Electronic Devices

Subject Code- BTEC-301-18

Unit 1: Semiconductor Physics

Review of quantum mechanics; Electrons in periodic lattices; e-k diagrams; Energy bands in intrinsic and extrinsic silicon; Diffusion current; Drift current; Mobility and Resistivity; Sheet resistance; Design of resistors.

Unit 2: Diodes

Generation and Recombination of carriers; Poisson and Continuity equation p-n junction characteristics; V-I characteristics; Small signal switching models; Avalanche breakdown; Zener diode; Schottky diode; Light Emitting diode; Tunnel diode; Varactor diode, Solar cell, Rectifier & Regulator circuits.

Unit 3: Transistors

Bipolar junction transistor; V-I characteristics; Ebers-Moll model; Transistor Configurations - CE, CB, CC; MOS capacitor; MOSFET - Construction and Working; I-V characteristics; Depletion-type and Enhancement-type MOS.

Unit 4: Fabrication Processes

Oxidation; diffusion; Ion-implantation; Annealing; Photolithography; Etching; Chemical Vapour Deposition (CVD); Sputtering; Twin-tub CMOS process.

Recommended Books

1. **G. Streetman, and S. K. Banerjee, Solid State Electronic Devices, Pearson.**
2. **D. Neamen, D. Biswas, Semiconductor Physics and Devices, McGraw-Hill Education**
3. **S. M. Sze and K. N. Kwok, Physics of Semiconductor Devices, John Wiley & Sons**
4. **C. T. Sah, Fundamentals of solid state electronics, World Scientific Publishing Co. Inc.**

Course: Electronic Devices		
Subject Code- BTEC-301-18		
	Course Outcomes	**BT Level**
BTEC-301-18.1	Understand physics of semiconductors and behavior of charge carriers within semiconductor	2
BTEC-301-18.2	Understand the working of semiconductor diodes supported with mathematical explanation	2
BTEC-301-18.3	Understand the working of BJT and MOSFET with their equivalent small signal models.	2
BTEC-301-18.4	Understand the chemical processes used in fabrication of integrated circuits.	2

Digital System Design

Subject Code- BTEC302-18

Unit 1: Boolean Algebra & Combinational Circuits

Logic gates; Boolean algebra; De Morgan's theorem, SOP & POS forms, canonical forms, Karnaugh

maps up to 6 variables, binary codes, code Conversion, 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.

Unit 2: Sequential Circuits

Building blocks of sequential circuits like S-R, J-K,T & D flip-flops; master-slave J-K FF; edge triggered FF; ripple counters; 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.

Unit 3: Programmable Devices & ADC and DAC

Specifications: noise margin, propagation delay, fan-in, fan-out, Tristate; TTL, ECL, CMOS families and their interfacing; architectures of PLA, PAL, GAL, CPLD&FPGA. DAC: weighted resistor, R-2R ladder, resistor string; ADC: single slope, dual slope, successive approximation, flash.

Unit 4: Introduction to VHDL

VHDL constructs; Data types and objects; different modelling styles in VHDL; Dataflow, Behavioural and Structural Modelling; Synthesis and Simulation; HDL programming for basic combinational and sequential circuits.

Recommended Books

R.P. Jain, *Modern digital Electronics*, Tata McGraw Hill
Douglas Perry, *VHDL*, Tata McGraw Hill
W.H. Gothmann, Digital Electronics-An introduction to theory and practice, PHI
D.V. Hall, *Digital Circuits and Systems*, Tata McGraw Hill

Course: Digital System Design		
Course Code-BTEC 302-18		
	Course Outcomes	**BT Level**
BTEC 302-18.1	Apply concepts of Boolean algebra for handling logical expressions.	3
BTEC 302-18.2	Understand working and realization of combinational circuits.	2
BTEC 302-18.3	Understand working flip-flops and use them in designing of sequential circuits.	2
BTEC 302-18.4	Understand fundamental concepts of logic families and architectural of programmable devices.	2
BTEC 302-18.5	Use HDL programming tool for simulation of combinational & sequential circuits	4

Electromagnetic Waves

Subject Code- BTEC303-18

Unit 1: Transmission Lines

Equations of voltage and current on transmission line; propagation constant and characteristic impedance, and reflection coefficient and VSWR; Loss-less and Low-loss transmission line; Power transfer on transmission line; S-parameters, Smith chart; Applications of transmission lines; Impedance matching; Use of transmission line sections as circuit elements.

Unit 2: Maxwell's Equations

Basics of vectors; Vector calculus; Basic laws of Electromagnetic; Maxwell's equations; Boundary conditions at media Interface.

Unit 3: Uniform Plane Wave

Uniform plane wave; Propagation of wave; Wave polarization; Poincare's sphere; wave propagation in conducting medium; Phase and Group velocity; Power flow and Poynting vector; Surface current and power loss in a conductor.

Unit 4: Plane Waves at a Media Interface

Plane wave in arbitrary direction; Reflection and refraction at dielectric interface; Total internal reflection; Reflection from a conducting boundary.

Unit 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.

Recommended Books

RK Shevgaonkar, *Electromagnetic Waves*, Tata McGraw Hill India
EC Jordan & KG Balmain, Electromagnetic waves & Radiating Systems, PHI
N Rao,Engineering Electromagnetics, Prentice Hall
DCheng, *Electromagnetics*, Prentice Hall
W H Hayt & J A Buck,*Engineering Electromagnetics*, McGraw Hill

Course: Electromagnetic Waves		
Course Code-BTEC 303-18		
	Course Outcomes	**BT Level**
BTEC303-18.1	Understand characteristics & wave propagation through transmission lines .	2
BTEC 303-18.2	Understand Maxwell's equations for electromagnetic waves .	2
BTEC 303-18.3	Characterize uniform plane wave	4
BTEC 303-18.4	Calculate reflection and transmission of waves at media interface	5

Network Theory..

Subject Code- BTEC304-18

Unit 1: Transmission Lines

Equations of voltage and current on transmission line; propagation constant and characteristic impedance, and reflection coefficient and VSWR; Loss-less and Low-loss transmission line; Power transfer on transmission line; S-parameters, Smith chart; Applications of transmission lines; Impedance matching; Use of transmission line sections as circuit elements.

Unit 2: Maxwell's Equations

Basics of vectors; Vector calculus; Basic laws of Electromagnetic; Maxwell's equations; Boundary conditions at media Interface.

Unit 3: Uniform Plane Wave

Uniform plane wave; Propagation of wave; Wave polarization; Poincare's sphere; wave propagation in conducting medium; Phase and Group velocity; Power flow and Poynting vector; Surface current and power loss in a conductor.

Unit 4: Plane Waves at a Media Interface

Plane wave in arbitrary direction; Reflection and refraction at dielectric interface; Total internal reflection; Reflection from a conducting boundary.

Unit 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.

Recommended Books

RK Shevgaonkar, *Electromagnetic Waves*, Tata McGraw Hill India
EC Jordan & KG Balmain, Electromagnetic waves & Radiating Systems, PHI
N Rao,Engineering Electromagnetics, Prentice Hall
DCheng, *Electromagnetics*, Prentice Hall
W H Hayt & J A Buck,*Engineering Electromagnetics*, McGraw Hill

Course: **Network Theory..**		
Course Code-BTEC 304-18		
	Course Outcomes	**BT Level**
BTEC303-18.1	Analyze linear networks using network theorems	4
BTEC 303-18.2	Use Laplace transform to analyze transient & steady state response of linear networks.	4
BTEC 303-18.3	Comprehend network parameters to analyze two port networks.	4
BTEC 303-18.4	Realize one port networks using Foster's and Cauer's methods	5

Mathematics III

Subject Code- BTAM 303-18

Section A

Unit 1 : Transforms Calculus-I:

Laplace Transform, Properties of Laplace Transform, Laplace Transform of Unit step function, Impulse function, Dirac-delta function, Periodic functions. Inverse Laplace Transform, convolution theorem, Evaluation of integrals by Laplace Transform, Applications to ODEs and PDEs.

Unit 2: Transforms Calculus-II:

Fourier Series, half range Fourier Sine and Cosine series, Fourier integrals, Gibbs Phenomenon, Fourier transforms, Relation between Laplace and Fourier transform, Properties of Fourier Transforms, Convolution Theorem and applications

Unit 3: Transforms Calculus-III

Basic theory of Z transforms, Translation theorem, Scaling property of Z transforms, Initial and Final value theorems, Differentiation of Z tranforms Solution of Difference equations using Z transform, Applications of Z transforms to find the sum of series

Section B

UNIT-4: Probability

Conditional probability, Discrete and continuous random variables, Probability distributions: Binomial, Poisson and Normal, Poisson approximation to the binomial distribution, evaluation of statistical parameters for these three distributions.

Unit 5: Correlation and regression

Correlation and Regression for bivariate data, Rank correlation, Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance for small and large samples (z-test, t-test, F-test and Chi-square test).

