Semester III (ECE)

Sr. No.	Course Code	Course Title	L	T	P	Contact Hrs./wk.	Marks		Credits
							Internal	External	
1	BTAM-18302	Mathematics-III	3	1	0	4	40	60	4
2	BTEC-18301	Electronic Devices	3	0	0	3	40	60	3
3	BTEC-18302	Digital System Design	3	0	0	3	40	60	3
4	BTEC-18303	Network Theory	3	1	0	4	40	60	4
5	BTCS-18303	Object Oriented Programming Language	3	0	0	3	40	60	3
6	BTEC-18305	Electronics Devices Lab	0	0	2	2	30	20	1
7	BTEC-18306	Digital System Design Lab	0	0	2	2	30	20	1
8	BTCS-18306	Object Oriented Programming Language Lab	0	0	2	2	30	20	1
9	BTEC-18307	Institutional Practical Training					60	40	1
10	ECMC-1	Constitution of India/Essence of Indian Traditional Knowledge	-	-	-	-			0
							350	**400**	**21**

Semester IV (ECE)

Sr. No.	Course Code	Course Title	L	T	P	Contact Hrs./wk.	Marks		Credits
							Internal	External	
1	BTEC-18401	Analog Communication	3	0	0	3	40	60	3
2	BTEC-18402	Analog Circuits	3	0	0	3	40	60	3
3	BTEC-18403	Microprocessor & Microcontroller	3	1	0	4	40	60	4
4	BTEC-18404	Electromagnetic Waves	3	0	0	3	40	60	3
5	BTEC-18405	Signals and Systems	3	0	0	3	40	60	3
6	BTEC-18406	Analog Communication Lab	0	0	2	2	30	20	1
7	BTEC-18407	Analog Circuits Lab	0	0	2	2	30	20	1
8	BTEC-18408	Microprocessor & Microcontroller Lab	0	0	2	2	30	20	1
							290	**360**	**19**

Semester V (ECE)

Sr. No.	Course Code	Course Title	L	T	P	Contact Hrs./wk.	Marks		Credits
							Internal	External	
1	BTEC-18501	Digital Communication	3	0	0	3	40	60	3
2	BTEC-18502	Digital Signal Processing	3	0	0	3	40	60	3
3	BTEC-18503	Control Systems	3	0	0	3	40	60	3
4	BTEC-18504	Computer Architecture	3	0	0	3	40	60	3
5	BTEC-189XX	Department Elective – 1	3	0	0	3	40	60	3
6	BTXX-18XXX	OE-1	3	0	0	3	40	60	3
7	BTEC-18505	Digital Communication Lab	0	0	2	2	30	20	1
8	BTEC-18506	Digital Signal Processing Lab	0	0	2	2	30	20	1
9	BTEC-18507	Institutional /Industrial Training					60	40	1
							360	**380**	**21**

Semester VI (ECE)

Sr. No.	Course Code	Course Title	L	T	P	Contact hrs. /wk.	Marks		Credits
							Internal	External	
1	BTEC-18601	Electronic Measurement & Instruments	3	0	0	3	40	60	3
2	BTEC-18602	Computer Networks	3	0	0	3	40	60	3
3	BTEC-189XX	Department Elective – 2	3	0	0	3	40	60	3
4	BTHS-18906	Economics for Engineers	3	0	0	3	40	60	3
5	BTXX-18XXX	OE-2	3	0	0	3	40	60	3
6	BTEC-18603	Computer Networks Lab	0	0	2	2	30	20	1
7	BTEC-18604	Electronic Measurement Lab	0	0	2	2	30	20	1
8	BTEC-18605	Mini Project/Electronic Design workshop	0	0	4	4	30	20	2
							290	**360**	**19**

Semester VII (ECE)

