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: Electronics & Communication 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 (Electronics and Communication 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	16EC C02	Network Theory	4	-	3	30	70	4
3	16EC C03	Electronic Devices and Circuits	4	-	3	30	70	4
4	16EC C04	Signals and Systems	4	-	3	30	70	4
5	16EC C05	Electromagnetic Theory and Transmission Lines	4	-	3	30	70	4
PRACTICALS								
6	16EC CO6	Electronic Workshop and Network Lab	-	3	3	25	50	2
7	16EC C07	Electronic Devices Lab	-	3	3	25	50	2
8	16EG C03	Soft Skills and Employability Enhancement Lab	-	2	2	15	35	1
		Total	**19**	**8**	**-**	**215**	**485**	**24**

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

CIE - Continuous Internal Evaluation SEE - Semester End Examination

AssessmentProcedures 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
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: *Students will be able to understand*

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: *Students will 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 $\int_0^{2\pi} f(\sin\theta, \cos\theta)d\theta$.

Text Books:

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

Suggested Reading:

1. N P Bali and Manish Goyal, "A Text Book of Engineering Mathematics", 9th Edition, Laxmi publishers, 2016.
2. Alan Jeffrey, "Mathematics for Engineers and Scientists", 6th Edition, Chapman & Hall/CRC publishers, 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", 3rd edition, Narosa Publications, 2007.

16EC C02

NETWORK THEORY

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

Course Objectives: *Students will be able to understand*

1. The nature of different circuit elements, fundamental circuit laws, theorems and analyze circuits using graph theory.
2. The transient response of first, second order circuits and wave-shaping.
3. The concept of steady state and applying phasor analysis to AC circuits in sinusoidal steady state and analyzing magnetic coupled circuits.
4. Series and parallel resonant circuits, two port network parameters.
5. The concept of symmetrical and asymmetrical networks.
6. The concept of passive Filters.

Course Outcomes: *Students will able to*

1. Apply basic concepts of electric circuits and also simplify using network theorems. They will also be able to find Solution to networks using topological description.
2. Analyze RL,RC,RLC circuits using Transient and Steady State Responses for dc and ac input signals.
3. Represent vector, phasor diagrams and also find power calculations for ac circuits. They will be able to classify dot convention rules, self and mutual inductance for simple magnetic coupled circuits.
4. Discuss complex frequency analysis to series and parallel resonant circuits. Students will be able to compare Z,Y,H, two port network parameters and their interconnections.
5. Classify and define symmetrical and asymmetrical network characteristics.
6. Design and calculate parameters of passive filters.

UNIT-I

Basic Concepts of Electric Circuits: Classification of basic components, Ohm's law, Kirchoff's laws, network reduction techniques, nodal and mesh analysis, Source transformations, Star and Delta transformations, Thevenin's and Norton's theorems, Superposition theorem, Maximum power transfer theorem, Reciprocity theorem, Tellegen's theorem, Millman's Theorem, Duality Theorem.

Network Topology: Topological description of networks. Network graphs, tree, chord, incidence matrix, tieset matrix, cutset matrix. Formulation of node and loop equations and solution to networks.

UNIT-II

Time domain analysis: steady state and transient analysis for basic RL, RC and RLC circuits in linear time invariant first order and second order circuits, Formulation of integral, differential equations, Zero Input Response (ZIR), Zero State Response (ZSR), complete response.

Wave- Shaping: RC, RL and RLC circuits, response to Step, Pulse, Square wave inputs.

UNIT-III

Steady state Sinusoidal analysis: Steady state response of RLC networks to exponential signals, Sinusoidal signals, phasor and vector representations, impedance and admittance, application to network theorems.

Calculation of power in a.c. circuits: Average power, apparent power, complex power.

Magnetic coupled circuits: Concept of self, mutual inductance, co-efficient of coupling, dot convention rules and analysis of simple circuits.

UNIT-IV

Frequency domain analysis: Concept of complex frequency, impedance and admittance functions, Pole-Zero cancellation, calculation of natural response from pole zero plot. Series and parallel resonance, Q-factor, selectivity, bandwidth.

Two port networks: Z, Y, h, g, ABCD and Inverse ABCD parameters, equivalence of two port networks. Inter connection of two port networks, ideal transformers.

UNIT-V

Symmetrical and Asymmetrical networks: Characteristic impedance, propagation constant, image and iterative impedances for T, π, L, Bridged T and Lattice networks. Introduction to Attenuators and equalizers.

Passive Filters: Classification of filters (Low pass, High pass, Band pass and Band stop), Characteristic impedance, Design of Constant K, m-derived and composite filters.

Text Books:

1. William H.Hayt, Jr.,Jack E. Kemmerly& Steven M.Durbin, "Engineering Circuit Analysis", 8th ed, McGraw Hill, 2013.
2. C.L.Wadhwa, "Network Analysis and Synthesis", 4th edition, New Age International Publications, 2016.

Suggested Reading:

1. M.E. Van Valkenburg M.E, " Network analysis" PHI, New Delhi, 3rd Edition 2002.
2. Charels A. Desoer and Ernest S Kuth, "Basic Circuit Theory" McGraw Hill, 2009.
3. Lawrence P. Huelsman, "Basic Circuit Theory" Pearson Publication, 3rd edition, 2009.