Text / References:

1. E. Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons, 2006.

2. R K jain and Iyengar, “Advanced Engineering Mathematics”, 5th Edition, Narosa Publishing, 2017.

3. P. G. Hoel, S. C. Port and C. J. Stone, “Introduction to Probability Theory”, Universal Book Stall, 2003.

4. S. Ross, “A First Course in Probability”, Pearson Education India, 2002.

5. W. Feller, “An Introduction to Probability Theory and its Applications”, Vol. 1, Wiley, 1968.

Course **Mathematics III**		
Course Code-BTAM 303-18		
	Course Outcomes	**BT Level**
BTAM 303-18.1	The mathematical tools needed in evaluating multiple integrals and their usage.	**5**
BTAM 303-18.2	The effective mathematical tools for the solutions of differential equations that model physical processes.	4
BTAM 303-18.3	The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering problems.	4
BTAM 303-18.4	To introduce the solution methodologies for second order Partial Differential Equations with applications in engineering	4
BTAM 303-18.5	To provide an overview of probability and statistics to engineers	2

Electronic Devices Lab

Subject Code- BTEC-311-18

Part-A: Experiments

Part-A: Experiments

List of Experiments

1. To Study the general datasheets of Semiconductor devices.
2. To study the V-I characteristics of a PN junction diode.

3. To study a Zener diode as voltage regulator.
4. To study the output waveform of a Half-wave rectifier.
5. To study the output waveform of a Full-wave center-tapped and bridge rectifier.
6. To study Input & output V-I characteristics of npn/pnp BJT in CE configuration
7. To study Input & output V-I characteristics of npn/pnp BJT in CB configuration
8. To study Input & output V-I characteristics of npn/pnp BJT in CC configuration
9. To study the functioning of a BJT as a switch.
10. To study V-I Characteristics of a MOSFET.

Part-B: Lab Projects

Every individual student is required design and build one Lab Project under the supervision of course teacher. Topic of the project may be any from the theory contents and not limited to following list:

1. Blinking linear/circular lights
2. Ambient light sensor based controller
3. Regulated dual power supply of ±5V or ±12V or mixed
4. BJT audio amplifier
5. BJT circuit for sampling of analog signal
6. Simulate any project idea using SPICE software

Course: Electronic Devices Lab		
Course Code- BTEC-311-18		
	Course Outcomes	**BT Level**
BTEC-311-18.1	Realize use of diodes in circuits with proper understanding to their working.	**2**
BTEC-311-18.2	Understand characteristics & working of BJT in different configurations.	2
BTEC-311-18.3	Understand characteristics & working of MOSFET in circuits.	2
BTEC-311-18.4	Think and design working circuits based on diodes, BJTs and MOSFETs.	4

Digital System Design Lab

Subject Code- BTEC-312-18

Part-A: Experiments

List of Experiments

1. To Study the general datasheets of Semiconductor devices.
2. To study the V-I characteristics of a PN junction diode.

3. To study a Zener diode as voltage regulator.
4. To study the output waveform of a Half-wave rectifier.
5. To study the output waveform of a Full-wave center-tapped and bridge rectifier.
6. To study Input & output V-I characteristics of npn/pnp BJT in CE configuration
7. To study Input & output V-I characteristics of npn/pnp BJT in CB configuration
8. To study Input & output V-I characteristics of npn/pnp BJT in CC configuration
9. To study the functioning of a BJT as a switch.
10. To study V-I Characteristics of a MOSFET.

Part-B: Lab Projects

Every individual student is required design and build one Lab Project under the supervision of course teacher. Topic of the project may be any from the theory contents and not limited to following list:

1. Blinking linear/circular lights
2. Ambient light sensor based controller
3. Regulated dual power supply of ±5V or ±12V or mixed
4. BJT audio amplifier
5. BJT circuit for sampling of analog signal
6. Simulate any project idea using SPICE software

Course: Digital System Design Lab		
Course Code- BTEC-311-18		
	Course Outcomes	**BT Level**
BTEC-312-18.1	Realize combinational circuits using logic gates.	**2**
BTEC-312-18.2	Realize sequential circuits using logic gates.	2
BTEC-312-18.3	Write & simulate VHDL programs for combinational & sequential circuits.	2
BTEC-312-18.4	Think and design working projects using digital 74XX ICs.	4

Foundational Course in Humanities (Development of Societies or Philosophy)

Subject Code- HSMC 101-18/HSMC

4-Week Institutional Training

Subject Code- BTEI-321-18

Four weeks training in the area of Electronics and Communication Engineering. This training should give exposure to the practical aspects of the discipline. In addition, the student may also work on a specified task or project which may be assigned to him/her.

Mentoring and Professional Development*

Subject Code- BMPD-331-18

Part – A
(Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B
(Outdoor Activities)

1. Sports/NSS/NCC
2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Analog Circuits

Subject Code- BTEC-401-18

Unit 1: Diode and Transistor Amplifier Circuits

Diode Circuits, Amplifiers types: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier; biasing schemes for BJT and FET amplifiers; bias stability; transistor configurations: CE/CS, CB/CG, CC/CD and their features; small-signal analysis; low-frequency transistor models; amplifier analysis: current gain, voltage gain, input resistance and output resistance; amplifier design procedure; low frequency analysis of multistage amplifiers. High frequency transistor models.

Unit 2: Feedback Amplifiers

Feedback topologies: Voltage series, current series, voltage shunt and current shunt feedback; effect of feedback on gain, bandwidth, input & output impedances; concept of stability, gain margin and phase margin.

Unit 3: Oscillators

Introduction, Types of Oscillators, Barkhausen criterion, RC-phase shift, Wien bridge, Hartley, Colpitts, Clapp oscillators and Non-sinusoidal oscillators.

Unit 4: Power Amplifiers

Class A, B, AB and C power amplifiers, their efficiency and distortions; frequency response: single stage, multistage amplifiers and cascade amplifier.

Course: Analog Circuits		
Course Code- BTEC-401-18		
	Course Outcomes	**BT Level**
BTEC-401-18.1	Understand the biasing of transistors and analyze BJT/FET amplifiers	**2**
BTEC-401-18.2	Analyze various rectifier and amplifier circuits	2
BTEC-401-18.3	Analyze sinusoidal and non-sinusoidal oscillators	2
BTEC-401-18.4	Understand various types of Power Amplifiers	4

Microprocessors and Microcontrollers

Subject Code- BTEC-402-18

Unit 1: Microprocessor 8085

History of microprocessors; microprocessor 8085 Architecture, Pin configuration; Memory Interfacing; microprocessor programming model; 8085 instructions; Addressing modes; programming techniques, counters and time delays; stack and subroutines; interrupts.

Unit 2: Microcontroller 8051 - Building Blocks

Microprocessor vs microcontroller; RISC vs CISC architectures; microcontroller 8051: architecture, pin configuration, flag-bits and PSW register, input-output ports, register banks and stack; semiconductor memories: ROM, SRAM, DRAM, virtual memory, cache memory; memory organization.

Unit 3: Microcontroller 8051 - Programming

Assembly language programming; data types and directives; jump loop and call instructions; I/O port programming; addressing modes and accessing memory using various addressing modes; arithmetic instructions and programs; logic instructions and programs; single bit instructions and programming, 8051 interrupts; timer/counter programming in the 8051.

Unit 4: Microcontroller 8051 - Interfacing

Parallel and serial ADC& DAC interfacing; LCD interfacing, Keyboard interfacing; sensor interfacing; interfacing with external memory; matrix keypad; stepper motor interfacing; DC motor interfacing and PWM.

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Course: Microprocessors and Microcontrollers		
Course Code- BTEC-402-18		
	Course Outcomes	**BT Level**
BTEC-402-18.1	Understand architecture &functionalities of different building block of 8085 microprocessor.	**2**
BTEC-402-18.2	Understand working of different building blocks of 8051 microcontroller.	2
BTEC-402-18.3	Comprehend and apply programming aspects of 8051 microcontroller.	3
BTEC-402-18.4	Interface & interact with different peripherals and devices.	4

Data Structures and Algorithms

Subject Code- BTCS-301-18

Detailed contents: Module 1:

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.

Introduction to pointers and dynamic memory allocation, use of pointers in self referential data structures.

Module 2:

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and

complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

Module 3:

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis, Applications of Binary Trees.

Module 4:

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

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Course: Data Structures and Algorithms		
Course Code- BTCS-301-18		
	Course Outcomes	**BT Level**
BTCS-301-18.1	Understand operations like searching, insertion, deletion, traversing on linear Data Structures and to determine their computational complexities	**2**
BTCS-301-18.2	Understand operations like searching, insertion, deletion, traversing on various non linear Data Structures and to determine their computational complexities	2
BTCS-301-18.3	Write algorithms for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.	4
BTCS-301-18.4	Apply appropriate Data Structure as per specific problem definition	3

Subject Code- BTEC-403-18-

Unit 1: Introduction to Signals and Systems

Classification of Signals: Periodic and Aperiodic signals, continuous and discrete time signals, continuous and discrete amplitude signals; Linear and nonlinear signals, Causal and non-causal signals, Even and odd signals, Energy and power signals; System properties: linearity, shift-invariance ,causality, stability, Realizability.

Unit 2: Linear-Shift Invariant Systems

Linear shift-invariant systems; Impulse response and step response ;Convolution, Input-output behaviour with Aperiodic convergent inputs; Characterization of causality and stability of LSI systems; System representation through differential equations and difference equations; Periodic inputs to an LSI system; Notion of frequency response and its relation to the impulse response.