Sr. No.	Course Code	Course Title	L	T	P	Contact hrs /week	Marks		Credits
							Internal	External	
1	BTEC-189XX	Department Elective -3	3	0	0	3	40	60	3
2	BTEC-189XX	Department Elective -4	3	0	0	3	40	60	3
3	BTEC-189XX	Department Elective -5	3	0	0	3	40	60	3
4	BTXX-18XXX	OE -3	3	0	0	3	40	60	3
5	BTHS-18905	Effective Technical Communication	3	0	0	3	40	60	3
6	BTEC-18702	Project Stage-I	0	0	10	10	40	20	5
7	BTEC-18703	Industrial Training					60	40	1
		TOTAL CREDITS					**300**	**360**	**21**

Semester VIII (ECE)

Sr. No.	Course Code	Course Title	L	T	P	Contact hrs /week	Marks		Credits
							Internal	External	
1	BTEC-189XX	Department Elective -6	3	0	0	3	40	60	3
2	BTEC-189XX	Department Elective -7	3	0	0	3	40	60	3
3	BTEC-189XX	Department Elective -8	3	0	0	3	40	60	3
4	BTXX-18XXX	OE -4	3	0	0	3	40	60	3
5	BTEC-18801	Project Stage-II	0	0	18	18	100	50	9
							260	**290**	**21**

BTAM18302 Mathematics-III

			L	T	P
Internal Marks	:	40			
External Marks	:	60	3	1	0
Total Marks	:	100			

Objectives: To make students familiar with some specific mathematical concepts and tools to understand and analyze the electronics and communication based engineering problems. The exposure of these tools will enhance the analytical ability to deal with engineering problems.

Fourier Series:
Periodic functions, Euler's formula. Even and odd functions, half range expansions, Fourier series of different wave forms.

(6)

Laplace Transforms:
Laplace transforms of various standard functions, properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function, periodic functions, applications to solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equation.

(8)

Partial Differential Equations:
Formation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients, Solution by the method of separation of variables.

(8)

Linear Systems and Eigen- Values:
Gauss–elimination method, Gauss- Jordan method, Gauss- Seidel iteration method, Rayleigh's Power method for Eigen values and Eigenvectors.

(8)

Solution of Initial value Problems
Solution of initial value problems: using Euler's Method, Modified Euler's Method and Runge Kutta Method of fourth order.

(6)

Books Recommended:
1. Higher Engineering Mathematics - by Dr. B.S. Grewal; Khanna Publishers.
2. Ian N. Sneedon, Elements of Partial Differential Equations, McGraw- Hill, Singapore, 1957.
3. Peter. V. O'Nil, Advanced Engineering Mathematics, Wadsworth Publishing Company.
4. Babu Ram, Advance Engineering Mathematics, Pearson Education.
5. Bindra, J. S., Applied Mathematics, Volume-III, Kataria Publications.
6. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons

BTEC18301 Electronic Devices

			L	T	P
Internal Marks	:	40			
External Marks	:	60	3	0	0
Total Marks	:	100			

Introduction to Semiconductor Physics:

Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors (6 Hours)

Semiconductor Diode:

Generation and recombination of carriers, P-N junction diodes, I-V characteristics of diodes and small signal switching models; Avalanche breakdown, Zener diode, Schottky diode (6 Hours)

Bipolar Junction Transistor (BJT):

Construction, Principle of Operation, Ebers-Moll Model,Transistor current components, Transistor as a switch and as an Amplifier, Common Emitter, Common Base and Common Collector configurations and I-V Characteristics, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Emitter Feedback Bias, Collector to Emitter feedback bias, Voltage divider bias, Bias stability, Stabilization against variations in VBE and β, Bias Compensation using Diodes and Transistors. (8 Hours)

Field Effect Transistor (FET):

Construction, Principle of Operation, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET (4 Hours)

Metal Oxide Semiconductor Field Effect Transistor (MOSFET):

Different types of MOSFET's, Working operation and V-I Characteristics of different types of MOSFET's, MOS capacitor, small signal models of MOS transistor, LED, photodiode and solar cell. (6 Hours)

Integrated Circuit Fabrication Process:

Oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process. (6 Hours)

Text /Reference Books:

1. G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices," 7th edition, Pearson,2014.
2. Milliman, J. and Halkias, C.C., Electronic Devices and Circuits, Tata McGraw Hill,2007
3. D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
4. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley &Sons, 2006.

