Books:

1. Mehta P.L., Managerial Economics - Analysis, Problems and Cases, Sultan Chand & Son's Educational publishers, 2013.
2. Maheswari S.N. Introduction to Accountancy, Vikas Publishing House, 2013.
3. Panday I.M. Financial Management, Vikas Publishing House, 11th Edition, 2015.

Suggested Reading:

1. Varshney and KL Maheswari, Managerial Economics, Sultan Chand, 2014.
2. M.Kasi Reddy and S.Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of India Pvt. Ltd., 2007.
3. A.R.Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

16EE C04

CIRCUITS AND MEASUREMENTS LAB

Instruction	1T+2P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. To understand thoroughly the fundamental concepts of all theorems.
2. To comprehend the basic principles of operation of measuring various circuit parameters.
3. To become familiar with digital instruments.

Course Outcomes: The student will be able to:

1. Specify the suitable technique to be adopted for the analysis of the given circuit.
2. Distinguish the adaptability of different techniques to prove theorems experimentally.
3. Analyze the transient response of a given circuit.
4. Know the right instruments (digital / analog) and its usage for a given circuit parameter.
5. Select a suitable bridge technique available for a given fundamental parameter measurement.
6. Identify the circuit parameters for a given locus diagram.

LIST OF EXPERIMENTS

PART - A: CIRCUITS

1. Transient response of first and second order circuits.
2. Frequency response of a RLC series circuit and Locus diagrams.
3. Determination of two port network parameters. (Z, Y, h & ABCD)
4. Verification of Thevenin's& Norton's Theorems.
5. Verification of Superposition, Reciprocity and Maximum power transfer theorems.
6. Determination of parameters of a coil.

PART - B: MEASUREMENTS

1. Measurement of resistance and Capacitance.
   i) Kelvin's double bridge
   ii) Schering bridge .
2. Calibration of Energy Meter
   i) Single-phase meter with Phantom loading
   ii) Three-phase meter with direct loading.

3. Measurement of inductance.
   i) Maxwell's
   ii) Anderson's bridges.
4. Measurement of voltage and impedance using DC potentiometer
5. Measurement of
   i) Iron losses using Epstein's square bridge
   ii) Frequency using Lissajous pattern.
6. Study of Digital instruments.

Note: At least **FIVE** experiments should be conducted from each **PART**.

16EC C17

ELECTRONIC ENGINEERING LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course objectives: Student will be able to understand:

1. The V-I Characteristics of diodes.
2. The design of various rectifiers.
3. The Transistor Characteristics and measurement of h-parameters.
4. The frequency response of BJT and FET amplifiers.
5. The study of various feedback amplifiers.
6. The performance analysis of multistage amplifiers.

Course Outcomes: Student will be able to

1. Verify the working of PN junction diodes, transistors and their characteristic behavior.
2. Design various rectifiers with different filter combinations.
3. Set up bias point in a transistor.
4. Build an amplifier and find the frequency response of amplifier.
5. Build a feedback amplifier and find the frequency response of amplifier.
6. Build a multi stage amplifier and find the frequency response of amplifier.

LIST OF EXPERIMENTS
PART-A

1. V-I characteristics of (Silicon and Germanium) diodes and measurement ofstatic and dynamic resistance.
2. Zener diode characteristics and its application as an voltage regulator.
3. Design, realization and performance evaluation of rectifier circuits with andwithout filters(C & π -section)Half wave rectifier.
4. Design, realization and performance evaluation of rectifier circuits with and r without filters(C & -section) Full wave rectifier.
5. Plotting the characteristics of BJT and measurement of h-parameters.
   a) Common Base Configuration b) Common Emitter Configuration
6. Plotting the characteristics of JFET in Common Source Configuration and measurement of trans- conductance and drain resistance.
7. Design of Biasing circuits.
   a) BJT b) JFET

PART-B

1. Design and Frequency response of Common Emitter BJT amplifier and measurement of Gain, Bandwidth, Input and Output impedances.
2. Design and Frequency response of Common Source FET amplifier and measurement of Gain, Bandwidth and Output impedance.
3. Design and Frequency response of Single stage and Multi stage RC coupled amplifier using BJT.
4. Design and Frequency response of Single stage and Multi stage RC coupled amplifier using FET.
5. Feedback amplifier frequency response of
   a) Voltage Series
   b) Voltage Shunt
6. Frequency response of Current series feedback amplifier.
7. Class B Power Amplifier.

NOTE: At least **SIX** experiments should be conducted from each part.

16ME C12

PRIME MOVERS AND PUMPS LAB

Instruction	1T+2P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: Student will understand

1. Application of the equation in measuring discharge of fluid.
2. The verification of energy head at various points in the stream.
3. The application of Darcy equation for flow through pipes.
4. Working principles of Pelton, Francis and Kaplan turbines.
5. Working principles of various types of pumps.
6. The working principle of internal combustion engines.