16EC C03

ELECTRONIC DEVICES AND CIRCUITS

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

Course objectives: *Students will be able to understand*

1. The concepts of semiconductor devices like PN junction diode, Transistor, and special diodes.
2. The applications of diodes.
3. The various configurations, characteristics and biasing techniques of transistors – BJT, JFET & MOSFET.
4. The applications of transistor as a switch and an amplifier.
5. The analysis of BJT & FET in various configurations using small signal equivalent models.
6. The frequency response of various amplifiers.

Course Outcomes: *Students will able to*

1. Recall the elementary concepts of diode and relate them to special devices. Students will also be able to define the working principles of BJT, FET.
2. Classify and relate the performance of different types of rectifiers. Students will be able to compare and contrast the biasing techniques, different configurations, characteristics of BJT & FET.
3. Modeling of different amplifiers.
4. Examine different non-linear wave shaping circuits and draw an inference for their outputs. Students will be able to distinguish different types of rectifying circuits and amplifier circuits and their performance parameters.
5. Choose the best configuration for the specifications like ripple factor in case rectifiers, gain in case of amplifiers.
6. Design, develop and improve the performance of the amplifier circuits.

UNIT – I

Semiconductor Diode Characteristics:

The p-n junction as a Diode and Energy Band Diagram, Current components in p-n diode, The Volt-ampere characteristics and temperature dependence, Diode Resistance, Transition Capacitance, Diffusion Capacitance, p-n diode switching times, Zener Diode, Zener voltage regulator and its limitation.

Elementary treatment of SCR- UJT- Diac- Triac - Varactor diode - PIN diode - Tunnel diode.

UNIT – II

Diode Applications:

Diode as a circuit element, small signal diode models, Clipping and Clamping circuits, Clamping circuit theorem.

Half wave, Full wave and Bridge Rectifiers - their operation, performance characteristics- ripple factor calculations, and analysis; Filters (L, C, LC and CLC filters).

UNIT – III

Bipolar Junction Transistor:

Construction and Operation of NPN and PNP transistor, current components and current flow in BJT, Modes of transistor operation, Early effect, BJT input and output characteristics of CB, CE CC configuration- h-parameters.

BJT biasing techniques, stability factors, Bias compensation techniques, Thermal runaway, Thermal stability, BJT as an amplifier and as a switch.

UNIT – IV

Field Effect Transistors:

The Junction Field Effect Transistor, the Pinch-off Voltage V_p, V-I characteristics of JFET. JFET biasing-zero current drift biasing, biasing of FET, FET as an amplifier and as a switch.

MOSFETs: Enhancement & Depletion mode MOSFETs, V-I characteristics, MOSFET as resistance, Biasing of MOSFETs, MOSFET as a switch, Introduction to FinFET.

UNIT – V

Amplifiers:

Analysis of BJT circuits using h-parameters in various configurations - their comparison (approximate and exact analysis), Millers Theorem & its duality – application circuits, frequency response. Analysis of FET circuits using equivalent model for various configurations - their comparison.

Text Books:

1. Millman and Halkias, " Electronic Devices and Circuits" 2nd Edition, McGraw Hill Publication 2007.
2. Robert L. Boylestad, "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. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, McGraw Hill Publication, 2009.
3. Christian Piguet, "Low Power CMOS Circuits Technology, Logic Design and CAD Tools" 1st Indian Reprint, CRC Press, 2010.

16EC C04

SIGNALS AND SYSTEMS

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

Course Objectives: *Students will be able to understand*

1. Signals and systems representation/classification and also the time and frequency domain analysis of continuous time signals with Fourier series, Fourier transforms and Laplace transforms.
2. Sampling theorem, the time and frequency domain analysis of discrete time signals with DTFS, DTFT and Z-Transforms.
3. The concepts of convolution and correlation integrals and also the properties in the context of signals/systems.

Course Outcomes: *Students will able to*

1. Classify signals, systems and analyze the signals using Fourier series.
2. Understand signal spectrums and characterize the systems.
3. Represent the signals by generalized exponentials using Laplace transforms and evaluate LTI system characteristics.
4. Demonstrate conversion of continuous time signal to discrete time signal and obtain discrete system characteristics using DTFT and Z Transform.
5. Compare the signals using correlation.
6. Relate input and output response of the system using Convolution.

UNIT– I

Continuous Time Signals: Introduction to signals and their representations. Classification of signals. Introduction to systems and their classifications. Orthogonality of signals, Complete set of mutually orthogonal functions, Harmonic signals**.**

Signal Representation: Exponential Fourier series, Existence and Convergence. Symmetry conditions, Amplitude and Phase spectra. Properties of Fourier series. Power Spectral Density.

UNIT – II

Signal Representation by Continuous Exponentials:

The direct and inverse Fourier transforms, Existence and properties of Fourier Transforms, Frequency spectrum. Fourier Transform of singularity functions and periodic signals. Energy Spectral Density, Filter characteristics of linear systems, Distortion less system, Phase delay and group delay. Causality and physical reliability: The Paley-weiner criterion.

UNIT – III

Signal Representation by Generalized Exponentials: The Bilateral and unilateral Laplace transforms. Region of convergence and its properties. Properties of Laplace transform, Inverse Laplace transform, Laplace transform of periodic signals, Applications to circuit analysis (RL, RC and RLC). LTI system: Impulse response, System transfer function, Stability and Causality.