5. C.T. Sah, "Fundamentals of solid state electronics," World Scientific Publishing Co. Inc, 1991.
6. Y. Tsividis and M. Colin, "Operation and Modeling of the MOS Transistor," Oxford Univ.Press, 2011.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand the principles of semiconductor Physics
2. Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.

BTEC-18302 Digital System Design

			L	T	P
Internal Marks	:	40			
External Marks	:	60	3	0	0
Total Marks	:	100			

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion. (8 Hours)

MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU. (5 Hours)

Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation (7 Hours)

Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA. Logic implementation using Programmable Devices. (5Hours)

VLSI Design flow: Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation (12Hours)

VHDL constructs and codes for combinational and sequential circuits. (3 Hours)

Text/Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition , 2006
4. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.

Course outcomes:

At the end of this course students will demonstrate the ability to

1. Design and analyze combinational logic circuits
2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder
3. Design & analyze synchronous sequential logic circuits
4. Use HDL & appropriate EDA tools for digital logic design and simulation

BTEC-18303 Network Theory

			L	T	P
Internal Marks	:	40			
External Marks	:	60	3	1	0
Total Marks	:	100			

Introduction to various signals: Step, Ramp, Impulse. Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactances, source transformation and duality. **(6 hours)**

Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC. circuits. Steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation. Behaviors of series and parallel resonant circuits. **(12 hours)**

Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions. **(4 hours)**

Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two port network and interconnections. **(10 hours)**

Introduction to band pass, low pass, high pass and band reject filters. **(4 hours)**

Text/Reference Books

1. Van, Valkenburg.; "Network analysis"; Prentice hall of India, 2000
2. Sudhakar, A., Shyammohan, 8S. P.; "Circuits and Network'; Tata McGraw-Hill New Delhi, 1994
3. A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education
4. Abhijit Chakrabarti, "Circuit Theory: Analysis & Synthesis" , Edition: 6 ,Publisher: S. Chand, Dhanpat Rai Publishing Co Pvt Ltd

Course outcomes:

At the end of this course students will demonstrate the ability to

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.

BTCS-18303 Object Oriented Programming

			L	T	P
Internal Marks	:	40			
External Marks	:	60	3	0	0
Total Marks	:	100			

Objectives of the course
The course will introduce standard tools and techniques for software development, using object oriented approach. To understand Object Oriented Programming concepts and basic characteristics of C++.

Introduction
What is object oriented programming? Procedural Vs. Object-Oriented Programming , Basic Concepts and Principles of OOP.

C++ Programming basics
Overview of C++, Program Structure, Exploring the Basic Components of C++ , Type Casting in C++, Operators in C++, Control Structures

Functions
Explore Functions , Describing Call by Value and Call by Reference , Inline Function, Overloading of Functions, String Library Functions, Recursive Functions, Friend Function.

Objects and Classes
Basics of Object and Class, Private and Public Members, Member Functions, Scope Resolution Operator, Constructors and their types, Destructors, Passing Objects as Function Parameters, Returning Objects from Functions.

Inheritance
Concept of inheritance, Derived class and base class, Types of Inheritance, Ambiguity and solution while implementing Multiple Inheritance.

Polymorphism
Concept of Polymorphism, Types of polymorphism, Function Overloading, Operator Overloading, Function Overriding.

Memory Management
Introduction to Pointers, Pointers and Objects, Dynamic Memory Management using new and delete operators, The this Pointer, pointer to object.

Templates and Exception Handling
Concept of Generic Programming, Function Template, Class Template, Exception handling mechanism, use of try, catch and throw keywords

Streams and Files
File Stream Operations, Opening and Closing a File, File Modes, File Pointers, Input Output Operations, Reading/Writing an object into file.

The concepts should be practiced using C++.

Suggested books

1. Lafore R., Object Oriented Programming in C++, Waite Group
2. E. Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill

Course Outcomes

After taking the course, students will be able to:

1. Recognise features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.
2. Apply these features to program design and implementation.
3. Design applications by using these object oriented concepts.