Course Outcomes: Student will be able to

1. Determine the principle of measurement of discharge of fluid.
2. Determine the direction of flow of fluid in the pipe.
3. Determine loss of head due to friction.
4. Estimate the power developed by Pelton, Francis and Kaplan turbines.
5. Determine the power required by various types of pumps.
6. Evaluate the performance of internal combustion engines.

LIST OF EXPERIMENTS

1. Measurement of discharge by venturimeter.
2. Verification of Bernoulli's equation.
3. Major (friction) losses in pipes - Laminar and Turbulent flows.
4. Performance of Pelton turbine.
5. Performance of Francis turbine.
6. Performance of Kaplan turbine.
7. Performance characteristics of reciprocating pump.
8. Performance characteristics of centrifugal pump.
9. Performance characteristics of Self priming pump.
10. Performance characteristics of Gear pump.
11. Performance test on Single cylinder diesel engine.
12. Heat balance test on single cylinder diesel engine.
13. Performance test on multi cylinder petrol engine.

NOTE: At least **TEN** experiments should be conducted in the semester.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
Choice Based Credit System
B.E (Electrical and Electronics Engineering)

SEMESTER - IV

S.No.	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16EEC06	Electrical Circuits -II	3	-	3	30	70	3
2	16EE C07	Electrical Machinery - I	3	-	3	30	70	3
3	16EE C08	Power Systems - I	3	-	3	30	70	3
4	16EE C09	Electromagnetic Theory	3/1	-	3	30	70	4
5	16EE C10	Digital Elctronics and Logic Design	3	-	3	30	70	3
6	16EE C11	Linear Integrated Circuits	3	-	3	30	70	3
PRACTICALS								
6	16EE C12	Electrical Machinery - I Lab	0/1	2	3	25	50	2
7	16EE C13	Linear Integrated Circuits Lab	0/1	2	3	25	50	2
8	16EG C03	Soft Skills and Employability Enhancement Lab	-	2	2	15	35	1
Total			**21**	**6**	**-**	**245**	**555**	**24**

L: Lecture T: Tutorial P: Practical D: Drawing
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Assessment Procedures for Awarding Marks

The distribution of marks is based on CIE by concerned teacher and the Semester end examination shall be as follows:

Course (in terms of credits)	CIE	Semester end Examination(Marks)	Remarks	Duration of SemesterEnd Examination
Three(3) Credits/ Four(4) Credits	30*	70**	Theory Course/ Engg.Graphics	3 Hours
Two(2) Credits	20*	50***	Theory	2 Hours
Two(2) Credits	25	50	Lab Course/ Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
Two(2) Credits	50	—-	Project Seminar/ Seminar	——
Six(6) Credits	50	100	Project	Viva-Voce
One(1) Credit	—-	50***	Environmental Studies,Professional Ethics and Human values	2 Hours
One(1) Credit	50		Mini Project	——-

CIE: Continuous Internal Evaluation

*Out of 30/20 sessional marks(CIE), 10/5 marks are allotted for slip-tests (Three slips test will be conducted, each of 10/5 marks, best two average is considered) and the remaining 20/15 marks are based on the average of two tests, weightage for each test is 20/15 marks.

**The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

***The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 15 marks. Part-B carries 35 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

Note: A course that has CIE (sessional marks) but no semester end examination as per scheme, is treated as Pass/Fail for which pass marks are 50% of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/grade as prescribed. Minimum pass marks for theory course is 40% of total marks i.e., CIE plus semester end examinations where as for the lab course/project is 50%.

16EE C06

ELECTRICAL CIRCUITS - II

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To understand the application of Laplace Transforms for analysis of Electrical Circuits.
2. To comprehend the application of Fourier series and Fourier transform representation of periodic signals.
3. To study the analysis of two port networks.
4. To study the aspects of network synthesis.

Course Outcomes: The student will be able to

1. Apply Laplace transform for circuit analysis and also able to draw the pole zero plots.
2. Find network functions and two port parameters and transform.
3. Acquire the knowledge to find the Fourier series of given function.
4. Acquire the knowledge synthesize the RL and RC circuits.
5. Design of the different types of filters.
6. Acquire knowledge to design of filters in mitigating harmonics.

UNIT- I

Circuit Analysis in S-Domain: Review of Laplace Transform, Initial and final value theorems, Application of Laplace transform for circuit analysis, Concept of transfer function, Pole, Zero plots.

UNIT-II

Two port Networks: Z, Y, ABCD and h-parameters, their interrelationships; series, parallel and cascade connection of two port networks, image & iterative impedances, terminated two port networks.

UNIT- III

Fourier Series: Representation of periodic functions using both trigonometric and exponential functions; Symmetry conditions, Fourier transform representation of a periodic signals, Symmetry properties; Power and bandwidth concepts; System function and its application in determining steady- state response.

UNIT-IV

Network Synthesis: Hurwitz polynomials and their properties, Positive Real functions and their properties, Synthesis of reactive network (one port) by Foster method, pole-zero interpretations of elements of Foster form, Cauer form of reactive networks, RL network synthesis by Foster and Cauer form of representation, RC network synthesis by Foster and Cauer method.