UNIT – IV

Discrete Time Signals: Sampling of continuous time signals. DTS representation. Discrete Time Fourier Transform and properties.

Z–Transform: The Direct Z-Transform, Region of convergence and its properties. S–Plane and Z–Plane correspondence, Z–Transform properties. Inverse Z–Transform, Discrete LTI system: impulse response and system transfer function, Stability and Causality.

UNIT – V

Convolution: Continuous convolution, Graphical interpretation and its properties. Discrete convolution, Graphical interpretation and its properties.

Correlation: Continuous correlation: Cross correlation and Auto correlation, their graphical interpretation and properties. Discrete correlation: Cross correlation and Auto correlation, their graphical interpretation and properties.

Text Books:

1. B.P.Lathi, “Signals, Systems and Communications”, BS Publications, 2008, 3rd Edition.
2. Alan V. Oppenheim,Alan S. Willsky,S.Hamid Nawad , “Signals and Systems” PHI 2nd Edition 2015.

Suggested Reading:

1. Simon Haykin, "Signals and Systems," Wiley India, 2009, 5th Edition.
2. M.J. Robert "Fundamentals of signals and systems", McGraw Hill, 2008.
3. Narayana Iyer, "Signals and Systems", Cengage learning, First Impression 2012.

16EC C05

ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

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

Course Objectives: *Students will be able to understand*

1. The mathematical fundamentals necessary for understanding the electromagnetic theory.
2. The electrostatics and magnetics along with Maxwell's equations for EM Waves.
3. The concepts of transmission lines.

Course Outcomes: *Students will able to*

1. Comprehend mathematically the coordinate systems and solve simple static electromagnetic problems using various laws and theorems.
2. Understand Maxwell's equations in different forms (differential and integral) and apply them to diverse engineering problems.
3. Demonstrate the Electromagnetic wave properties with respect to different transmission mediums.
4. Compare the plane wave transmission and reflection at different boundaries.
5. Predict the behavior of reflection and refraction of the waves in different mediums.
6. Estimate the transmission line properties, reflection and matching concepts.

UNIT – I

Review of coordinate systems. Coulomb's Law, Electric field due to various Charge Distributions. Electric flux and flux density. Gauss Law: Integral form, point form and its applications. Work, Potential and Energy, Energy Density, Dipole, Laplace's and Poisson's equations. Current and Current Density, Continuity of current Equation, Relaxation Time.

UNIT – II

Capacitance of Parallel plate**,** Coaxial and Spherical Capacitors.

Biot-Savart's law, Ampere's law: Integral form, point form and its applications. Stoke's theorem, Magnetic flux and magnetic flux density. Vector magnetic potential. Forces due to Magnetic Fields, Inductance: Self-inductance, calculation of inductance for simple structures.

UNIT – III

Time varying fields, Maxwell equations: Integral form and Point form. Boundary conditions.

Wave equations, Uniform plane waves in lossy and lossless medium. Skin Depth, Polarization, Instantaneous and average Poynting theorem and its applications.

UNIT – IV

Reflection and Refraction of Plane Waves - Normal and Oblique Incidence for both perfect Conductor and perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection.

Transmission Lines - I: Types, Parameters, Transmission Line Equations, Primary and Secondary Constants, Characteristics Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line. Impedance at any point on the transmission line.

UNIT – V

Transmission Lines - II: RF and UHF Lines, Open and short circuit lines and their significance. Properties of Lines. Distortion and distortion less transmission line, Concept of loading of a transmission line, Campbell's formula. Reflection and VSWR. Matching: Quarter wave transformer, Single Stub matching. Smith chart and its applications.

Text Books:

1. Matthew N.O. Sadiku, "Elements of Electromagnetics" 6th edition, 2015, Newyork Oxford University Press.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics" 8th edition, 2016, TMH.
3. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems" 2nd edition., 2000, PHI.

Suggested Reading:

1. "Networks Lines and Fields", John D. Ryder, 2nd edition, 2015, PHI.

16EC C06

ELECTRONIC WORKSHOP AND NETWORKS 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: *Students will be able to understand*

1. Understand the basic Concepts of Electric Circuits and equipment.
2. Understand the operation of CRO and LCR –Q meter.
3. Verify network theorems.
4. Design and verify Resonant circuits, Attenuators and passive filters.

Course Outcomes: *Students will able to*

1. Measure R,L,C components using electronic equipment.
2. Use CRO and power devices.
3. Conduct experiments on DC and AC circuits and also verify the network theorems.
4. Design passive filters.
5. Measure two port parameters.
6. Simulate a circuit using the simulation software.

EXPERIMENTS LIST

1. Study of RLC components, Bread board, Regulated power supply, Function generator, CRO.
2. Measurement of R, L, C components using LCR - Q Meter.
3. Soldering for simple circuits.
4. Verification of Ohm's law, KVL and KCL.
5. Verification of Superposition theorem and Tellegen's theorem.
6. Verification of Thevenin's and Norton's theorems.
7. Verification of Maximum power transfer theorem and Reciprocity theorem.
8. Verification of Transient Response in RC, RL circuits for DC inputs.
9. Design and Verification of Series Resonance.