Unit 3: Continuous-Time Analysis of Signals and Systems

Fourier Series; Fourier Transform; Magnitude and phase response; Properties of Fourier Transform: Convolution/Multiplication, Duality, Time-shifting, Frequency-shifting, Time-scaling, Integration and differentiation in time-domain; Review of Laplace Transform for continuous-time signals and systems; Notion of Eigen functions of LSI systems; System transfer function and poles-zeros analysis; Solution to differential equations and system behaviour.

Unit 4: Discrete-Time Analysis of Signals and Systems

Sampling Theorem and its proof; Spectra of sampled signals; Aliasing and its effects; Reconstruction and its implications; Probability: Mean, median, mode and standard deviation; combinatorial probability, probability distribution functions. Discrete-Time Fourier Transform (DTFT); Discrete Fourier Transform; Parseval's Theorem; Review of Z-Transform for discrete-time signals and systems; System functions; Region of convergence and z-domain analysis, Conditional Probability.

Text/Reference books:

1. Allan V. Oppenheim, S. Wilsky and S. H. Nawab, *Signals and Systems*, Pearson Education
2. I J Nagrath, S N Sharan, R Ranjan S Kumar, *Signals and Systems*, Tata McGraw Hill
3. B.P. Lathi, Signal Processing and Linear Systems, Oxford University Press
4. S Poornachandra, B Sasikala, *Signals and Systems*, Tata McGraw Hill
5. Robert A. Gabel, Richard A. Roberts, *Signals and Linear Systems*, John Wiley and Sons.

Course: Signals & Systems		
Subject Code- BTEC-403-18		
	Course Outcomes	**BT Level**
BTEC-403-18.1	Mathematically characterize different types of signals and systems.	4
BTEC-403-18.2	Analyze the behavior of linear-shift invariant systems.	4
BTEC-403-18.3	Apply concepts of Fourier and Laplace Transforms to analyze continuous-time signals and systems.	3
BTEC-403-18.4	Investigate discrete-time signals and systems using Discrete-Time Fourier and Z-Transforms and simple Probability concepts.	4

Understanding Harmony

Subject Code- HSMC 122-18

Unit 1: Introduction to Signals and Systems

Classification of Signals: Periodic and Aperiodic signals, continuous and discrete time signals, continuous and discrete amplitude signals; Linear and nonlinear signals, Causal and non-causal signals, Even and odd signals, Energy and power signals; System properties: linearity, shift-invariance ,causality, stability, Realizability.

Unit 2: Linear-Shift Invariant Systems

Linear shift-invariant systems; Impulse response and step response ;Convolution, Input-output behaviour with Aperiodic convergent inputs; Characterization of causality and stability of LSI systems; System representation through differential equations and difference equations; Periodic inputs to an LSI system; Notion of frequency response and its relation to the impulse response.

Unit 3: Continuous-Time Analysis of Signals and Systems

Fourier Series; Fourier Transform; Magnitude and phase response; Properties of Fourier Transform: Convolution/Multiplication, Duality, Time-shifting, Frequency-shifting, Time-scaling, Integration and differentiation in time-domain; Review of Laplace Transform for continuous-time signals and systems; Notion of Eigen functions of LSI systems; System transfer function and poles-zeros analysis; Solution to differential equations and system behaviour.

Unit 4: Discrete-Time Analysis of Signals and Systems

Sampling Theorem and its proof; Spectra of sampled signals; Aliasing and its effects; Reconstruction and its implications; Probability: Mean, median, mode and standard deviation; combinatorial probability, probability distribution functions. Discrete-Time Fourier Transform (DTFT); Discrete Fourier Transform; Parseval's Theorem; Review of Z-Transform for discrete-time signals and systems; System functions; Region of convergence and z-domain analysis, Conditional Probability.

Text/Reference books:

1. Allan V. Oppenheim, S. Wilsky and S. H. Nawab, *Signals and Systems*, Pearson Education
2. I J Nagrath, S N Sharan, R Ranjan S Kumar, *Signals and Systems*, Tata McGraw Hill
3. B.P. Lathi, Signal Processing and Linear Systems, Oxford University Press
4. S Poornachandra, B Sasikala, *Signals and Systems*, Tata McGraw Hill
5. Robert A. Gabel, Richard A. Roberts, *Signals and Linear Systems*, John Wiley and Sons.

Course: Signals & Systems		
Subject Code- BTEC-403-18		
	Course Outcomes	**BT Level**
BTEC-403-18.1	Mathematically characterize different types of signals and systems.	4
BTEC-403-18.2	Analyze the behavior of linear-shift invariant systems.	4
BTEC-403-18.3	Apply concepts of Fourier and Laplace Transforms to analyze continuous-time signals and systems.	3
BTEC-403-18.4	Investigate discrete-time signals and systems using Discrete-Time Fourier and Z-Transforms and simple Probability concepts.	4

Environmental Sciences

Subject Code- EVS-101-18

1. Environment Science (Mandatory non-credit course)

We as human being are not an entity separate from the environment around us rather we are a constituent seamlessly integrated and co-exist with the environment around us. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa. Ancient wisdom drawn from Vedas about environment and its sustenance reflects these ethos. There is a direct application of this wisdom even in modern times. Idea of an activity based course on environment protection is to sensitize the students.

Detailed Contents

Module 1 : Natural Resources :Renewable and non-renewable resources

Natural resources and associated problems.

a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resoureces for sustainable lifestyles.

Module 2 : Ecosystems

Concept of an ecosystem. Structure and function of an ecosystem.
Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of following ecosystems:

a. Forest ecosystem
b. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Module 3 : Biodiversity and its conservation

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biodiversity at global, National and local levels.
- Inida as a mega-diversity nation
- Hot-sports of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
-

Module 4 : Social Issues and the Environment

- From Unsustainable to Sustainable development
- Resettlement and rahabilitation of people; its problems and concerns.
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, Nuclear accidents and holocaust. Case Studies.
- Public awareness.

*ACTIVITIES

Nature club (bird watching, recognizing plants at institute/at home, recognizing local animals, appreciating biodiversity

Impart knowledge and inculcate the habit of taking interest and understanding biodiversity in and around the college campus. The students should be encouraged to take interest in bird watching, recognizing local plants, herbs and local animals. The students should be encouraged

to appreciate the difference in the local biodiversity in their hometown, in the place of their study and other places they visit for vacation/breaks etc.

Following activities must be included.

Identify a tree fruit flower peculiar to a place or having origin from the place.

Making high resolution big photographs of small creatures (bees, spiders, ants. mosquitos etc.) especially part of body so that people can recognize (games on recognizing animals/plants).

Videography/ photography/ information collections on specialties/unique features of different types of common creatures.

Search and explore patents and rights related to animals, trees etc. Studying miracles of mechanisms of different body systems

1(A) Awareness Activities:

a) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
b) Slogan making event
c) Poster making event
d) Cycle rally
e) Lectures from experts
f) Plantation
g) Gifting a tree to see its full growth
h) Cleanliness drive
i) Drive for segregation of waste
i) To live with some eminent environmentalist for a week or so to understand his work vi) To work in kitchen garden for mess
j) To know about the different varieties of plants
k) Shutting down the fans and ACs of the campus for an hour or so
l) Visit to a local area to document environmental assets

river/forest/grassland/hill/mountain/lake/Estuary/Wetlan

ds

m) Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
n) Visit to a Wildlife sanctuary, National Park or Biosphere Reserve

Suggested Readings

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p

Course: Environmental Sciences		
Subject Code- EVS-101-18		
	Course Outcomes	**BT Level**
EVS-101-18.1	Students will enable to understand environmental problems at local and national level through literature and general awareness.	2
EVS-101-18.2	The students will gain practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental Issues.	3
EVS-101-18.3	The students will apply interdisciplinary approach to understand key environmental issues and critically analyze them to explore the possibilities to mitigate these problems.	3
EVS-101-18.4	Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world	2

Analog Circuits Lab

Subject Code- BTEC-411-18

Part-A: Experiments

List of Experiments:

1.To Study the Output waveforms of diode clipper and Diode Clamper circuits.
2.To study the Input/Output V-I characteristics of BJT in CE configuration.
3.To study Emitter follower circuit.
4. To calculate the frequency of RC phase shift oscillator.
5.To measure the frequency of Wein bridge oscillator.
6. To measure the frequency of Hartley oscillator.
7. To measure the frequency of Colpitt's oscillator.

To study Gain analysis of Class-A Power Amplifier

8. To study Gain analysis of Class-B Power Amplifier
9. To study Gain analysis of Class B Push-pull Power Amplifier

Part-B: Lab Projects

Every individual student is required design one Lab Project under the supervision of course teacher.
Topic of the project may be any from the theory contents and not limited to following list:

1. BJT audio amplifier/power amplifier
2. Any project based on IoT/Arduino platform

Analog Circuits Lab		
Subject Code- BTEC-411-18		
	Course Outcomes	**BT Level**
BTEC-411-18.1	study and verify the characteristics of diodes/BJTs in circuits with proper understanding to their working.	4
BTEC-411-18.2	Understand frequency response & working of various types of Oscillators.	2
BTEC-411-18.3	Understand characteristics & working of Power amplifiers.	2
BTEC-411-18.4	Think and design working circuits based on diodes, BJTs and MOSFETs.	6

Microprocessor and Microcontroller Lab

Subject Code- BTEC-412-18

Part-A: Write programs in Assembly language & embedded C to

1. Add two 8-bit numbers stored in registers or internal/External memory locations.
2. Multiply two 8-bit numbers.
3. Multiply two 16-bit numbers.
4. Transfer block of data from internal memory locations to external memory locations
5. Sort block of data in ascending or descending order.
6. Generate 5KHz pulse waveform of 50% duty cycle.
7. Interface ADC and DAC.
8. Interface Matrix Keyboard.
9. Interface LCD Displays.
10. Interface Stepper Motor.
11. Control DC motor using PWM.