UNIT-V

Passive Filters: Classification and General Relations in filters, Constant-K low pass, high pass, band pass and band elimination filters; M-derived low pass, high pass, band pass and band elimination filters.

Text Books:

1. M.E. Van Valkenburg, Network Analysis, Prentice Hall of India Publications, 3rd Edition, 1995.
2. W.H.Hayt, J.E.Kimmerly, Engineering Circuit Analysis, McGraw Hill, 8th Edition, 2013.
3. Gopal. G. Bhise, Prem Chadha and Kulashetra, Network Analysis and Filter Design, Umesh Publications, 2000.
4. M Nahvi, Joseph Edminister and K Uma Rao, Electric Circuits, Schaum's Outline Series, Tata Mc-Graw Hill Publications, 5th Edition, 2010.

Suggested Reading:

1. Franklin F. Kuo, Network Analysis And Synthesis, Wiley Publications, 2nd Edition 2009.
2. A. Sudhakar, Shyammohan Palli, Network Analysis, Tata Mc-Graw Hill Publications, 4th Edition, 2010.
3. T.K. Nagsarkar, Sukhija, Circuits & Networks, Oxford University Press, 2nd Edition, 2010.

16EE C07

ELECTRICAL MACHINERY- I

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To study the principles of electro mechanical energy conversion.
2. To understand Armature reaction and commutation in DC machines. To understand types of DC generators and motors, and their characteristics and applications.
3. To discuss different methods of speed control of DC motors and Testing of DC Machines.
4. To familiarize the construction details, principle of operation, prediction of performance, methods of single-phase transformers.
5. To know different connections of 3-phase transformers and parallel operation.

Course Outcomes: The student will be able to

1. Apply basic principles of electromechanical laws and energy conversion.
2. Acquire knowledge about operating characteristics of generators, speed control of DC motors and their application in Industry and domestic appliances.
3. Acquire the concept of single phase and three phase transformers and their applications.
4. Distinguish between different types of 3-phase transformers connection.
5. Analyze the performance of single- phase and 3-phase transformers during parallel operations.
6. Understand a 3-phase to 2-phase conversion system through Scott connection.

UNIT- I

Principles of Electro-Mechanical Energy Conversion: Energy in magnetic system, Field energy and mechanical force, Direction of mechanical force developed, Flow of energy in electro-mechanical devices, singly excited and multiply excited systems, Basic concepts of magnetically induced emf and force.

UNIT -II

DC Machines: Brief description of constructional features, Armature windings, simple lap and wave windings, Brush position, Classification of DC Machines.

DC Generators: Generated emf, Methods of excitation, Armature reaction, Theory of commutation, Types of generators and their characteristics, Series and parallel operation.

UNIT-III

DC Motors: Generation of electromagnetic torque, Types of motors and their characteristics, Application of motors, Starting and speed control methods of DC motors. Testing of DC Motors, Losses and efficiency, Swinburne's test, Hopkinson's test, Field test for series motors, Retardation test, Separation of losses.

UNIT-IV

Single Phase Transformers: Constructional features, Principle of operation, Ideal transformer, Transformer on 'No load' and 'On load', Vector diagram, Equivalent circuit, Polarity test, O.C & S.C tests, Sumpner's test, Regulation & efficiency, All day efficiency, Separation of losses- Excitation Phenomena of Transformers.

UNIT-V

Three Phase Transformers: Three phase transformers connections Y-Y, and Scott connections. Parallel operation of transformers.

Text Books:

1. Nagrath I.J & Kothari D.P, Electrical Machines, Tata McGraw Hill Publications, Sigma series, 2006.
2. H.Cotton, Advanced Electrical Technology, Wheeler & Co, CBS publishers, 7th Edition, 2005.
3. J.B Gupta, Theory and performance of electrical machines, S.K. Kataria & Sons, 14th Edition, 2014.

Suggested Reading:

1. P.S. Bhimbra, Electrical Machinery, Khanna Publications, 7th Edition, 2003.
2. Fitzgerald Kingsley, Umans, Electric Machinery, Tata Mc-Graw Hill Publications, 6th Edition, 2002.
3. Ashfaq Husain, Electrical Machines, Danpatrai and sons publications, 2nd Edition, 2012.

16EE C08

POWER SYSTEMS - I

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To introduce Generation of energy through conventional sources such as: Thermal, Hydro and Nuclear, also gives insight into the generation of power through non-conventional sources along with economic aspects.
2. To familiarize mechanical design of transmission lines and cables.
3. To familiarize present practices in tariff calculations.
4. To develop knowledge to understand classification and connection schemes of distribution systems.

Course Outcomes: The student will be able to

1. Gain knowledge of construction and operation of conventional and non-conventional sources of energy along with financial management.
2. Know the effects sag on transmission lines.
3. Acquire the concepts to study the performance of insulators and cables.
4. Gain knowledge in calculating the current practices in tariff.
5. Gain the knowledge to classify the connection schemes of distribution systems.
6. Acquire knowledge in different constructional aspects of over-head lines, underground cables and also economic aspects of Power generation.