10. Design and Verification of Parallel Resonance.
11. Measurement of two-port network parameters (Z,Y,h,T).
12. Design and Verification of Attenuators.
13. Design & verification of Constant-K low-pass & high-pass filters.
14. Design & verification of m-derived low-pass & high-pass filters.

Note: Experiments are to be simulated by using any simulating software.

16EC C07

ELECTRONIC DEVICES 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: *Students will be able to understand*

1. The V-I characteristics of diodes.
2. The design and performance evaluation of various diodes as rectifiers.
3. The characteristics of transistor in various configurations.
4. The design of various biasing techniques for transistors –BJT, JFET.
5. The analysis of amplifiers –BJT, JFET.
6. The behavior of various special diodes.

Course Outcomes: *Students will able to*

1. Recall the elementary concepts of diode, BJT, FET.
2. Classify and relate the performance of different types of rectifiers. Compare and contrast the biasing techniques, different configurations, characteristics of BJT & FET.
3. Model different amplifier circuits.
4. Examine different non-linear wave shaping circuits and draw an inference for their outputs. Distinguish different types of rectifying circuits and amplifier circuits and their performance parameters.
5. Choose the best configuration for the specifications provided.
6. Design, develop and improve the performance of the amplifier circuits**.**

List of Experiments:

1. V-I Characteristics of Silicon and Germanium diodes and measurement of static and dynamic resistances.
2. Zener diode characteristics and its application as voltage regulator.
3. Clipping and Clamping Circuits.

4. Design, realization and performance evaluation of half wave rectifiers without filters and with filters(capacitor filter and π section filters).
5. Design, realization and performance evaluation of full wave rectifiers without filters and with C & section filters.
6. Plotting the characteristics of BJT in Common Base configuration and measurement of h-parameters.
7. Plotting the characteristics of BJT in Common Emitter configuration and measurement of h-parameters.
8. Plotting the characteristics of JFET in CS configurations and measurement of Transconductance and Drain resistance.
9. BJT biasing circuits.
10. FET biasing circuits.
11. Common Emitter BJT Amplifier and measurement of Gain, bandwidth, input and output impedances.
12. Common Source FET Amplifier and measurement of Gain, bandwidth, input and output impedances.
13. Emitter Follower / Source Follower circuits and measurement of Gain, bandwidth, input and output impedance.
14. Characteristics of special semi-conductor devices-UJT and SCR.
11. Characteristics of Tunnel diode and photo diode.

Suggested Reading:

1. Robert Diffenderfer, "Electronic Devices Systems and Applications", Cengage Learning India Private Limited, 2010.
2. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, "Basic Electronics, A Text - Lab Manual", 7th Edition, TMH 2001.

Note:

1. Wherever possible, Analysis and design of circuits should be carried out using SPICE tools.
2. A minimum of 12 experiments should be performed.

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
CIE	15 Marks
Credits	1

Course Objectives: *Students will be able to understand*

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. The elements of research and hone their soft skills through a live, mini project.

Course Outcomes: *Students will 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. 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”, New York: Free Press, 1989.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

Choice Based Credit System

B.E (Electronics and Communication 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	16EC C08	Digital Ligic Design	3	-	3	30	70	3
2	16EC C09	Analog Electronic Circuits	4	-	3	30	70	4
3	16EC C10	Analog Communication	4	-	3	30	70	4
4	16EC C11	Antennas and Wave Propagation	3	-	3	30	70	3
5	16EC C12	Electronic Instrumentation	3	-	3	30	70	3
6	16MB C01	Engg Eco. and Accountancy	3	-	3	30	70	3
PRACTICALS								
7	16EC C13	Digital Logic Design Lab using Verilog	-	2	2	15	35	1
8	16EC C14	Analog Electronic Circuits Lab	-	3	3	25	50	2
9	16EC C15	Analog Communication Lab	-	3	3	25	50	2
		Total	**18**	**8**	**-**	**245**	**555**	**25**

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

CIE - Continuous Internal Evaluation SEE - Semester End Examination

AssessmentProcedures for Awarding Marks

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

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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
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%.

16EC C08

DIGITAL 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: *Students will be able to understand*

1. To learn various techniques for logic minimization.
2. To comprehend the concepts of various combinational circuits.
3. To understand the concepts of various sequential circuits.
4. To learn the fundamentals of Verilog HDL.
5. To learn the various abstraction levels in Verilog HDL.
6. To simulate and synthesize the process/concepts.

Course Outcomes: *Students will able to*

1.. The Various switching algebra theorems and minimization of switching functions.
2. The Structure of different digital logic elements like gates, multiplexers, encoders, decoders, adders and subtractors to build simple applications.
3. Different types of flip-flops and sequential circuits.
4. The Design of FSM.
5. The Design and simulation of various combinational and sequential logic circuits using Verilog HDL.
6. The Simulation and synthesis of digital logic design using Verilog HDL.

Unit-I

Introduction to Boolean algebra, Basic Postulates and theorems, Canonical forms and Standard forms, Simplification of switching function using theorems, Introduction to Logic Gates, Ex-OR, Ex-NOR operations. Minimization of Switching Functions: Karnaugh map method, Quine – McCluskey Tabular Minimization Method. Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

Unit-II

Binary Arithmetic Circuits: Binary Adders, Subtractors and BCD adder.Code converters:Binary to Gray, Gray to Binary, BCD to excess3,BCD to Seven Segment display. Decoders, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Implementations of Logic Functions using Decoders and Multiplexers.