Part-B: Lab Projects

Every individual student is required design one Lab Project under the supervision of course teacher. Topic of the project may be any from the theory contents and not limited to following list:

1. RFID attendance system
2. Home automation
3. Robotic vehicle
4. Sensor traffic lights
5. Floor cleaning robot
6. Robot for defense applications
7. GPS vehicle tracking
8. Accident identification and SMS

Microprocessor and Microcontroller Lab		
Subject Code- BTEC-412-18		
	Course Outcomes	**BT Level**
BTEC-412-18	Write programs for common arithmetic operations with 8-bit/16-bit numbers using 8085.	4
BTEC-412-18.2	Write programs for transfer, sort block of data with 8085/8086 processor(s).	2
BTEC-412-18.3	Write programs for controlling stepper and DC motors using Microprocessor(s).	2
BTEC-412-18.4	Write programs to generate waveforms and interface ADC and DAC using of 8051 Microcontroller.	6

Mentoring and Professional Deveopment*

Subject Code- BMPD-351-18

Part – A
(Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B
(Outdoor Activities)

1. Sports/NSS/NCC
2.

3. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.
Evaluation shall be based on rubrics for Part – A & B
Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted

and the same shall be submitted to the department.Recommended Books

R.P. Jain, *Modern digital Electronics*, Tata McGraw Hill
Douglas Perry, *VHDL*, Tata McGraw Hill
W.H. Gothmann, Digital Electronics-An introduction to theory and practice, PHI
D.V. Hall, *Digital Circuits and Systems*, Tata McGraw Hill

Course: Digital System Design		
Course Code-BTEC 302-18		
	Course Outcomes	**BT Level**
BTEC 302-18.1	Apply concepts of Boolean algebra for handling logical expressions.	3
BTEC 302-18.2	Understand working and realization of combinational circuits.	2
BTEC 302-18.3	Understand working flip-flops and use them in designing of sequential circuits.	2
BTEC 302-18.4	Understand fundamental concepts of logic families and architectural of programmable devices.	2
BTEC 302-18.5	Use HDL programming tool for simulation of combinational & sequential circuits	4

Analog and Digital Communication

Subject Code- 501-18

Unit 1: Analog Communication

Review of Signals and Systems, Frequency domain representation of signals, Amplitude Modulation: Transmission and Reception of DSB, SSB and VSB,Angle Modulation, Spectral characteristics of angle modulated signals, Principles of Frequency and Pulse Modulation, Representation of FM and PM signals, Review of white noise characteristics, Noise in amplitude modulation and Angle Modulation systems, Pre-emphasis and De emphasis.

Unit 2:Digital Communication

Analog to Digital: Need, Sampling process, Pulse Amplitude modulation and Concept of Time division multiplexing, Pulse code modulation (PCM), Differential pulse code modulation. Delta modulation and demodulation, Adaptive and Sigma Delta Modulation, Noise considerations in PCM, Digital Multiplexers.

Unit 3: Elements of Detection Theory

Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Review of probability and random process Gaussian noise characteristics, Baseband Pulse Transmission: Inter symbol Interference and Nyquist criterion.

Unit 4: Digital Modulation Techniques

Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.

Recommended Books

1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.
4. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering'',John Wiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication'', Kluwer Academic Publishers, 2004.
6. Proakis J.G., ``Digital Communications'', 4th Edition, McGraw Hill, 2000.
7.

Course: Analog and Digital Communication		
Subject Code- BTEC-501-18		
	Course Outcomes	**BT Level**
BTEC-501-18.1	Analyze and compare different analog modulation schemes for their efficiency and bandwidth	4
BTEC-501-18.2	Analyze the behavior of a communication system in presence of noise	4
BTEC-501-18.3	Investigate pulsed modulation system and analyze their system performance	4
BTEC-501-18.4	Analyze different digital modulation schemes and can compute the bit error performance	4

Digital Signal Processing

Subject Code- 502-18

Unit 1: Discrete Time Signals

Elementary Discrete time sequences and systems; Representation of signals on orthogonal basis; Sampling and reconstruction of signals; Discrete systems attributes, Basic elements of digital signal processing such as convolution, correlation and autocorrelation, Concepts of stability, causality, linearity, difference equations. Implementation of Discrete Time Systems, Linear Periodic and Circular convolution, Z-Transform, Inverse Z-Transform methods, Properties of Z-Transform.

Unit 2: LSI Systems

Analysis of LSI systems, Frequency Analysis, Inverse Systems, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT) with their properties, Inverse DFT and FFT methods, Goertzel Algorithm.

Unit 3: Digital filters Design

Structures of realization of discrete time system, direct form, Cascade form, parallel form and lattice structure of FIR and IIR systems. Time Invariant and Bilinear Transformation Methods,Rectangular,Hamming and Hanning Window methods, Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Low pass, Band pass, Band stop and High pass filters. Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Matched Z-Transformation, Analog and Digital Transformation in the Frequency Domain. Finite Precision Effects**:** Fixed point and Floating point representations, Effect of round off noise in digital filters, Limit cycles.

Unit 4: Introduction to Multirate signal processing and DSP processors

Concepts of Multirate Signal Processing, need and significance, Applications of DSP,Limitations of Analog signal processing, Advantages of Digital signalprocessing, Architectures of ADSP and TMS (C6XXX) series of processor.

Recommended Books

1. S.K.Mitra, Digital Signal Processing: A computer based approach.TMH, 2001.
2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.

3. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms And Applications, Prentice Hall, 1997.
4. L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall, 1992.
5. J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall, 1992.
D.J.DeFatta, J. G. Lucas andW.S.Hodgkiss, Digital Signal Processing, John Wiley& Sons, 1988.

Course: Digital Signal Processing		
Subject Code- BTEC-502-18		
	Course Outcomes	**BT Level**
BTEC-502-18.1	Represent signals mathematically in continuous and discrete time and frequency domain	4
BTEC-502-18.2	Get the response of an LSI system to different signals	4
BTEC-502-18.3	Design of different types of digital filters for various applications	6

Control Systems

Subject Code- BTEC-504-18

Unit 1: Introduction

Classification with understanding of Industrial Control system examples. Transfer function. System with dead-time. System response. Control hardware and their models: potentiometers, synchros, LVDT, DC and AC servomotors, Tacho generators, Electro hydraulic valves, hydraulic servomotors, electro pneumatic valves, pneumatic actuators. Closed-loop systems. Block diagram and signal flow graph analysis.

Unit 2: Feedback Control systems

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness. proportional, integral and derivative systems. Feed forward and multi-loop control configurations, stability concept, relative stability, Routh stability criterion.

Unit 3: Second Order systems

Time response of second-order systems, steady-state errors and error constants. Performance specifications in time-domain. Root locus method of design. Lead and lag compensation.

Frequency-response analysis- Polar plots, Bode plot, stability in frequency domain, Nyquist plots. Nyquist stability criterion. Performance specifications in frequency-domain. Frequency domain methods of design, Compensation & their realization in time & frequency domain. Lead and Lag compensation. Op-amp based and digital implementation of compensators. Tuning of process controllers. State variable formulation and solution.

Unit 4: State variable Analysis

Concepts of state, state variable, state model, state models for linear continuous time functions, diagonalization of transfer function, solution of state equations, concept of controllability & observability. Introduction to Optimal control & Nonlinear control, Optimal Control problem, Regulator problem, Output regulator, tracking problem. Nonlinear system – Basic concept & analysis.

Recommended Books:

1. Gopal. M., “Control Systems: Principles and Design”, Tata McGraw-Hill, 1997.
2. Kuo, B.C., “Automatic Control System”, Prentice Hall, sixth edition, 1993.
3. Ogata, K., “ Modern Control Engineering” , Prentice Hall, second edition, 1991.

Nagrath& Gopal, “Modern Control Engineering”, New Age International, New Delhi

Course: Control Systems		
Subject Code- BTEC-504-18		
	Course Outcomes	**BT Level**
BTEC-501-18.1	Characterize a system and find its study state behaviour	5
BTEC-501-18.2	Investigate stability of a system using different tests	4
BTEC-501-18.3	Design various controllers	6
BTEC-501-18.4	Solve linear, non-linear and optimal control problems	5

Routing and Switching

Subject Code- BTEC-905A-18

Network Fundamentals

Basics of network architecture, enterprise network constructs, Ethernet framing, IP addressing, Internet Control Message Protocol, Address Resolution Protocol, Transport Layer Protocols, Data Forwarding Scenario. Expanding the Enterprise Network, Navigating the CLI, File System Navigation and Management, VRP Operating System Image Management.