UNIT-I

Thermal- Hydro -Power Plants: Principles, Choice of site, layout and various parts of generating stations, Brief description of Hydro Power Plant Dam, Spillways, Head works, Surge tank, Penstocks, Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses, Brief description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and Cooling towers.

UNIT-II

Nuclear Station: Schematic Arrangement of Nuclear Power Station, Advantages and disadvantages, Types of Nuclear reactors, Gas Turbine Power Plant, Schematic arrangement of Gas Turbine power plant, Advantages and disadvantages. Introduction to Non-Conventional Energy Sources: Solar Energy, Radiation on earth surface - Introduction to Solar PV Technology, Wind Energy, Motion of Wind, Wind Power, Wind turbine siting, Major Applications. Tidal energy, limitations, tidal energy technology.

UNIT-III

Construction of Overhead lines: Overhead line materials, supports, types, Vibration dampers, Arcing horns, Ground wires, Sag /Tension calculations, Equal / Unequal supports, Effects of wind, ice / Erection Conditions Stringing charts. Insulators, Types, Material for construction, potential distribution over string of insulators, equalizing of potential, Methods, Insulator testing.

UNIT-IV

Underground Cables: Construction of Cables, Insulating Materials for Cables, Classification of Cables, Cables for 3-Phase Service, Laying of Underground Cables, Insulation Resistance of a Single-Core Cable, Capacitance of a Single-Core Cable, Dielectric Stress in a Single-Core Cable, Most Economical Conductor Size in a Cable, Grading of Cables ,Capacitance Grading, Inters heath Grading, Capacitance of 3-Core Cables, Measurements of Ce and Cc.

UNIT-V

Economics of Power Generation: Load curve, Load demand and diversified factors, Base load operation, Types of costs and depreciation calculations; Tariffs, different types of tariffs; Methods of power factor improvement.

General Aspects of AC and DC Distribution Systems-Types of D.C. & A.C Distributors, Calculations for Distributor fed at one end, distributor fed at both ends.

Text Books

1. C.L. Wadhwa, Electrical Power Systems, Wiley Eastern Ltd,5th Edition, 2009.
2. M.L. Soni, P.V.Gupta, V.S. Bhatnagar and A. Chakrabarti,A Text Book on Power System Engineering Dhanpat Rai& Co. Pvt. Ltd, 4th Edition, 2008.

Suggested Reading

1. M.V. Deshpande,Elements of Power Station Design, Eastern Economy Edition, 2010.
2. P.P. Walsh, P.Fletcher, Gas turbine performance, Blackwell Publisher, 2nd Edition, 2004.
3. S.N.Singh, Electric Power Generation, Transmission and Distribution, PHI Ltd., 2nd Edition, 2011.
4. B.H. Khan, Non-Conventional Energy Resources, Tata McGraw Hill, 2nd Edition, 2013.

16EE C09

ELECTROMAGNETIC THEORY

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:

1. To understand various coordinate systems and applications of vector calculus.
2. To comprehend the electrostatic field concepts and applications.
3. To assimilate the concepts and applications of magnetic fields.
4. To know the significance of EMI & EMC.

Course Outcomes: The student will be able to

1. Recognize the importance of different coordinate systems and vector algebra in field theory.
2. Analyze electric and magnetic field intensity, flux density and potential due to various charge distributions.
3. Differentiate between conduction & convection currents through various materials.
4. Apply Maxwell's equations for EM wave propagation.
5. Identify EMI & EMC, the causes and effects, various control methods of EMI.
6. Acquire knowledge in applying Electro Magnetic theory in design of electrical machines.

UNIT- I

Orthogonal Coordinate Systems &Review of Vector Calculus: Rectangular, Cylindrical, Spherical coordinate systems; Line, Surface and Volume integrals; Operator Del, Gradient, Divergence, Curl &Laplacian of a field; Divergence, Stokes' theorems.

Electrostatic fields: Various charge configurations, Coulomb's law, Electric field intensity and flux density of different charge distributions, Gauss law, Integral and Point form of Maxwell's Electrostatic Equation.

UNIT- II

Electrostatic Field in Materials: Electrical Potential, Capacitance of Parallel plate capacitor, Equi-potential lines, Properties of materials, convection and conduction currents, conductors, dielectric constant, continuity equation and relaxation time, boundary conditions, Poisson's and Laplace's equations, Uniqueness theorem.

UNIT-III

Magneto Static Fields: Biot-Savart's law, Ampere's law, Displacement current, Magnetic scalar and Vector Potentials, boundary conditions, Forces in Magnetic fields, Lorentz force equation, Force between parallel conductors, Inductance Calculations (Solenoid, Toroid), Mutual Inductance.

UNIT- IV

Time Varying Electromagnetic Fields: Faraday's laws of electromagnetic induction, Final forms of Maxwell's Equations, Power and Poynting theorem, Time-Harmonic Electromagnetic fields, Wave equations (One dimension), Plane Wave, Propagation in perfect and lossy-dielectrics.