Unit-III

Introduction to Sequential Logic: Types of Flip-Flops, Excitation tables and Flip-Flop Conversions. Hold and setup times. Classification of sequential circuits. Shift registers and counters, Design of synchronous and asynchronous up/down counters, modulo-N counters.State Diagram, State Table, Mealy and Moore type FSM, Sequence Detection using FSM.

Unit-IV

Introduction to HDLs, Basic Concepts of Verilog HDL, Data Types, System Tasks and Compiler Directives. Gate Level Modelling: Gate Types and Gate Delays. Dataflow Modeling: Continuous Assignment and Delays. Design of Stimulus Block.

Unit-V

Behavioral Modelling: Structured Procedures, Procedural Assignments, Timing control, Conditional statements, Sequential and Parallel Blocks. Switch level Modelling.Introduction to tasks and functions.Design of Mealy and Moore state models using Verilog HDL.Introduction to Logic Synthesis.

Text books:

1. Morris Mano M. and Michael D.Ciletti, “Digital Design, With an Introduction to Verilog HDL” 5th edition, Pearson 2013.
2. Samir Palnitkar, “Verilog HDL,A guide to Digital design and synthesis”, 2/e , Pearson Education, 2008.

Suggested Readings:

1. Michael D. Ciletti, “Advanced Digital Design with Verilog HDL”, PHI, 2005.
2. Donald P. Leach, Albert Paul Malvino, GouthamSaha, “Digital Principles and applications” 6th edition Tata McGraw Hill.
3. ZhiKohavi,NirajK.Jha, “Switching and Finite Automata Theory” 3rd edition, Cambridge Press.

16EC C09

ANALOG ELECTRONIC CIRCUITS

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

Course objectives: *Students will be able to understand*

1. The concept of multistage amplifiers and their analysis.
2. The concept of feedback amplifiers and their analysis.
3. The various multivibrators.
4. The various large signal amplifiers and their analysis.
5. The design and analysis of various tuned amplifiers.
6. The various regulators using transistors.

Course Outcomes: *Students will able to*

1. Define the high frequency model of BJT and FET.
2. Compare and contrast different types of multistage, feedback, power and tuned amplifiers.
3. Apply the concepts of BJT in multivibrators, feedback, multistage amplifiers and tuned amplifiers.
4. Categorize different types of feedback amplifiers, power amplifiers and voltage regulators.
5. Choose the best configuration for the specifications (like conversion efficiency in case power amplifiers, input and output impedance, resonating frequency and bandwidth).
6. Build narrow band amplifiers and improve the performance of the transistors voltage regulators.

f_T, f_β

UNIT – I

Multi stage amplifiers:

Multi stage amplifiers: CE-CE, CE-CB, CC-CC - Bootstrap, High frequency equivalent circuit– Analysis – BJT (and gain band-width product) & FET, Amplifier Frequency response, Multistage amplifiers: low frequency and High frequency analysis of RC coupled, Transformer coupled and Direct coupled amplifiers with BJT and FET.

UNIT – II

Feedback amplifiers:

Feed Back 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.

Oscillators: Positive feedback and conditions for sinusoidal oscillations, RC oscillator, LC oscillator, Crystal oscillator, Amplitude and frequency stability of oscillator.

UNIT III

Multivibrators:

Analysis and design of Transistor Multivibrators – Bistable, Monostable and Astable circuits. Operation of regenerative comparator (Schmitt Trigger).

UNIT – IV

Large Signal Amplifiers: BJT as large signal audio amplifiers, Classes of operation, Harmonic distortion, power dissipation, efficiency calculations. Design considerations of transformer coupled and transformer less push-pull audio power amplifiers under Class-A, Class-B, Class D and Class-AB operations, Heat Sinks.

UNIT – V

Tuned Amplifiers:

General consideration, Analysis and design of single tuned, inductively coupled and double tuned types with BJT, selectivity, gain & bandwidth comparison of multistage single tuned and double tuned amplifiers, the problem of stability in RF amplifiers, Neutralization &unilaterisation staggered tuned amplifiers. Class B and Class C tuned amplifiers.

Regulators: Transistorized series and shunt regulators.

Text Books:

1. Jacob Millman, Christos Halkias, Chetan Parikh, “Integrated Electronics”, 2nd Edition, McGraw Hill Publication, 2011.
2. Donald Schilling, Charles Belove, TuviaApelewicz Raymond Saccardi, “Electronic Circuits: Discrete and Integrated”, TMH, 3rd Edition, 2012.

Suggested Reading:

1. David Bell, “Fundamentals of Electronic Devices and Circuits”, 5th Edition, Oxford University Press 2008.
2. Robert L. Boylestad, “Electronic Devices and Circuit Theory”, 10th Edition, PHI, 2013.
3. Ben G Streetman and Sanjay Banerjee, “Solid State Electronic Devices”, 6th Edition, Pearson Education, 2005.

16EC C10

ANALOG COMMUNICATION

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

Course Objectives: *Students will be able to understand*

1. The concept of modulation and also analyze continuous / pulse modulation schemes.
2. The design procedure of AM and FM transmitters and receivers.
3. The concept of noise and its effect on modulation schemes and also to estimate the figure of merit.