BT**EC18305 Electronic Devices Lab**

			L	T	P
Internal Marks	:	30	**0**	**0**	**2**
External Marks	:	20			
Total Marks	:	50			

Note: The teacher can introduce any new experiment as per the requirements of syllabus.

List of Experiments

1. To familiarize with the various electronic component and multimeter.
2. To familiarize with the CRO, DSO and signal generator.
3. To study the operation of half wave rectifier.
4. To study full wave & bridge rectifiers and calculate efficiency and ripple factor.
5. To study simple capacitive, T & π filters.
6. To observe the application of Zener diode as voltage regulator.
7. To implement any one application of photodiode.
8. To study the characteristics of a solar cell.
9. To study the action of a transistor as an electronic switch.
10. To plot the input and output characteristics of CE configuration.
11. To plot the input and output characteristics of CB configuration.
12. To plot JFET characteristics in CS configuration.

BTEC-18306 Digital System Design Lab

			L	T	P
Internal Marks	:	30			
External Marks	:	20	0	0	2
Total Marks	:	50			

Note: The Lab teacher may introduce new experiments as per the requirements of the course using VHDL.

List of Experiments:

1. Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates.
2. Realization of OR, AND, NOT and XOR functions using universal gates.
3. Realization of half adder / full Adder using logic gates.
4. Realization of half Subtractor / full Subtractor using logic gates.
5. Design a 4-bit binary-to-gray & gray-to-binary code converter.
6. Design of basic gates: And, OR, NOT and Universal gates.
7. Design of half-Adder, full Adder, half Subtractor, full Subtractor.
8. Design of 3:8 Decoder.
9. Design of 8:3 Priority Encoder.
10. Design of 4-bit Binary to Gray Code Converter.
11. Design of 4-bit Binary to BCD Converter using Sequential statement.
12. Design an 8-bit Parity Generator (with for loop and Generic statements).
13. Design of all type of Flip-Flops using (if-then-else) Sequential constructs.
14. Design of Synchronous 8-bit Johnson Counter.
15. Design of Synchronous 8-bit Universal Shift Register (PIPO).
16. Design MOD Counters (MOD 3, MOD 5, MOD 8, and MOD 16).
17. Design of ALU.
18. Design of Mealy and Moore FSM.

BTCS-18306, Object Oriented Programming Lab

			L	T	P
Internal Marks	:	20	0	0	2
External Marks	:	30			
Total Marks	:	50			

1. Introduction to OOP lab (Simple C++ program)
2. WAP to demonstrate the use of Classes and Objects
3. Constructors and Destructors; Write a program to demonstrate different types of constructors and destructors.
4. Operator overloading; Write a program for overloading various unary operators
5. Write a program for overloading various binary operators
6. Memory Management; Write a program to demonstrate the use of new and delete keywords
7. Inheritance; Write a program to demonstrate different types of inheritance
8. Write a program to remove ambiguity from hybrid inheritance
9. Polymorphism; Write a program for polymorphism(virtual function)
10. Write a program for templates (class and function template)
11. File handling; Write a program to copy contents of one file to another file.
12. Program using streams

Course outcomes:

The student is expected to:

1. Conceptualize the given problem and transform it in to an Object Oriented system.
2. Implement coding standard and verification practices
3. Build expertise in Object Oriented programming language.

BTEC-18401 Analog Communication

			L	T	P
Internal Marks	:	40			
External Marks	:	60	3	0	0
Total Marks	:	100			

Base Band Signals and Systems:

Introduction, Elements of communication system, Noise, types of noise and characteristics; Noise Figure & noise factor, Noise equivalent temperature. Modulation & Demodulation, Mixing; Linear & Nonlinear, need of modulation, types of modulation systems, basic transmission signals, Frequency multiplexing technique. (3Hours)

Analog Modulation Techniques:

Introduction, theory of amplitude modulation; AM power calculations, AM current calculations, AM modulation with a complex wave, theory of frequency modulation; mathematical analysis of FM, spectra of FM signals, narrow band of FM, Wide band FM, Theory of phase modulation, phase modulation obtained from frequency modulation, comparison of AM & FM, Comparison of PM & FM. (4 Hours)

AM Transmission & Reception:

Introduction, generation of Amplitude Modulation, Low level and high level modulation, basic principle of AM generation; square law modulation, Amplitude modulation in amplifier circuits, suppressed carrier AM generation (Balanced Modulator) ring Modulator, Product Modulator/balanced Modulator.