UNIT-V

Electromagnetic Interference and Compatibility (Theoretical Aspects only): Introduction to Electromagnetic Interference and Electromagnetic Compatibility (EMI & EMC)- Sources and Characteristics of EMI, Control Techniques of EMI, Grounding, Shielding, Filtering. Introduction to numerical electro magnetics.

Text Books:

1. Hayt, W.H and J.A Buck, Engineering Electromagnetics, Tata Mc-Graw Hill, 7th Edition, 2006.
2. Sadiku, M.N.O, Principles of Electromagnetics, Oxford University press, 4th Edition, 2006.

Suggested Reading:

1. S. P. Seth, Elements of Electromagnetic Fields, Danpat Rai& Co, 2007.
2. David K. Cheng, Field and Wave Electromagnetics, Pearson Education. 2nd Edition 2004.
3. AshutoshPramanik, Electromagnetism Theory and Applications, PHI Pvt. Ltd., 3rd Edition, 2008.

16EE C10

DIGITAL ELECTRONICS AND LOGIC DESIGN

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To understand the basics of Boolean algebra and Minimization Techniques.
2. To know the basics of Digital logic family.
3. To study binary arithmetic & its circuits and code converters.
4. To understand the Design of synchronous sequential circuits.
5. To know design of sequence detector and generators and programmable logic circuits.

Course Outcomes: The student will be able to

1. Apply Boolean algebra rules, K-maps, Tabulation methods to minimize Boolean algebraic expressions.
2. Classify, describe and compare the characteristics of various digital logic families.
3. Acquire the knowledge to build the combinational logic circuits.
4. Acquire the knowledge to build the sequential logic circuits.
5. Design the counters.
6. Acquire the knowledge to synthesize the digital circuits using D, JK & T Flip-flops.

UNIT- I

Number Systems: Introduction to number systems and their codes, Number complements: One's &Two's complement arithmetic, BCD and Excess-3 arithmetic.

Boolean Algebra: Review of Basics and laws of Boolean algebra, Minimization of Boolean expressions, Truth tables and maps, Sum of products and product of sums.

UNIT-II

Simplification of Boolean Functions: K-Map method of reduction, Incompletely specified functions, multiple output minimization, Tabular minimization.

Digital logic families and IC's: Characteristics of Digital IC's, Introduction to RTL, DTL, TTL, CMOS, ECL families, Comparison of performance.

UNIT-III

Binary Arithmetic and Circuits: Half and Full adder, Subtractor and Magnitude comparator, Carry look ahead adder.

Combinational Circuits: Multiplexer and de-multiplexer, Encoder and decoder, Code converters, Implementation of combinational logic using standard logic gates and multiplexers.

UNIT- IV

Sequential Logic: Basic latch circuit - Debouncing switch, Flip-flops: SR, JK, D and T, Truth table and excitation tables.

Registers & Counters: Registers, Shift registers, Applications of registers, Ripple & Synchronous counters- up/down counter, BCD counter, Counter decoding,, Ring counters.

UNIT-V

Design of Digital Systems: Concept of state, State diagram, Design of counters, Sequence detector and generators, Synthesis using D, JK, T flip-flops, Programmable Logic devices: Introduction, PROM, PLA, PAL.

Text Books:

1. Morris Mano M., Digital Design, Prentice Hall of India, 3rd Edition, 2002.
2. Donald Pleach, Albert Paul Malvino, Goutamsaba Digital Principles and Applications, McGraw- Hill, 6th Edition, 2006.

Suggested Reading:

1. Tocci, Widmer, Moss, Digital Systems, Principles and Applications, Pearson Education, 10th Edition, 2016.
2. B. Somnath Nair, Digital Electronics and Logic Design, Prentice Hall of India, Eastern Economy, Edition, 2006.

16EE C11

LINEAR INTEGRATED CIRCUITS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To study the characteristics of operational amplifiers, stability, basic applications such as integrator, differentiator etc.,
2. To study the different applications of operational amplifiers in voltage limiter, Schmitt trigger, instrumentation circuits.
3. To study the concepts of waveform generation, sine, square, triangular using op-amps.
4. To study the operation of 555 timer as a mono-stable and an astable multi vibrator.
5. To study different types of voltage regulator, Filters and their characteristics.

Course Outcomes: The student will be able to

1. Understand the basic characteristics of op-amps and their significance.
2. Analyze a typical op-amp equivalent circuit by calculating its voltage gain and input resistance.
3. Define stability for a amplifier circuit.
4. Analyze an instrumentation amplifier circuit and discuss its applications.
5. Analyze higher order filter circuits and explain their significance.
6. Analyze and design voltage regulators (Fixed voltage and adjustable voltage).

UNIT-I

Operational Amplifier Characteristics: open loop voltage gain, output impedance, input impedance, common mode rejection ratio, Offset balancing techniques, Slew rate, Frequency response, Stability, frequency compensation of Op-amp.

Basic OP-Amp Applications: inverter summer, analog integrator, differentiator, current to voltage converter, voltage to current converter, voltage follower, ac amplifier.

UNIT-II

OP-Amp Applications: Voltage limiter, clipper & clamper, precision rectifier, full wave and half wave, peak detector, comparator, zero crossing

detector, Schmitt trigger, monostable, astable, bistable multiplier, divider, difference amplifier instrumentation amplifier circuits using Op-amps.