Course Outcomes: *Students will able to*

1. Understand the need for modulation, representation of various AM modulation schemes and further they will able to generate and demodulate various types of AM signals.
2. Represent, analyze and distinguish FM and PM signals and also they will be able to generate and demodulate FM signals.
3. Understand the functioning of transmitters. They will be able to evaluate the radio receiver characteristics. To understand the necessity of Pre-emphasis and De-emphasis in FM broadcasting.
4. Understand and analyze the concept of Random Variable and Random Process. Further they will be able to evaluate the Response of Linear Systems for random signals.
5. Know the various sources of noise. They will be able to represent and analyze noise. Further they can evaluate and compare its effect on analog modulation schemes.
6. Demonstrate the Sampling theorem and analyze various sampling processes. Further they will be able to understand the various pulse modulation schemes.

UNIT – I

Linear Modulation Schemes: Need for Modulation, Double Side Band Suppressed Carrier Modulation, Balanced Modulator, Ring Modulator, Coherent Detector and Costas Detector.Conventional Amplitude Modulation, Phasor Diagram of AM, Switching Modulator,Square Law

Modulator, Envelope Detector. Hilbert Transform and its Properties, Complex Representation of Signals: Pre-Envelope, Complex Envelope, Natural Envelope, Canonical Representation of Band Pass Signals. Single Side Band Modulation, Phase Shift Modulator,Vestigial Side Band Modulation.

UNIT – II

Non-LinearModulation Schemes: Angle Modulation, Frequency Modulation and Phase modulation, Concept of Instantaneous Phase and Frequency. Types of FM modulation: Narrow Band FMand Wide Band FM.FM Spectrum in Terms of Bessel Functions. Phasor Diagram of NBFM. Frequency Multipliers and Mixers. Direct and Indirect (Armstrong's) methods of FM Generation. Balanced Slope Detector and Foster–Seeley Discriminator for FM Demodulation. Introduction to PLL.

UNIT – III

Transmitters and Receivers: High Level and Low Level AM Transmitters.FM Transmitters. Principle and Operation of Tuned Radio Frequency and Super Heterodyne Receivers. Selection of RF Amplifier. Choice of Intermediate Frequency. Image Frequency and its Rejection Ratio, Receiver Characteristics: Sensitivity, Selectivity, Fidelity. Double Spotting, Tracking and Alignment. Pre-emphasis and De-emphasis.

UNIT – IV

Probability, Random Variables and RandomProcess : Probability, Joint and ConditionalProbability, Concept of Random Variables, Distribution and DensityFunctions and theirproperties: Binomial, Poisson, Uniform, Exponential, Gaussian and Rayleigh Distributions. Operations on RandomVariables:Moments about Origin and Central Moments. RandomProcess: Concept, Stationarity and Ergodicity, Auto CorrelationFunction, Spectral Characteristics : Power Spectral Density and itsProperties. Linear System withRandominputs:Random Signal Response of LinearSystem, Auto Correlation of Response.

UNIT – V

Noise : Noise Sources, Thermal Noise. White Noise andcoloured noise. Noise Temperature. Noise in Two-Port Network: Noise Figure, Equivalent Noise Temperature and Noise Bandwidth. Noise Figure and Equivalent Noise Temperature for Cascaded Stages. S/N Ratios and Figure of Merit Calculations for AM, DSB-SC and SSB systems.

Pulse Analog Modulation Schemes: Sampling of low Pass and Band Pass Signals. Types of Sampling. Pulse Modulation Schemes: PAM, PWM and PPM.

Text Books:

1. Simon Haykin, "Communication Systems",2nd Edition, Wiley India, 2011.
2. Peyton Z. Peebles JR., "Probability Random Variables and Random Signal Principles", Tata Mc Graw Hill, edition, 4/e, 2002.
3. Herbert Taub, Donald L. Shilling &GoutamSaha, "Principles of Communication Systems," 3rd Edition, TMH, 2008.

Suggested Reading:

1. Singh, R.P. and Sapre, S.D., "Communication Systems," TMH, 2007.

16EC C11

ANTENNAS AND WAVE PROPAGATION

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

Course Objectives: *Students will be able to understand*

1. The basic principles of an antenna and its parameters for characterizing its performance.
2. The fundamental concepts of various types of antennas, arrays for customizing the pattern parameters.
3. The propagation behavior of the radio wave in both troposphere and ionosphere.

Course Outcomes: *Students will able to*

1. Understand the basic parameters of an antenna.
2. Extend current distribution concept in order to estimate the field patterns.
3. Appraise the concepts of broad side and end fire arrays.
4. Identify the significance of antenna array with respect to working principle and radiation pattern.
5. Understand the working principle and characteristics of various antennas.
6. Study the behavior of radio waves in various modes of wave propagation.

UNIT – I

Principles of radiation, retarded potential and isotropic radiator, Basic antenna parameters: Radiation patterns, radiation intensity, far field, near field, gain and directivity, Antenna Polarization, effective aperture area and efficiency. Point sources, current distribution, infinitesimal dipole.

UNIT – II

Half-wave dipole, quarter wave monopole, Effect of earth on vertical patterns, Loop antenna, Far field pattern of circular loop with uniform current.

Qualitative treatment of Helical Antennas: Axial mode pattern, wideband characteristics, radiation efficiency, Bandwidth.