Network Connections

Establishing a Single Switched Network, Spanning Tree Protocol, Rapid Spanning Tree Protocol, Segmenting the IP Network, IP Static Routes, Distance Vector Routing with RIP, Link State Routing with OSPF, DHCP, FTP and Telnet Protocols, Simple Network Management Protocol, Introducing IPv6 Networks, IPv6 Routing Technologies, IPv6 Application Services

Network Construction

Link Aggregation, VLAN Principles, GARP and GVRP, VLAN Routing, Wireless LAN Overview, Bridging Enterprise Networks with Serial WAN Technology, Frame Relay Principles, Establishing DSL/ADSL Networks with PPPoE, Network Address Translation, Establishing Enterprise Radio Access Network Solutions.

Network Security

Access Control Lists, Authentication, Authorization and Accounting (AAA), Securing Data with IPsec and VPN, Generic Routing Encapsulation.

Recommended Books:

1. Computer Networks by Andrew S. Tanenbaum, David J. Wetherall, Pearson

https://ilearningx.huawei.com/portal/#/courses/course- v1:HuaweiX+EBGTC00000030+2018.7/about

Course: Routing and Switching		
Subject Code-BTEC-905A-18		
	Course Outcomes	**BT Level**
BTEC-905A-18.1	Demonstrate a basic understanding of small and medium-sized networks, including general network technologies.	2
BTEC-905A-18.2	Ability to assist the design of small and medium-sized networks, and implement the designs.	4
BTEC-905A-18.3	Ability to construct simple networks and integrate voice, wireless, cloud, security, and storage technologies into their networks in order to support a variety of applications.	4

Random Variables and stochastic Processes

Subject Code- BTEC-905B-18

Sets and set operations; Probability space; Conditional probability and Bayes theorem; Combinatorial probability and sampling models.

Discrete random variables, probability mass function, probability distribution function,example random variables and distributions; Continuous random variables, probability density function, probability distribution function, example distributions;

Joint distributions, functions of one and two random variables, moments of randomvariables; Conditional distribution, densities and moments; Characteristic functions of a random variable; Markov, Chebyshev and Chernoff bounds;

Random sequences and modes of convergence (everywhere, almost everywhere,probability, distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central limit theorem.

Random process. Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Power spectral density

Text/Reference Books:

1. H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing," Third Edition, Pearson Education
2. A.Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes," Fourth Edition, McGraw Hill.
3. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International
4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability, UBS Publishers,
5. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Stochastic Processes, UBS Publishers

S. Ross, Introduction to Stochastic Models, Harcourt Asia, Academic Press.

Course: Random Variables and stochastic Processes		
Subject Code- BTEC-905B-18		
	Course Outcomes	**BT Level**
BTEC-905B-18.1	Understand representation of random signals	5
BTEC-905B-18.2	Investigate characteristics of random processes	4
BTEC-905B-18.3	Make use of theorems related to random signals	6
BTEC-905B-18.4	To understand propagation of random signals in LTI systems	5

VLSI/ULSI Technology

Subject Code- BTEC-905C-18

VLSI Fabrication : Solid state diffusion modeling and technology, ion implantation technology and damage annealing, characterization of impurity profiles.

Oxidation: Kinetics of Silicon dioxide growth both for thick, thin and ultra thin films. Oxidation techniques in VLSI and ULSI, characterization of oxides films, low k and high k dielectrics for ULSI.

Environment for VLSI/ULSI Technology, Clean room and safety requirements, Wafer cleaning process and wet chemical etching techniques.

Lithography: Photolithography, e-beam lithography and newer lithography techniques for VLSI/ ULSI, mask generation. chemical vapor deposition techniques : CVD techniques for deposition of polysilicon, silicon dioxide, silicon nitrite and metal films, epitaxial growth of silicon.
Metal film deposition: Evaporation and sputtering techniques, failure mechanisms in metal interconnect multilevel metallization schemes.

Plasma and rapid thermal processing, PECVD, plasma etching and RIE techniques, RTP techniques for annealing, growth and deposition of various films for use in ULSI

TEXT/Reference BOOKS

1. VLSI Technology, S. M. Sze, McGraw Hill, II , 1988 REFERENCE BOOKS
2. VLSI fabrication principles, S. K. Gandhi, "John Wiley, New York",1983 ULSI Technology, C. Y. Chang. S. M. Sze, McGraw Hill companies,1996

Course: VLSI/ULSI Technology		
Subject Code- BTEC-905C-18		
	Course Outcomes	**BT Level**
BTEC-905C-18.1	understand the process of VLSI fabrication	2
BTEC-905C-18.2	Investigate the Oxidation processes for VLSI/ULSI device fabrication	4
BTEC-905C-18.3	Learn about the environment for VLSI/ULSI technology	3
BTEC-905C-18.4	Understand Lithography and deposition processes	2

Programming in JAVA

Subject Code- BTEC-905D-18

Introduction to Java: History of Java, Features of Java, Java Development Kit (JDK), Security in Java, Java Basics: Keywords; Working of Java; Including Comments; Data Types in Java; Primitive Data Types; Abstract / Derived Data Types; Variables in Java; Using Classes in Java; Declaring Methods in Java, Code to Display Test Value; The main() Method, Invoking a Method in Java; Saving, Compiling and Executing Java Programs

Operators and Control Statements: Operators, Arithmetic Operators, Increment and Decrement Operators, Comparison Operators, Logical Operators, Operator Precedence; Control Flow Statements, If-else Statement, Switch Statement, For Loop, While Loop, Do…While Loop, Break Statement Continue Statement
Arrays and Strings: Arrays; String Handling; Special String Operations; Character Extraction; String Comparison; Searching Strings; String Modification; StringBuffer

Inheritance, Package and Interface: Inheritance, Types of Relationships, What is Inheritance?, Significance of Generalization, Inheritance in Java, Access Specifiers, The Abstract Class; Packages, Defining a Package, CLASSPATH; Interface, Defining an Interface, Some Uses of Interfaces, Interfaces versus Abstract Classes Exception Handling: Definition of an Exception; Exception Classes; Common Exceptions; Exception Handling Techniques, Streams in Java: Streams Basics; The Abstract Streams; Stream Classes; Readers and Writers; Random Access Files; Serialization

Applets: What are Applets?; The Applet Class; The Applet and HTML; Life Cycle of an Applet; The Graphics Class; Painting the Applet; User Interfaces for Applet; Adding Components to user interface; AWT (Abstract Windowing Toolkit) Control, Event Handling: Components of an Event; Event Classes; Event Listener; Event-Handling; Adapter Classes; Inner Classes; Anonymous Classes, Swing: Concepts of Swing; Java Foundation Class (JFC); Swing Packages and Classes; Working with Swing- An Example; Swing Components

Java Data Base Connectivity: Java Data Base Connectivity; Database Management; Mechanism for connecting to a back end database; Loading the ODBC driver, RMI, CORBA and Java Beans: Remote Method Invocation (RMI); RMI Terminology; Common Object Request Broker Architecture (CORBA), What is Java IDL?, Example: The Hello Client-Server; Java Beans, The BeanBox, Running the BeanBox.

Course: Programming in JAVA		
Subject Code- BTEC-905D-18		
	Course Outcomes	**BT Level**
BTEC-905D-18.1	Apply the concepts and basics of JAVA	2
BTEC-905D-18.2	Demonstrate the knowledge of operators and control statements	5
BTEC-905D-18.3	Ability to learn about Inheritance, Interface, Applets.	2
BTEC-905D-18.4	Learn about JAVA database connectivity	2

Speech and Audio Processing

Subject Code- BTEC-905E-18

Introduction- Speech production and modeling - Human Auditory System;General structure of speech coders; Classification of speech coding techniques – parametric, waveform and hybrid ; Requirements of speech codecs –quality, coding delays, robustness.

Speech Signal Processing- Pitch-period estimation, all-pole and all-zero filters,convolution; Power spectral density, periodogram, autoregressive model, autocorrelation estimation.

Linear Prediction of Speech- Basic concepts of linear prediction; LinearPrediction Analysis of non-stationary signals –prediction gain, examples; Levinson-Durbin algorithm; Long term and short-term linear prediction models; Moving average prediction.

Speech Quantization- Scalar quantization–uniform quantizer, optimum quantizer,logarithmic quantizer, adaptive quantizer, differential quantizers; Vector quantization – distortion measures, codebook design, codebook types.

Scalar Quantization of LPC- Spectral distortion measures, Quantization based onreflection coefficient and log area ratio, bit allocation; Line spectral frequency – LPC to LSF conversions, quantization based on LSF.

Linear Prediction Coding- LPC model of speech production; Structures of LPCencoders and decoders; Voicing detection; Limitations of the LPC model.

Code Excited Linear Prediction-CELP speech production model; Analysis-by-synthesis; Generic CELP encoders and decoders; Excitation codebook search – state-save method, zero-input zerostate method; CELP based on adaptive codebook, Adaptive Codebook search; Low Delay CELP and algebraic CELP. Speech Coding Standards-An overview of ITU-T G.726, G.728and G.729standards.

Text/Reference Books:

1. “Digital Speech” by A.M.Kondoz, Second Edition (Wiley Students Edition), 2004.

2. “Speech Coding Algorithms: Foundation and Evolution of Standardized Coders”, W.C. Chu, WileyInter science, 2003.

Course: Speech and Audio Processing		
Subject Code- BTEC-905E-18		
	Course Outcomes	**BT Level**
BTEC-905E-18.1	Mathematically model the speech signal	2
BTEC-905E-18.2	Analyze the quality and properties of speech signal.	5
BTEC-905E-18.3	Modify and enhance the speech and audio signals	2

Project Management

Subject Code- BTEC-905-18

UNIT - I: Project Management Concepts Attributes of a Project, Project Life Cycle, The Project management Process, Global Project Management, Benefits of Project Management, Needs Identification.