Receiver Parameters; Selectivity, Sensitivity, Fidelity, Tuned Ratio Frequency (TRF) Receiver, Super heterodyne Receiver; Basic elements of AM super heterodyne Receiver; RF Amplifiers, Image Frequency Rejection, Tracking & Alignment, IF Amplifier, AM detector; square law detector, Envelope or Diode detector, AM detector with AGC, Distortion in diode detectors, AM detector Circuit using Transistor, Double hetro -dyne receiver, AM receiver using a phase locked loop (PLL), AM receiver characteristics. (10 Hours)

FM Transmission & Reception:

FM allocation standards, generation of FM by direct method, varactor diode Modulator, Cross by Direct FM Transmitter, Phase-Locked-Loop Direct FM Transmitter, Indirect generation of FM; Armstrong method, RC phase shift method, Frequency stabilized reactance FM transmitter.

Frequency demodulators, Tuned circuit frequency discriminators; Slope Detector, Balance Slope Detector, Foster Seeley discriminator, Ratio Detector, FM detection using PLL, Zero crossing detector as a Frequency Demodulator, quadrature FM demodulator, pre emphasis and de-emphasis, limiter circuits, FM Capture effect, FM receiver, FM stereo transmission and reception, Two way FM Radio Transmitter and Receiver. (8Hours)

SSB Transmission & Reception:

Introduction, Single Side band systems, AM-SSB; Full carrier, Suppressed carrier , reduced carrier, Independent side band, and Vestigial side band, Comparison of SSB Transmission to conventional AM, Generation of SSB; Filter method, Phase Shift Method, Third Method. SSB Product Demodulator, Balanced Modulator as SSB Demodulator, Single Side band

receivers; Single side band BFO Receivers, Coherent Single side band BFO Receivers, Single Side band Envelop detection receiver, (7Hours)

Pulse Modulation Transmissions and Reception:

Introduction, Sampling Theorem, Pulse Amplitude Modulation (PAM), Natural PAM Frequency Spectra for PAM , Flat-top PAM, Sample and hold circuits, Time division Multiplexing, PAM Modulator Circuit, Demodulation of PAM Signals, Pulse Width Modulation(PWM) and Demodulation, Pulse Position Modulation (PPM) and Demodulation. (4Hours)

Suggested / Recommended Books:

1. Electronic communication Systems by Kennedy & Davis, Tata Mcgraw Hill.
2. Analog Communication Systems by Manoj Kumar &Manisha, SatyaPrakashan, New Delhi, 2nd Edition.
3. Electronic Communication System, Tomasi, Pearson Education.
4. Electronic Communication, Roddy, Pearson Education.
5. Analog Communication Systems by SymonHykens, John Wiley &Sons .
6. Principles of Communication System, Taub& Schilling, Tata Mc-Graw Hill.

Course Outcomes:

At the end of this course students will demonstrate the ability to
1. Analyze and compare different analog modulation schemes for their efficiency
2. Analyze the behavior of a communication system in presence of noise
3. Investigate pulsed modulation system and analyze their system performance.

BTEC-18402 Analog circuits

			L	T	P
Internal Marks	:	40			
External Marks	:	60	3	0	0
Total Marks	:	100			

Diode Circuits, Amplifier models: Voltage amplifier, current amplifier, trans- conductance amplifier and trans-resistance amplifier. (5 Hrs)

Single stage and multistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues. (4 Hrs)

Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., concept of stability, gain margin and phase margin. (4 Hrs)

Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators(phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators. Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load. (6 Hrs)

Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OP-AMP design: design of differential amplifier for a given specification, design of gain stages and output stages, compensation. (5 Hrs)

OP-AMP applications: review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications. Active filters: Low pass, high pass, band pass and band stop, design guidelines. (6 Hrs)

Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. Analog-to-digital converters (ADC): Single slope, dual slope, successive approximation, flash etc. (6 Hrs)

Text/Reference Books:

1. J.V. Wait, L.P. Huelsman and GA Korn, Introduction to Operational Amplifier theory and applications, McGraw Hill, 1992.
2. J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988.
3. P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.
4. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, Edition IV.
5. Paul R. Gray and Robert G.Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley, 3rd Edition.
6. Ramakant A Gayakwad Op-Amps and Linear Integrated Circuits, 4th Edition

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand the characteristics of diodes and transistors
2. Design and analyze various rectifier and amplifier circuits
3. Design sinusoidal and non-sinusoidal oscillators
4. Understand the functioning of OP-AMP and design OP-AMP based circuits
5. Design ADC and DAC

BTEC-18404 Electromagnetic Waves

			L	T	P
Internal Marks	:	40			
External Marks	:	60	3	0	0
Total Marks	:	100			

1. Maxwell's Equations
Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface. **(5 Hours)**

2. Uniform Plane Wave
Uniform plane wave, Propagation of wave, Wave polarization, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor. **(7 Hours)**

3. Transmission Lines
Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements. **(8 Hours)**

4. Plane Waves at a Media Interface
Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary. **(7 Hours)**

5. Wave propagation in parallel plane waveguide
Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide. **(5 Hours)**

6. Introduction to antennas
Radiation Parameters of antenna, Monopole and Dipole antenna Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole.
(4 Hours)

Text/Reference Books:

1. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005
2. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India
3. Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997.
4. David Cheng, Electromagnetics, Prentice Hall

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand characteristics and wave propagation on high frequency transmission lines.
2. Carry out impedence transformation on TL
3. Use section of transmission line sections for realizing circuit elements
4. Characterize uniform plane wave
5. Calculate reflection and transmission of waves at media interface

BTEC18405 Signals and System

			L	T	P
Internal Marks	:	40			
External Marks	:	60	3	0	0
Total Marks	:	100			

Signals and systems as seen in everyday life, and in various branches of engineering and science.

Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability, LTI systems. **(8 hours)**

Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input- output behavior with aperiodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations. **(8 hours)**

Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT)**(8 hours)**

The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis. **(4 hours)**

The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. **(8 hours)**

Text/Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall,
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
3. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
4. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
5. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.
6. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.

Course outcomes:

At the end of this course students will demonstrate the ability to

1. Analyze different types of signals
2. Represent continuous and discrete systems in time and frequency domain using different transforms
3. Investigate whether the system is stable
4. Sampling and reconstruction of a signal

BTEC-18406 Analog Communication Lab

Internal Marks	:	30	**L**	**T**	**P**
External Marks	:	20	**0**	**0**	**2**
Total Marks	:	50			

Note:- Attempt any eight experiments. The teacher can introduce any new experiment as per the requirements of syllabus.

List of Experiments:

1. Generation & detection of DSBFC amplitude modulated signal.
2. Generation & detection of frequency modulated Signal
3. Generation & detection of SSB AM signal.
4. Detection of FM Signal using PLL.
5. To study the circuit of PAM modulator & Demodulator
6. To study the circuit of PWM modulator & Demodulator
7. To study the circuit of PPM modulator & Demodulator
8. Study of Frequency Division Multiplexing / Demultiplexing .
9. Generation & study of Analog TDM at least 4 channels.
10. To Study Super heterodyne AM receiver and measurement of receiver parameters viz. sensitivity, selectivity & fidelity.
11. Sampling Theorem & Reconstruction of Signal from its samples using Natural Sampling, Flat Top Sampling & Sample & Hold Circuits & effect of duty cycle.

BTEC-18407 Analog Circuit Laboratory

			L	T	P
Internal Marks	:	30	0	0	2
External Marks	:	20			
Total Marks	:	50			

Note:- Attempt any eight experiments. The teacher can introduce any new experiment as per the requirements of syllabus.