UNIT-III

Waveform Generation using Op-Amps: Sine, Square, Triangular and Quadrature oscillators, voltage controlled oscillator / multi vibrator, voltage to frequency converter, 555 timer functional diagram, operation as monostable and astable. phase locked loop, A/D and D/ A converters.

UNIT-IV

Voltage Regulators: Series voltage regulator using Op-amp, shunt regulators using Op-amp, switching regulators using Op-amp, dual voltage regulator, fixed voltage regulators, dual tracking regulators, hybrid regulator, current sensing and current feedback protection.

UNIT-V

Filters: RC active filters, low pass, high band pass, band reject, notch, first order, second order transformation, state variable filter, switched capacitor filter, universal filter, Balanced modulator/ demodulator.

Text Books:

1. D.Roy Choudhury, Linear Integrated Circuits, Shail B.Jain, , New Age Intern.(P) Ltd., 3rd Edition 2007.
2. Malvino Albert Paul, Electronic Principles, , Tata McGraw Hill, 7th Edition, 2006.

Suggested Reading:

1. Gayakwad R.A. Op-Amps and Linear Integrated Circuits, PHI, 4th Edition, 2002.
2. David A. Bell, Operational Amplifiers and Linear ICs, PHI, 2003.
3. Coughlin and Driscoll, Operational Amplifiers and Linear integrated Circuits, PHI, 6th Edition, 2003.

16EE C12

ELECTRICAL MACHINES - I LAB

Instruction	1T+2P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. To understand the performance & Load characteristics of different types of DC generators & DC motors.
2. To understand the procedure to separate core losses in a single phase transformer, perform Open Circuit and Short Circuit tests on single phase transformer and conduct Sumpner's test on two identical transformers.
3. To understand the procedure to estimate the efficiency of DC machine by Hopkinson test.
4. To understand the control procedure and vary speed of DC shunt motor.
5. To understand the process of dynamic braking.

Course Outcomes: The student will be able to

1. Acquire requisite knowledge to evaluate and compare the characteristics and performance aspects of different types DC generators and DC motors by conducting suitable tests.
2. Acquire knowledge to analyze the single phase transformer by performing the suitable tests.
3. Gain practical knowledge to know different losses and efficiency in DC machine and their dependence on other Parameters such as speed, field current etc., and also calculate efficiency at different loads.
4. Gain knowledge to perform speed control of DC shunt motor.
5. Calculate moment of inertia of DC machine through retardation curve.
6. Acquire knowledge to evaluate the performance aspects of DC generator, DC motor and Transformer.

LIST OF EXPERIMENTS

1. Magnetization characteristics and the speed verses voltage curve of separately excited DC generator and self excited D.C. generator
2. Load characteristics of separately excited DC generator and DC shunt generator.
3. Load characteristics of DC Compound generator.

4. Performance characteristics of DC series motor.
5. Swinburne's test & determination of performance characteristics of D.C. shunt motor.
6. Performance characteristics of DC Compound motor.
7. Separation of iron and friction losses and estimation of parameters in D.C. machines.
8. Speed control of D.C. shunt motor by shunt field control and armature resistance control.
9. Separation of core losses in a single phase transformer .
10. Open circuit and short circuit tests on a single phase transformer.
11. Sumpner's test on two identical transformers.
12. Estimation of efficiency of DC Machine by Hopkinson test.
13. Retardation test, dynamic braking of DC shunt motors.
14. Load test on single phase transformers.

Note: At least **TEN** experiments should be conducted in the semester.

16EE C13

LINEAR INTEGRATED CIRCUITS LAB

Instruction	1T+2P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. To analyze and design various applications of Op-Amp.
2. To design and construct waveform generation circuits.
3. To design and implement timer and analog and digital circuits using op amps.
4. To design and implement combinational logic circuits using digital IC's.
5. To design and implement Active Filters, such as Low pass, High Pass, Band Pass for various cut off frequencies.

Course Outcomes: After completing the Lab course, the student will be able to:

1. Design and conduct experiments using op-amps, as well as analyze and interpret result.
2. Design basic application circuits using op-amp.
3. Analyze circuits for inverting and non-inverting amplifiers, diff. amps and comparators.
4. Recognize and make use of the DC & AC limitations of OP-AMPS.
5. Understand and implements the working of basic digital circuits.
6. Acquire knowledge concerning the application aspects of synchronous as Asynchronous counters, A/D and D/A converters.

LIST OF EXPERIMENTS

PART - A

I. Generation of triangular, sine and square wave using IC's.
2. PLL (Phase locked loop).
3. Design of astable multi-vibrator using 555 timer.
4. Active filters.
5. Instrumentation amplifier-Sample and hold circuit.
6. Design of integrator and differentiator using Op-Amp.
7. Clippers and clampers using Op-Amps.
8. Monostable operation using IC's.
9. Boot-strap sweep circuit using Op-Amp.