UNIT - II: Project Selection, Preparing a Request for Proposal, Soliciting Proposals, Project organization, the project as part of the functional organization, pure project organization, the matrix organization, mixed organizational systems.

UNIT - III: Project Planning and Scheduling: Design of project management system; project work system; work breakdown structure, project execution plan, work packaging plan, project procedure manual; project scheduling; bar charts, line of balance (LOB) and Network Techniques (PERT / CPM)/ GERT, Resource allocation, Crashing and Resource Sharing.

UNIT - IV: Project Monitoring/Control and Project Performance: Planning, Monitoring and Control; Design of monitoring system; Computerized PMIS (Project Management Information System). Coordination; Procedures, Meetings, Control; Scope/Progress control, Performance control, Schedule control, Cost control, Performance Indicators; Project Audit; Life Cycle, Responsibilities of Evaluator/ Auditor, Responsibilities of the Project Manager.

Suggested Books/References:

1. Chandra, P. (2017). Projects: Preparation, Appraisal, Budgeting and Implementation. 8th Edition,Tata Mcgraw .
2. Desai, V. (2017). Project Management and Entrepreneurship.2nd Edition, Himalaya Publishing House.
3. Fyffe, D. S. (2001). Project Feasibility Analysis. New York: John Wiley and Sons.
3. Ragaranjan K. (2005). Elements of project Management. 1st Edition, New Age International

Course: Project Management		
Subject Code- BTEC-905-18		
	Course Outcomes	**BT Level**
BTEC-905-18.1	Study the basic concepts of Project Management.	2
BTEC-905-18.2	Learn about Project selection and organisation.	5
BTEC-905-18.3	Understand Project planning and scheduling.	2
BTEC-905-18.4	Learn about Project Monitoring, control and performance.	2

Analog and Digital Communication Laboratory

Subject Code- BTEC-511-18

List of Experiments:

1. To study the Characteristics/output waveform of Amplitude Modulation and demodulation techniques.
2. To Investigate and compare the outputs of SSB, DSB-SC and VSB Modulation systems.
3. To study and compare Noise Interference in AM and FM systems.
4. To study the effect of threshold in Angle modulation.
5. To study the effect of Sampling and Investigate the Output response of Pulse Amplitude Modulation.
6. To Investigate the Output response of Pulse Code Modulation.
7. To Study the output response of PSK & FSK.
8. To Study Delta modulation and demodulation technique and observe effect of slope overload.
9. To study the output response of QAM.
10. To study the output response of Continuous Phase Modulation.
11. To study the output response of Minimum Shift keying.

Digital link simulation; error introduction & error estimation in a digital link using MATLAB (SIMULINK)/ communication simulation packages.

Course: Analog and Digital Communication Laboratory		
Subject Code- BTEC-511-18		
	Course Outcomes	**BT Level**
BTEC-511-18.1	study and verify the characteristics and output waveforms of AM, FM, PCM	2
BTEC-511-18.2	study and compare noise in AM and FM systems	5
BTEC-511-18.3	investigate the output responses of PAM, PCM, PSK, FSK, MSK.	2

Digital Signal Processing

Subject Code- BTEC-512-18

List of Experiments:

Perform the following exercises using MATLAB

1. To develop elementary signal function modules (m-files) for unit sample, unit step, exponential and unit ramp sequences.
2. Write a program in MATLAB to generate standard sequences.
3. Write a program in MATLAB to compute power density spectrum of a sequence.
4. To develop program modules based on operation on sequences like signal Shifting, signal folding, signal addition and signal multiplication.
5. To develop program for finding magnitude and phase response of LTI system described by system function H(z).
6. To write a MATLAB programs for pole-zero plot, amplitude, phase response and impulse response from the given transfer function of a discrete-time causal system.

List of Lab Experiments on hardware:(using C6xxx board ,Code composer studio and Acarya app)

7. Implementation Linear and Circular Convolution
8. To Find DFT and IDFT of given time DT Signal
9. N point FFT Algorithm implementation
10. Digital Filter Design - FIR Filter Implementation
11. Digital Filter Design - IIR Filter Implementation
12. Configuring Audio Codec of C6xxx Boards
13. Configuration of Audio Input and Output Channels (Loopback/Talkback using Acarya Application)
14. Implementation of Audio Delay Line, Echo and Audio Reverberation
15. Applications - Digital Signal Generations
16. Moving Average filter Design (Noise Cancellation using Acarya Application Reference)

List of Experiments:

Perform the following exercises using MATLAB

17. To develop elementary signal function modules (m-files) for unit sample, unit step, exponential and unit ramp sequences.
18. Write a program in MATLAB to generate standard sequences.
19. Write a program in MATLAB to compute power density spectrum of a sequence.
20. To develop program modules based on operation on sequences like signal Shifting, signal folding, signal addition and signal multiplication.
21. To develop program for finding magnitude and phase response of LTI system described by system function H(z).
22. To write a MATLAB programs for pole-zero plot, amplitude, phase response and impulse response from the given transfer function of a discrete-time causal system.

List of Lab Experiments on hardware:(using C6xxx board ,Code composer studio and Acarya app)

23. Implementation Linear and Circular Convolution
24. To Find DFT and IDFT of given time DT Signal
25. N point FFT Algorithm implementation
26. Digital Filter Design - FIR Filter Implementation
27. Digital Filter Design - IIR Filter Implementation

Configuring Audio Codec of C6xxx Boards

Course Digital Signal Processing:		
Subject Code- BTEC-512-18		
	Course Outcomes	**BT Level**
BTEC-512-18.1	Understanding of Matlab	2
BTEC-512-18.2	Understanding of Signals	5

Linear Integrated Circuits

Subject Code- BTEC-513-18

List of Experiments (Minimum 10 experiments to be performed):

1. Study differential amplifier configurations.
2. Measure the performance parameters of an Op amp.
3. Application of Op amp as Inverting and Non Inverting amplifier.
4. Study frequency response of an Op Amp and determine Gain-Bandwidth product
5. Application of Op-Amp as summing, scaling & averaging amplifier.
6. Application of Op-Amp as Instrumentation amplifier
7. Design differentiator and Integrator using Op-Amp.
8. Design Low pass, High pass and Band pass 1st order Butterworth active filters using Op-amp
9. Design Phase shift and Wein Bridge oscillator using Op-Amp.
10. Application of Op Amp as square wave, triangular wave and Sawtooth wave generator.
11. Application of Op Amp as Zero Crossing detector and window detector.
12. Application of Op Amp as Schmitt Trigger.
13. Application of 555 as Monostable and Astable multivibrator.
14. Examine the operation of a PLL and determine the free running frequency, the capture range and the lock in range of PLL.

Course: Linear Integrated Circuits		
Subject Code- BTEC-513-18		
	Course Outcomes	**BT Level**
BTEC-513-18.1	study and investigate the configurations of Differential amplifiers	2
BTEC-513-18.2	measure the performance parameters of am OP-Amp	5
BTEC-513-18.3	Use Op-Amps for various applications.	2

4-Week Industrial Training I

Subject Code- BTEI-521-18

Minimum of four weeks in an Industry in the area of Electronics and Communication Engineering at the end of 4th Semester. The summer internship should give exposure to the practical aspects of the discipline. In addition, the student may also work on a specified task or project which may be assigned to the student. The outcome of the internship should be presented in the presence of the Peers and Faculty with a Power point Presentation and submit the hard copy report duly endorsed by the Industry for Evaluation to the Department. A Viva-voce will be conducted.

Course: Linear Integrated Circuits		
Subject Code- BTEC-513-18		
	Course Outcomes	**BT Level**
BTEC-513-18.1	study and investigate the configurations of Differential amplifiers	2
BTEC-513-18.2	measure the performance parameters of am OP-Amp	5
BTEC-513-18.3	Use Op-Amps for various applications.	2

Mentoring and Professional Development

Subject Code- BMPD-351-18

* As stated in the IKGPTU B.Tech 1st Year Scheme and Syllabus
**S/US - Satisfactory and Unsatisfactory

* Guidelines regarding Mentoring and Professional Development
The objective of mentoring will be development of:

- Overall Personality
- Aptitude (Technical and General)
- General Awareness (Current Affairs and GK)
- Communication Skills
- Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities.
For achieving the above, suggestive list of activities to be conducted are:

Part – A (Class Activities)

1. Expert and video lectures
2. Aptitude Test

3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B (Outdoor Activities)

1. Sports/NSS/NCC

2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B
Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted
and the same shall be submitted to the department.

Wireless Communication

Subject Code- BTEC-601-18

Unit 1: Elements of Cellular Radio Systems Design: Basic cellular system, Performance criteria, Components and Operation of cellular systems, Planning a cellular system, Analog & Digital cellular systems, Concept of frequency reuse channels, Co-channel interference, Reduction factor, desired C/I for a normal case in an omni directional antenna system, Cell splitting.

Unit 2: Digital Communication through fading multipath channels: Fading channels and their characteristics- Channel modelling, Digital signalling over a frequency non selective slowly fading channel. Concept of diversity branches and signal paths. Combining methods: Selective diversity combining, Switched combining, Maximal ratio combining, Equal gain combining.