List of Experiments:

1. To study the characteristics of a Class- A amplifier.
2. To study the characteristics of Class- B amplifier.
3. To study the characteristics of Class- B push-pull amplifier.
4. To study the characteristics of complementary symmetry amplifier.
5. To study the response of RC phase shift oscillator and determine frequency of oscillation.
6. To study the response of Hartley oscillator and determine frequency of oscillation.
7. To study the response of Colpitt's oscillator and determine frequency of oscillation.
8. To study the response of Wien Bridge oscillator and determine frequency of oscillation
9. Application of op-amp as inverting and non inverting amplifier.
10. To study frequency response of op-amp.
11. Application of op-amp as summing, scaling and averaging amplifier.
12. Application of op-amp as schmitt trigger.

BTEC-18408 Microprocessor & Microcontroller Lab

			L	T	P
Internal Marks	:	30			
External Marks	:	20	0	0	2
Total Marks	:	50			

List of Experiments using 8085/8051

Note: The Lab teacher may introduce new experiments as per the need of the course.

1. Study of 8085Microprocessor kit.
2. Write a program to add two 8/16-bit number using 8085.
3. Write a program to subtract two 8/16-bit number using 8085.
4. Write a program to multiply two 8 bit numbers by repetitive addition method using 8085.
5. Write a program to sort series using bubble sort algorithm using 8085.
6. Study of 8051 Microcontroller kit.
7. Write a program to add two numbers lying at two memory locations and display the result using 8051.
8. Write a program for multiplication of two numbers lying at memory location and display the result using 8051.
9. Write a Program to arrange 10 numbers stored in memory location in Ascending and Descending order in 8051.
10. Write a program of flashing LED connected to port 2 of the Micro Controller 8051.
11. Study of Interrupt structure in 8051.
12. Interfacing of an LCD Display with 8051
13. Write a program to interface an ADC using 8051.
14. Write a program to generate a Ramp waveform using DAC interface using 8051.

BTEC-18309 Basic Electronic Engineering

			L	T	P
Internal Marks	:	40			
External Marks	:	60	3	0	0
Total Marks	:	100			

Objectives:
To provide an overview of electronic device components to Mechanical engineering students

Semiconductor Devices and Applications: Introduction to P-N junction Diode and V-I characteristics, Half wave and Full-wave rectifiers, capacitor filter. Zener diode and its characteristics, Zener diode as voltage regulator. Regulated power supply IC based on 78XX and 79XX series, Introduction to BJT, its input-output and transfer characteristics, BJT as a single stage CE amplifier, frequency response and bandwidth. (8 Hours)

Operational amplifier and its applications: Introduction to operational amplifiers, Op-amp input modes and parameters, Op-amp in open loop configuration, op-amp with negative feedback, study of practical op-amp IC 741, inverting and non-inverting amplifier applications: summing and difference amplifier, unity gain buffer, comparator, integrator and differentiator. (7 Hours)

Timing Circuits and Oscillators: RC-timing circuits, IC 555 and its applications as astable and mono-stable multi-vibrators, positive feedback, Barkhausen's criteria for oscillation, R-C phase shift and Wein bridge oscillator. (7 Hours)

Digital Electronics Fundamentals :Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K- map, Logic ICs, half and full adder/subtractor, multiplexers, demultiplexers, flip-flops, shift registers, counters, Block diagram of microprocessor/microcontroller and their applications. (7 Hours)

Electronic Communication Systems: The elements of communication system, IEEE frequency spectrum, Transmission media: wired and wireless, need of modulation, AM and FM modulation schemes, (7 Hours)

Text /Reference Books:
1. Floyd ," Electronic Devices" Pearson Education 9th edition, 2012.
2. R.P. Jain , "Modern Digital Electronics", Tata Mc Graw Hill, 3rd Edition, 2007.
3. Frenzel, "Communication Electronics: Principles and Applications", Tata Mc Graw Hill, 3rd Edition, 2001

Course Outcomes:
At the end of this course students will demonstrate the ability to
1. Understand the principles of semiconductor devices and their applications.
2. Design an application using Operational amplifier.
3. Understand the working of timing circuits and oscillators.

4. Understand logic gates, flip flop as a building block of digital systems.
5. Learn the basics of Electronic communication system.