PART - B

1. Multiplexer-application for logic realization and parallel to serial Conversions.
2. Synchronous counters.
3. Asynchronous counters.
4. Half adder, full adder and subtractor and realization of combinational logic.
5. A/D converters.
6. D/ A converters.

Note: At least **SIX** experiments from **Part-A** and **FOUR** from **Part-B** should be conducted in the semester.

16EG CO3

SOFT SKILLS AND EMPLOYABILITY ENHANCEMENT LAB

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
Continuous Internal Evaluation	15 Marks
Credits	1

Course Objectives: To help the students

1. Participate in group discussions and case studies with confidence and to make effective presentations. Also to learn the art of communication.
2. With- resume packaging, preparing and facing interviews.
3. Build an impressive personality through effective time management & goal setting, self confidence and assertiveness.
4. Understand what constitutes proper grooming and etiquette in a professional environment. Also to understand academic ethics and value systems.
5. To understand the elements of research and hone their soft skills through a live, mini project.

Course Outcomes: The students will be able to

1. Be effective communicators and participate in group discussions and case studies with confidence. Also be able to make presentations in a professional context.
2. Write resumes, prepare and face interviews confidently.
3. Be assertive and set short term and long term goals. Also learn to mange time effectively and deal with stress.
4. Make the transition smoothly from Campus to Corporate. Also use media with etiquette and know what academic ethics are.
5. To do a live, mini project by collecting and analyzing data and making oral and written presentation of the same.

Exercise 1

Group Discussion and Case studies: Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.

Elements of effective presentation , Structure of presentation, Presentation tools, Body language, Creating an effective PPT

Exercise 2

Interview Skills: Resume writing, structure and presentation, planning, defining the career objective, projecting ones strengths and skill-sets.

Interview Skills: concept and process, pre-interview planning, opening strategies, answering strategies, mock interviews.

Exercise 3

Personality Development: Effective Time Management, setting realistic goals, self confidence and assertiveness, stress management, moral values.

Exercise 4

Corporate Culture: Grooming and etiquette, communication media etiquette, Academic ethics and integrity.

Exercise 5

Mini Project: General/Technical, Research, developing a questionnaire, data collection, analysis, written report and project seminar.

Suggested Reading:

1. Dr. Shalini Verma, Body Language- Your Success Mantra, S Chand, 2006.
2. Ramesh, Gopalswamy, and Mahadevan Ramesh, The ACE of Soft Skills, New Delhi: Pearson, 2010.
3. Covey and Stephen R,The Habits of Highly Effective People, Free Press, 1989, New York.

Core Courses offered to other Departments

SEMESTER - III

S.No.	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
PRACTICALS								
1	16EE C05	Basics of Mechanical and Electrical Engineering Lab Part-B (for B.Tech Chemical III-SEM)	0/1	2	3	25	50	2
Total			**1**	**2**	**-**	**25**	**50**	**2**

L: Lecture T: Tutorial P: Practical D: Drawing
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Assessment Procedures for Awarding Marks

The distribution of marks is based on CIE by concerned teacher and the Semester end examination shall be as follows:

Course (in terms of credits)	CIE	Semester end Examination(Marks)	Remarks	Duration of SemesterEnd Examination
Three(3) Credits/ Four(4) Credits	30*	70**	Theory Course/ Engg.Graphics	3 Hours
Two(2) Credits	20*	50***	Theory	2 Hours
Two(2) Credits	25	50	Lab Course/ Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
Two(2) Credits	50	—-	Project Seminar/ Seminar	——
Six(6) Credits	50	100	Project	Viva-Voce
One(1) Credit	—-	50***	Environmental Studies,Professional Ethics and Human values	2 Hours
One(1) Credit	50		Mini Project	——-

CIE: Continuous Internal Evaluation

*Out of 30/20 sessional marks(CIE), 10/5 marks are allotted for slip-tests (Three slips test will be conducted, each of 10/5 marks, best two average is considered) and the remaining 20/15 marks are based on the average of two tests, weightage for each test is 20/15 marks.

**The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

***The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 15 marks. Part-B carries 35 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

Note: A course that has CIE (sessional marks) but no semester end examination as per scheme, is treated as Pass/Fail for which pass marks are 50% of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/grade as prescribed. Minimum pass marks for theory course is 40% of total marks i.e., CIE plus semester end examinations where as for the lab course/project is 50%.

16EEC05

BASICS OF MECHANICAL AND ELECTRICAL ENGINEERING LAB
(B.Tech. Chemical III - SEM)

ELECTRICAL ENGINEERING LAB
(PART-B)

Instruction	1T+2P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. To acquire the knowledge of different types of electrical elements.
2. To verify the basic electrical circuit laws.
3. To determine the parameters and power factor of a coil.

Course Outcomes: The student will be able to

1. Find out the resistance of the given resistor.
2. Understand the voltage division and current division rules.
3. Determine the parameters of the given coil.
4. Measure the power factor of a coil using different methods.