Unit 3: Multiple Access Techniques for Wireless Communications: Introduction, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access, Space Division Multiple Access (SDMA), Packet Radio Protocols; Pure ALOHA, Slotted ALOHA.

Unit 4: Wireless Systems & Standards: AMPS and ETACS, United states digital cellular (IS- 54 & IS 136), IEEE Standards, Global system for Mobile (GSM): Services, Features, System Architecture and Channel Types, Frame Structure for GSM, Speech Processing in GSM, GPRS/EDGE specifications and features. 3G systems: UMTS & CDMA 2000 standards and specifications. CDMA Digital standard (IS 95): Frequency and Channel specifications, Forward CDMA Channel, Reverse CDMA Channel, Wireless Cable Television.

Unit 5: Evolution of Communication Generations: Introduction to Bluetooth, Zigbee, LTE-Advance systems, 4G & 5G Mobile techniques and Emerging technologies.

Course: Wireless Communication		
Subject Code- BTEC-601-18		
	Course Outcomes	**BT Level**
BTEC-601-18.1	study and investigate the configurations of Differential amplifiers	4
BTEC-601-18.2	measure the performance parameters of am OP-Amp	4
BTEC-601-18.3	Use Op-Amps for various applications.	3

Computer Networks

Subject Code- BTCS-504-18

Unit 1: Data Communication - Data Communication System & its Components, Representation of data and its flow Networks, Various Connection Topologies, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization.

Unit 2: Data Link Layer and Medium Access Sub Layer - Design issues, Framing, Error detection and correction codes: checksum, CRC, hamming code, Data link protocols for noisy and noiseless channels, Sliding Window Protocols: Stop & Wait ARQ, Go-back-N ARQ, Selective repeat ARQ, Data link protocols: HDLC and PPP

Unit 3: Network Layer Switching - Logical addressing IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

Unit 4: Transport Layer Process to Process Communication - User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

Unit 5: Application Layer - Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), World wide web (WWW), HTTP, SNMP, Bluetooth, Firewalls.

Course: Computer Networks		
Subject Code- BTCS-504-18		
	Course Outcomes	**BT Level**
BTCS-504-18.1	Explain the functions of the different layer of the OSI Protocol	2
BTCS-504-18.2	Describe the function of each block of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs)	2
BTCS-504-18.3	Develop the network programming for a given problem related TCP/IP protocol	6
BTCS-504-18.4	Learn about DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.	2

Optical Fibers and Communication

Subject Code- BTEC-602-18

Unit 1: Introduction

Need of Fiber Optic Communications, Evolution of Light wave Systems, Channel Multiplexing, Modulation Formats, Optical Communication Systems, Light wave System Components; Optical Fibers as a Communication Channel, Optical Transmitters, Optical Receivers.

Unit 2: Optical Fibers

Geometrical-Optics Description; Step-Index Fibers, Graded Index Fibers, Wave Propagation; Maxwell's Equations, Fiber Modes, Single-Mode-Fibers, Dispersion in Single-Mode Fibers; Group Velocity Dispersion, Material Dispersion, Wave guide Dispersion, Higher-order Dispersion, Polarization-Mode Dispersion, Dispersion-Induced Limitations; Basic Propagation Equation, Chirped Gaussian Pulses, Limitations on the Bit Rate, Fiber Bandwidth, Fiber Losses; Attenuation Coefficient, Material Absorption, Rayleigh Scattering, wave guide Imperfections, Nonlinear Optical effects; Stimulated Light Scattering, Nonlinear Phase Modulation, Four Wave Mixing, Fiber Manufacturing; Design Issues, Fabrication Methods, Cables and Connectors.

Unit 3: Optical Transmitters

Basic Concepts; Emission and Absorption Rates, p-n Junctions, Non radiative Recombination, Semi conductor Materials, Light Emitting Diodes; Power-current Characteristics, LED spectrum, Modulation Response, LED Structures, Semi Conductor Lasers; DFB Lasers, Coupled Cavity semiconductor Lasers, Tunable Semiconductor Lasers, Vertical Cavity Semiconductor Lasers, Laser Characteristics, Small & Large Signal Modulation, Spectral Line width.

Unit 4: Optical Receivers

Basic concepts, p-n Photo Diodes, p-i-n Photo Diodes, Avalanche Photo Diode, MSM Photo detector, Receiver Design, Receiver Noise; Noise mechanism, Receiver sensitivity; Bit error rate, Minimum Receiver Power, Sensitivity Degradation, Receiver Performance.

Unit 5: Light Wave Systems

Overview: System Architecture, Loss limited Light wave systems, Dispersion limited Light wave systems, Power Budget, Long Haul systems, Sources of Power Penalty; Model Noise, Dispersive Pulse Broadening, Mode Partition Noise, Frequency Chirping, Reflection Feedback Noise, WDM Light wave systems, Optical TDM Systems.

Course: Optical Fibers and Communication		
Subject Code- BTEC-602-18		
	Course Outcomes	**BT Level**
BTEC-602-18.1	Understand the basics of Optical Communication and Optical fibres	2
BTEC-602-18.2	Learn about the Optical Transmitters and Receivers	2
BTEC-602-18.3	Explain the Light wave Architecture and systems	2
BTEC-602-18.4	Ability to explain the manufacturing, modulation and wave mixing in Optical Communication	2

Microwave and Antenna Engineering

Subject Code- BTEC-603-18

Unit 1: Microwave Tubes and Solid-State devices

Limitations of Conventional tubes, construction, Operation and properties of Klystron Amplifier, reflex Klystron, Magnetron, Travelling Wave Tube (TWT), Backward Wave Oscillator (BWO), Crossed field amplifiers. Microwaves Transistors: (Bipolar, FET), Transferred Electron Devices (Gunn diode), Avalanche transit time effect (IMPATT, TRAPATT), Microwave Amplification by Stimulated Emission of Radiation (MASER).

Unit 2: Microwave Components and Measurements

Analysis of Microwave components using S-parameters, Junctions (E, H, Hybrid), Directional coupler, Bends and Corners, Microwave posts, S.S. tuners, Attenuators, Phase shifter, Ferrite devices (Isolator, Circulator, Gyrator), Cavity resonator, Matched termination. Power measurements using calorimeters and bolometers, Measurement of Standing Wave Ratio (SWR), Frequency and wavelength.

Unit 3: Antennas

Concept of radiation in Single wire, Two wire and Dipole, Introduction to Antenna parameters: Reflection Co-efficient, VSWR, Radiation pattern, Directivity, Gain. Infinitesimal dipole, Monopole and half wave dipole, Far-field, Radiating near-field and reactive near-field regions, Microstrip Patch & Fractal Antennas.

Unit 4: Antenna Arrays and Aperture Antennas

Array of two-point sources, Array factor, Array configurations, Hansen-woodyard end fire array, n-element linear array with uniform amplitude and spacing, n-element linear array with non-uniform spacing, Binomial and Dolph-Tschebysceff array. Aperture Antennas: Rectangular and circular aperture antennas, Horn antenna, Babinet's Principle, Slot Antenna, Loop antenna.

Course: Microwave and Antenna Engineering		
Subject Code -BTEC-603-18		
	Course Outcomes	**BT Level**
BTEC-603-18.1	Understand the working and operation of various Microwave Tubes and Microwave Solid- state devices.	2
BTEC-603-18.2	Learn about various important Microwave Components and the Microwave measurements that can be carried out.	2
BTEC-603-18.3	Explain the basic concepts and types of Antennas and its regions	2
BTEC-603-18.4	Describe the important concepts of Antenna Arrays and Antenna Aperture.	2

WLAN and Security

Subject Code- BTEC-906A-18

Unit 1: Fundamentals of Wireless Communication

Fundamentals of Wireless Communication, Advantages, Limitations and Applications, Wireless Media, Infrared Modulation Techniques, DSSS and FHSS, Multiple access technique: TDMA, CDMA, FDMA, CSMA, OFDMA, Frequency Spectrum, Radio and Infrared Frequency Spectrum

Unit 2: Wireless local area networks (WLAN)

Introduction, Types of WLANs, WLAN Equipment, WLAN topologies and Technologies, IEEE 802.11 WLAN: Architecture, Physical Layer Standards.

Unit 3: WLAN Medium access control

Challenges for the MAC, MAC Access Modes and Timing, Contention-Based Access Using the DCF, Fragmentation and Reassembly, Frame Format, Encapsulation of Higher-Layer Protocols Within 802.11, Contention-Based Data Service

Unit 4: WLAN Framing

General frame format, Frame Control field, Format of individual frame types: Control frames, Data frames, Management frames, Types of Management Frames Management Frame fields, Frame Transmission and Association and Authentication States

Unit 5: Wireless Security

Wireless Application Protocol, WAP Security, Authentication, Integrity, Confidentiality, Security Issues with Wireless Transport Layer Security (WTLS), Wireless LAN Security, Access Point Security, Work Station Security, Safeguarding Wireless LAN's.