BTEC-18310 Basic Electronic

Internal Marks	:	**L**	**T**	**P**
External Marks	:	**1**	**0**	**2**
Total Marks	:			

The objective of this Course is to provide the students with an introductory and broad treatment of the field of Electronics Engineering to facilitate better understanding of the devices, instruments and sensors used in Civil Engineering applications. Lab should be taken concurrently. This course emphasizes more on the laboratory/practical use of the knowledge gained from the course lectures. What Will I Learn?

a) Know broadly the concepts and functionalities of the electronic devices, tools and instruments
b) Understand use, general specifications and deploy abilities of the electronic devices, and assemblies
c) Confidence in handling and usage of electronic devices, tools and instruments in engineering applications

Proposed Syllabus (All modules to provide only broad overview)

Module1: Diodes and Applications covering, Semiconductor Diode - Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Load Line Analysis; Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications; Silicon Controlled Rectifier (SCR) – Operation, Construction, Characteristics, Ratings, Applications;

Module 2: Transistor Characteristics covering, Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Voltage Divider Bias Configuration; Field Effect Transistor (FET) – Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs, Introduction to CMOS circuits;

Module 3: Transistor Amplifiers and Oscillators covering, Classification, Small Signal Amplifiers – Basic Features, Common Emitter Amplifier, Coupling and Bypass Capacitors, Distortion, AC Equivalent Circuit; Feedback Amplifiers – Principle, Advantages of Negative Feedback, Topologies, Current Series and Voltage Series Feedback Amplifiers; Oscillators – Classification, RC Phase Shift, Wien Bridge, High Frequency LC and Non-Sinusoidal type Oscillators;

Module 4: Operational Amplifiers and Applications covering, Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal OpAmp, Concept of Virtual Ground;

Practicals:

Module 1: Laboratory Sessions covering, Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT and DIP), Bread Boards and Printed Circuit Boards (PCBs); Identification, Specifications, Testing of Active Devices – Diodes, BJTs, JFETs, MOSFETs, Power Transistors, SCRs and LEDs; AICTE Model Curriculum for Undergraduate degree in Civil Engineering (Engineering & Technology)

Module 2: Study and Operation of Digital Multi Meter, Function / Signal Generator, Regulated Power Supply (RPS), Cathode Ray Oscilloscopes; Amplitude, Phase and Frequency of Sinusoidal Signals using Lissajous Patterns on CRO; (CRO);

Module 3: Experimental Verification of PN Junction Diode Characteristics in A) Forward Bias B) Reverse Bias, Zener Diode Characteristics and Zener Diode as Voltage Regulator, Input and Output Characteristics of BJT in Common Emitter (CE) Configuration, Drain and Transfer Characteristics of JFET in Common Source (CS) Configuration;

Module 4: Study of Half Wave and Full Wave Rectification, Regulation with Filters, Gain and Bandwidth of BJT Common Emitter (CE) Amplifier, Gain and Bandwidth of JFET Common Source (CS) Amplifier, Gain and Bandwidth of BJT Current Series and Voltage Series Feedback Amplifiers, Oscillation Frequency of BJT based RC Phase Shift, Hartley and Colpitts Oscillators;

Module 5: Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator; Op-Amp Applications – Differentiator and Integrator, Square Wave and Triangular Wave Generation, Applications of 555 Timer – Astable and Monostable Multivibrators;

Module 6: Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs); Truth Tables and Functionality of Flip-Flops – SR, JK and D Flip-Flop ICs; Serial-In-Serial-Out and Serial-In-Parallel-Out Shift operations using 4-bit/8-bit Shift Register ICs; Functionality of Up-Down / Decade Counter ICs; (15 Sessions)

Text/Reference Books:

1. David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India
2. Santiram Kal (2002), Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India
3. Thomas L. Floyd and R. P. Jain (2009), Digital Fundamentals by Pearson Education,
4. Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), Basic Electronics – A Text-Lab. Manual, TMH
5. R. T. Paynter (2009), Introductory Electronic Devices & Circuits, Conventional Flow Version, Pearson