UNIT – III

Arrays of point sources, two element array with equal and unequal amplitudes, different phases.Effect of inter element phase shift on beam scanning. Linear array with uniform distribution. Broadside and End fire arrays. Principle of pattern multiplication. Introduction to nonlinear arrays.

UNIT– IV

VHF, UHF Rhombic Antenna, Yagi - Uda Array, Design of Horn antenna, Parabolic Reflector and Cassegrain feed, Lens antennas. Log-Periodic antenna.Microstrip antennas: different types, advantages and disadvantages of Microstrip antennas, Design of rectangular Microstrip antennas.

UNIT – V

Ground wave propagation, Space and Surface waves, Tropospheric refraction and reflection, Duct propagation, Sky wave propagation: Critical frequency, Maximum Usable Frequency (MUF) and Skip distance, Introduction to regular and irregular variations in ionosphere. Friis transmission formula, Line of sight propagation.

Text Books:

1. Constantine A. Balanis, "Antenna Theory: Analysis and Design," 3rd Edition, John Wiley, 2005.
2. John D. Krauss, Ronald J. Marhefka & Ahmad S. Khan, "Antennas and Wave Propagation," 4th Edition, TMH, 2010.
3. Edward C. Jordan and Kenneth G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 2001.

Suggested Readings:

1. Chatterjee, R., "Antenna Theory and Practice", New Age Publishers, 2008.

16EC C12

ELECTRONIC INSTRUMENTATION

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

Course Objectives: *Students will be able to understand*

1. To impart a basic knowledge of International Standards for various physical quantities.
2. To provide a basic understanding of measurement systems and an in-depth understanding of measurement errors.
3. To expose the students to many varieties of transducers, measuring instruments, their Operating principles and construction.
4. To provide an idea of strengths and weaknesses of the various types of sensors and Transducers.
5. To introduce students to various types of spectrum analyzers, virtual instrumentation techniques and their applications.
6. To provide basic exposure to some of the prominent bio-medical Instrumentation systems.

Course Outcomes: *Students will able to*

1. Understand the various standards available for the measurement process.
2. Evaluate and perform accurate measurements for any engineering system with clear idea of the potential errors.
3. Understand the working principles of various transducers.
4. Select an appropriate transducer for given application.
5. Use instruments like spectrum analyzer, DSO and other virtual instrumentation techniques for appropriate measurements.
6. Understand the fundamentals of various Biomedical instrumentation systems.

UNIT– I

Accuracy and Precision - Conformity and Significant figures, Resolution and Sensitivity,Types of Errors,Loading effect, Absolute errors and Relative errors, Measurement of error combinations, Statistical analysis,Probable error and Limiting errors, Calibration, IEEE standards, Elements of ISO 9001, Quality management standards.

UNIT – II

Classification of transducers, factors for selection of a transducer, Passive electrical transducers: Strain gauges - gauge factor, types of strain gauges - bonded and un-bonded, rosettes, LVDT - construction and displacement measurement, Capacitive transducer and thickness measurement. Active electrical transducers: Piezo-electric transducer and different modes of operation, photo-conductive, photo-voltaic and photo - emissive transducers, semiconductor stain gauges.

UNIT – III

Characteristics of sound, pressure, power and intensity levels. Microphones and their types. Temperature measurement, resistance wire thermometers, semiconductor thermometers and thermocouples. Introduction to Micro-Electro-Mechanical Systems (MEMS).

UNIT – IV

Block diagram, specification and design considerations of different types of DVMs. Spectrum analyzers. Delayed time base oscilloscope, Digital storage oscilloscope. Introduction to Virtual Instrumentation, SCADA. Data Acquisition System- block diagram.

UNIT – V

Human physiological systems and related concepts. Bio-potential electrodes Bio-potential recorders - ECG, EEG, EMG and CT scanners, magnetic resonance and imaging systems, Ultrasonic Imaging systems.

Text Books:

1. Albert D. Helfric, and William D. Cooper, “Modern Electronic Instrumentation and Measurement Techniques”, PHI, 2010.
2. H S Kalsi, “Electronic Instrumentation”, 3/e, TMH, 2011.
3. Nakra B.C, and Chaudhry K.K., “Instrumentation, Measurement and Analysis”, TMH, 2004.

Suggested Readings:

1. David A. Bell, “Electronic Instrumentation & Measurements” PHI, 2nd Edition, 2003.
2. Khandpur. R.S., “Handbook of Bio-Medical Instrumentation”, TMH, 2003.
3. Leslie Cromwell and F.J. Weibell, E.A. Pfeiffer, “Biomedical Instrumentation and Measurements”, PHI, 2nd Ed, 1980.

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: *Students will be able to understand*

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: *Students will 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

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 Readings:

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.

16EC C13

DIGITAL LOGIC DESIGN LAB USING VERILOG

Instruction	3Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives: *Students will be able to understand*

1. To simulate and synthesize combinational logic circuits.
2. To simulate and synthesize sequential logic circuits.
3. To write a test bench for verifying the functionality of digital design.
4. To simulate various abstraction levels.
5. To learn and implement procedure for any digital design.

Course Outcomes: *Students will able to*

1. Design a Digital circuit using Verilog HDL.
2. Understand various abstraction levels of a digital design.
3. Verify the functionality of a design using Test bench.
4. Simulate and synthesize combinational logic circuits.
5. Simulate and synthesize sequential logic circuits.