LIST OF EXPERIMENTS

1. Study of different types of resistors, inductors and capacitors.
2. Verification of Ohm's law.
3. Verification of KVL & KCL.
4. Verification of Voltage and current division rules.
5. Measurement of power factor of a coil using 3 ammeters.
6. Measurement of power factor of a coil using 3 volt meters.
7. Determination of the parameters of a coil.

Note: At least **FOUR** Experiments should be conducted in the semester.

Core Courses offered to other Departments

SEMESTER - IV

S.No.	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
PRACTICALS								
1	16EE C14	Electrical Machines and Microcontroller Applications (for BE Mech. & Prod. IV-SEM)	4	-	3	30	70	4
Total			**4**	**-**	**-**	**30**	**70**	**4**

L: Lecture T: Tutorial P: Practical D: Drawing

CIE - Continuous Internal Evaluation SEE - Semester End Examination

Assessment Procedures for Awarding Marks

The distribution of marks is based on CIE by concerned teacher and the Semester end examination shall be as follows:

Course (in terms of credits)	CIE	Semester end Examination(Marks)	Remarks	Duration of SemesterEnd Examination
Three(3) Credits/ Four(4) Credits	30*	70**	Theory Course/ Engg.Graphics	3 Hours
Two(2) Credits	20*	50***	Theory	2 Hours
Two(2) Credits	25	50	Lab Course/ Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
Two(2) Credits	50	—-	Project Seminar/ Seminar	——
Six(6) Credits	50	100	Project	Viva-Voce
One(1) Credit	—-	50***	Environmental Studies,Professional Ethics and Human values	2 Hours
One(1) Credit	50		Mini Project	——-

CIE: Continuous Internal Evaluation

*Out of 30/20 sessional marks(CIE), 10/5 marks are allotted for slip-tests (Three slips test will be conducted, each of 10/5 marks, best two average is considered) and the remaining 20/15 marks are based on the average of two tests, weightage for each test is 20/15 marks.

**The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

***The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 15 marks. Part-B carries 35 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

Note: A course that has CIE (sessional marks) but no semester end examination as per scheme, is treated as Pass/Fail for which pass marks are 50% of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/grade as prescribed. Minimum pass marks for theory course is 40% of total marks i.e., CIE plus semester end examinations where as for the lab course/project is 50%.

16EE C14

ELECTRICAL MACHINES AND MICRO CONTROLLER APPLICATIONS
(Common to BE Mech & Prod IV-SEM)

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:

1. To understand the concepts of transformers.
2. To comprehend the need of DC & AC machines and their control aspects.
3. To know the features of 3-phase induction motors.
4. To understand the concepts of 8051 of microcontrollers.
5. To understand the basics of interfacing with 8051.

Course Outcomes: The student will be able to

1. Identify the compatibility of DC machines for a given application.
2. Identify the applications of 3-phase induction motor.
3. Calculate the Efficiency and regulation of transformer.
4. Program using 8051micro-controller.
5. Use 8051 for basic applications.
6. Acquire knowledge in analyzing the performance aspects of stepper motor, DC motor through interfacing with 8051 micro-controller.

UNIT- I

D.C. Generators: Constructional details, Principle of operation, EMF equation, Classification of generators, Armature reaction, Characteristics of shunt, series and compound generators.

DC Motors: Working Principle, back EMF, Classification of motors, Torque developed in motors, Characteristics of shunt, series and compound motors, Three point starter, Speed control of DC motors.

UNIT- II

Transformers: Construction, Working principle, EMF equation, Ideal transformer, Practical transformer on no load and load conditions, Equivalent circuit of transformer, Efficiency and regulation of transformer, OC and SC tests.

UNIT-III

Three Phase Induction Motors: Production of rotating magnetic field, construction and principle of operation, Torque Calculation, speed-torque characteristics, Speed control of 3-phase induction motors.

UNIT-IV

8051 Microcontrollers: Introduction to microprocessor, microcontroller classification, Internal architecture of 8051 and its pin configuration, Memory organization and expansion. SFR's: Counter and timers, serial data I/O, Interrupts.

8051 Instruction set: Addressing modes and Instruction set. Assembly Language Programming with 8051.

UNIT-V

8051 Interfacing: Expansion of I/O ports, A/D converter, D/A converter, Stepper motor interfacing with 8051, DC motor interfacing with 8051.

Text Books:

1. Kothari, Nagrath, Basic Electrical Engineering, Tata McGraw Hill Publications, 2nd Edition, 2007.
2. Md. Ali Mazidi, J.Gilispie Mazidi & R.D. MCkinlay, The 8051 Microcontroller &Embedded Systems using Assembly and C, 2nd Edition, Pearson Education, 2007.

Suggested Reading:

1. B. L.Theraja & A.K. Theraja, A Text book of Electrical Technology, S.Chand & Co, 24th Edition,2007.
2. P. V. Prasad, S. Sivanagaraju, Electrical Engineering: Concepts and Applications, Cengage Learning, 1st Edition, 2012.
3. V.K.Mehta, Principles of Electrical Engineering, S.Chand & Co, 1st Edition, 2003.
4. Ayala K.J, The 8051 Micro Controller Architecture, Programming and Application, West Publishing Company, 2007.