Write a Verilog HDL to Simulate and Synthesize the following

1. Logic Gates.
2. Arithmetic Units: Adders and Subtractors.
3. Multiplexers and De-multiplexers.
4. Encoders, Decoders, Priority Encoder and Comparator.
5. Implementation of logic function using Multiplexers and Decoders.
6. Arithmetic and Logic Unit.
7. Flip-Flops.
8. Up, Down and UP/Down Counters.
9. Sequence Detector using Mealy and Moore type state machines.

16EC C14

ANALOG ELECTRONIC CIRCUITS 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: *Students will be able to understand*

1. The basic knowledge of various multivibrators.
2. The design and analysis of the multistage amplifiers.
3. The frequency response and behavior of various feedback amplifiers.
4. The generation of analog signals using oscillators.
5. The design and analysis of power amplifiers.
6. The design concepts of tuned amplifiers and band width measurement.

Course Outcomes: *Students will able to*

1. Define the bandwidth of multistage amplifiers using BJT and FET.
2. Compare and contrast different types of multistage configurations, feedback, power, tuned amplifiers.
3. Apply the concepts of analysis of BJT and compare the results in the lab for multi-vibrators, feedback, multistage amplifiers and tuned amplifiers.
4. Categorize different types of feedback amplifiers, power amplifiers and voltage regulators.
5. Choose the best configuration for the specifications (like conversion efficiency in case power amplifiers, input and output impedance, resonating frequency and band-width).
6. Build narrow band amplifiers and improve the performance of the transistors voltage regulators.

ANALOG CIRCUITS LAB

1. Design and development of Astable multivibrator.
2. Design and development of Monostable multivibrator.
3. Design and development of Bistable multivibrator.

4. Design and development of Schmitt Trigger.
5. Design and development of Voltage to Frequency converter.
6. Design andfrequency response of Single stage and Multistage RC - Coupled amplifier using BJT.
7. Design andfrequency response of Single stage and Multistage RC - Coupled amplifier using FET.
8. Voltage series feedback amplifier.
9. Voltage shunt feedback amplifier.
10. Current series feedback amplifier.
11. Current shunt feedback amplifier.
12. RC Phase Shift Oscillator.
13. Hartley Oscillator &Colpitts Oscillator.
14. Design of Class-A power amplifier.
15. Design of Class-B power amplifier.
16. Tuned Amplifiers (Single and Double).

Suggested Reading:

1. Robert Diffenderfer, "Electronic Devices Systems and Applications", Cengage Learning India Private Limited, 2010.
2. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, "Basic Electronics, A Text - Lab Manual", 7th Edition, TMH 2001.

Note:

1. Wherever possible, Analysis and design of circuits should be carried out using SPICE tools.
2. A minimum of 12 experiments should be performed.

16EC C15

ANALOG COMMUNICATION 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: *Students will be able to understand*

1. The concepts of various modulation schemes like AM, FM &PM.
2. The generation & detection methods of FM and AM.
3. The principles of various AM and FM transmitters and receivers.
4. The representation and analysis of various noise sources.

Course Outcomes: *Students will able to*

1. Demonstrate the generation and detection of various analog modulated signals.
2. Understand the sampling concept and further they can generate and detect various pulse modulated signals.
3. Obtain and analyze frequency response of Pre-Emphasis and De-Emphasis circuits.
4. Evaluate Mixer, Radio receiver and PLL characteristics.
5. Understand the concept of multiplexing and also can compare FDM and TDM techniques.
6. Estimate the Power spectral density of noise and Signal to Noise ratio and further able to analyze spectrums of AM and FM signals.

List of Experiments

1. AM signals generation and detection.
2. Generation of DSB-SC using Balanced modulator.
3. SSB Modulation and Demodulation.
4. FM generation and detection.
5. Frequency response of Pre-Emphasis and De-Emphasis circuits.
6. Evaluation of Radio Receiver characteristics.
7. Sampling of continuous time signal and its Reconstruction (PAM).
8. Frequency division Multiplexing and De-Multiplexing.

9. Time division Multiplexing and De-Multiplexing.
10. PWM Modulation and Demodulation.
11. PPM Modulation and Demodulation.
12. Determination of PLL Characteristics.
13. Analysis of Mixer Characteristics.
14. Spectral Analysis of AM and FM signals using Spectral Analyzer.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Choice Based Credit System

B.E (Electronics and Communication Engineering)

Courses offered to Department of EEE

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	16EC C16	Electronic Engineering	4	-	3	30	70	4
PRACTICALS								
2	16EC C17	Electronic Engineering Lab	-	3	3	30	70	2
Total			**4**	**3**	**-**	**60**	**140**	**6**

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

CIE - Continuous Internal Evaluation SEE - Semester End Examination

AssessmentProcedures 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
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%.

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: *Students 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: *Students will able to*

1. Understand semiconductordevices such as PN junction Diodes, BJT, JFET and MOSFET.
2. Analyze application of diodes.
3. Study V-I characteristics BJT, JFET and MOSFET.
4. Study the switching behavior of BJT, JFET, MOSFET.
5. Study the equivalent model of PN junction diode, BJT, JFET and MOSFET.
6. 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 V_p, 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:

Feed Back 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.

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: *Students 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: *Students will 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 6 experiments should be conducted from each part.