Unit 6: WLAN Security and Authentication

Cryptographic Background to WEP, WEP Cryptographic Operations, Problems with WEP, The Extensible Authentication Protocol, EAP Packet Format, EAP Requests and Responses, EAP Success and Failure, EAP Exchange, 802.1x: Network Port Authentication, 802.1x Architecture and Nomenclature, EAPOL Encapsulation, 802.1x Exchange, 802.1x on Wireless LANs

Course: WLAN and Security		
Subject Code - BTEC-906A-18		
	Course Outcomes	**BT Level**
BTEC-906A-18.1	Develop an understanding WLAN and its architecture	6
BTEC-906A-18.2	Understand the gap between wired and wireless networks	2
BTEC-906A-18.3	Build the knowledge of security building blocks which enable them to solve the problems of designing security solutions in wireless networks.	6
BTEC-906A-18.4	Learn the wireless LAN authentication protocols in detail, and enhance the skills of configuring a secure wireless network.	2

Satellite Communication

Subject Code- BTEC-906B-18

Unit 1 - Introduction to Satellite Communication

Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication, Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day.

Unit 2 - Satellite sub-systems

Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Altitude and orbit control system (AOCS), Communication sub-system, power sub-systems etc.

Unit 3 - Typical Phenomena in Satellite Communication

Solar Eclipse on satellite, its effects, remedies for Eclipse, Doppler frequency shift phenomena and expression for Doppler shift. Received signal power equations.

Unit 4 – Satellite Link Design

Introduction, General Link Design Equations, System Noise Temperature C/N and G/T Ratio, Atmospheric and Ionosphere Effects on Link design, Uplink design, Complete Link Design, Interference effects on Complete Link design, Earth Station Parameters.

Unit 5 – VSAT Satellite Systems

Introduction, Network Architecture, VSAT Earth Station, VSAT Applications.

Course: Satellite Communication		
Subject Code - BTEC-906B-18		
	Course Outcomes	**BT Level**
BTEC-906B-18.1	Visualize the architecture of satellite systems as a means of high speed, high range communication system.	2
BTEC-906B-18.2	State various aspects related to satellite systems such as orbital equations, sub-systems in a satellite, link budget, modulation and multiple access schemes.	2
BTEC-906B-18.3	Understand the Phenomena in Satellite communication.	2
BTEC-906B-18.4	Understand the general Link Design equation and the concepts related to it.	2
BTEC-906B-18.5	Learn about VSAT system and its applications.	4

CMOS and RF Circuit Design

Subject Code- BTEC-906C-18

Unit 1: CMOS Physics, Transceiver Specifications and Architecture

Introduction to MOSFET Physics, Noise: Thermal, shot, flicker, popcorn noise, Two port Noise theory, Noise Figure, THD, IP2, IP3, Sensitivity, SFDR, Phase noise – Specification distribution

over a communication link, Homodyne Receiver, Heterodyne Receiver, Image reject, Low IF Receiver Architectures, Direct up conversion Transmitter, Two step up conversion Transmitter.

Unit 2: RF Circuits Design

Overview: RF Filter Design, Design issues in Integrated RF filters, Active RF components, Matching and Biasing networks, Basic blocks in RF systems & their modelling, Design of LNA, Mixer, RF frequency synthesizer and RF Oscillators, Phase noise, Noise power and trade off, MOSFET behavior at RF frequencies, Integrated parasitic elements at high frequencies.

Unit 3: Impedance Matching and Amplifiers

S-parameters with Smith chart, Passive IC components, Impedance matching networks, Common Gate, Common Source Amplifiers, OC Time constants in bandwidth estimation and enhancement, High frequency amplifier design, Power match and Noise match.

Unit 4: Mixed Signal Design

Mixed-signal layout, Interconnects and data transmission; Voltage-mode signaling and data transmission; Current-mode signaling and data transmission, Basics of data converters; Successive approximation ADCs, Dual slope ADCs, Flash ADCs, Pipeline ADCs, Hybrid ADC structures, High-resolution ADCs, DACs.

Course: CMOS and RF Circuit Design		
Subject Code - BTEC-906C-18		
	Course Outcomes	**BT Level**
BTEC-906C-18.1	Get familiar with the concepts of CMOS and RF circuit designs.	4
BTEC-906C-18.2	Explore the design methods of RF receivers and transmitters.	6
BTEC-906C-18.3	Understand the concepts of Mixed signal design.	2
BTEC-906C-18.4	Use the design methods of Receivers and Transmitters.	3

C# AND .NET Programming

Subject Code- BTEC-906D-18

Unit 1: C# Advanced Features

Delegates – Lambdas – Lambda Expressions – Events – Event Publisher – Event Listener – Strings and Regular Expressions – Generics – Collections – Memory Management and Pointers – Errors and Exceptions – Reflection.

UNIT 2: Object Oriented Aspects of C#

Class, Objects, Constructors and its types, inheritance, properties, indexers, index overloading, polymorphism, sealed class and methods, interface, abstract class, abstract and interface, operator overloading, delegates, events, errors and exception, Threading.

Unit 3: Base Class Libraries & Data Manipulation

Diagnostics -Tasks, Threads and Synchronization – .Net Security – Localization -Manipulating XML- SAX and DOM – Manipulating files and the Registry- Transactions -ADO.NET- Peer-to-Peer Networking – PNRP
– Building P2P Applications – Windows Presentation Foundation (WPF).

Unit 4: .NET Framework and Compact Framework

Assemblies – Shared assemblies – Custom Hosting with CLR Objects – App domains -Core XAML – Bubbling and Tunneling Events- Reading and Writing XAML – .Net Compact Framework – Compact Edition Data Stores – Errors, Testing and Debugging -Optimizing performance – Packaging and Deployment – Networking and Mobile Devices

Course: C# AND .NET Programming		
Subject Code - BTEC-906D-18		
	Course Outcomes	**BT Level**
BTEC-906D-18.1	Write various applications using C# Language in the .NET Framework.	4
BTEC-906D-18.2	Develop distributed applications using .NET Framework.	6
BTEC-906D-18.3	Create mobile applications using .NET compact Framework.	6
BTEC-906D-18.4	Learn other concepts of .NET approach towards problem solving	3

Natural Language Processing

Subject Code- BTEC-906E-18

Unit 1 – Introduction\

Biology of speech processing, place and manner of articulation, word boundary detection, Argmax computation, HMM and speech recognition

Unit 2 - Words and Wordforms

Morphology fundamentals, Morphological diversity of Indian languages, Morphology paradigms, FSM based morphology, automatic morphology learning, shallow parsing, named entities, Maximum entropy models, random fields

Unit 3 – Parsing

Context-free grammars and languages, Theories of Parsing, Parsing algorithms, rule based and

probabilistic parsing, scope ambiguity and attachment ambiguity resolution

Unit 4 – Word Sense and Word Net

Lexical knowledge networks, Wordnet theory, Indian languages wordnet, multilingual dictionaries, semantic roles, word sense disambiguation, metaphors

Unit 5 - Web 2.0 Applications

Sentiment Analysis, text entailment, robust and scalable machine translation, question answering, multilingual setting, cross lingual information retrieval.

Course:Natural Language Processing		
Subject Code - BTEC-906E-18		
	Course Outcomes	**BT Level**
BTEC-906E-18.1	Demonstrate a basic understanding of the concepts of Natural language Processing	2
BTEC-906E-18.2	Learn about various Word forms and models therein	4
BTEC-906E-18.3	Understand Structures by using Parsing and its Algorithms	2
BTEC-906E-18.4	Explain about the Lexical knowledge Networks and related Web applications	2

Optical Fibers and Communication Lab

Subject Code- BTEC-611-18

List of Experiments:

The student has to perform 8 to 10 Lab experiments from the below:

1. Study and measurement of Attenuation and Loss in optical fibre.
2. Study and measurement of bending loss in optical fibre.
3. Study and measurement of numerical aperture of optical fibre.
4. Measurement of optical power using optical power meter.
5. To Study the transmission of TDM signal through optical fibre.
6. To determine the bit rate of the optical fibre link.
7. Study of various multiplexing techniques.
8. To determine the BER of wireless system using M-ARY (BPSK,QPSK,8PSK,16PSK) and QAM technique.

9.To learn fibre splicing techniques and to become familiar with the use of optical time domain reflectometry in characterizing optical fibres.
10.To establish fibre optic analog link and to study the relationship between the input signal & received signal.
11.To study the VI characteristics of fibre optic source and Photo Detector.
12.Simulation of an optical communication system & calculation of its BER and Q factor using simulator.

Course: Optical Fibers and Communication Lab		
Subject Code - BTEC-611-18		
	Course Outcomes	**BT Level**
BTEC-611-18.1	To perform experiments based on optical communication in order to understand in depth concepts of latest communication system.	**4**
BTEC-611-18.2	To study various types of optical sources and light detectors	3
BTEC-611-18.3	To know methods of slicing and connecting techniques of optical fibres	2
BTEC-611-18.4	To study different types of losses in optical fibres.	3
BTEC-611-18.5	To know applications of optical fibres.	2

Microwave and Antenna Engineering Lab

Subject Code- BTEC-612-18

List of Experiments:

The student has to perform 8 to 10 Lab experiments from the below:

1. To study various Microwave Components and Instruments.
2. To study the V-I Characteristics of Gunn Diode Oscillator at X-band.
3. To study Output power and Frequency as a function of voltage using Gunn Diode Oscillator at X-band.
4. To Study the characteristics of a Reflex Klystron oscillator
5. To determine the Standing Wave Ratio (SWR) and Voltage standing wave ratio (VSWR).

6. To measure the dielectric constant of a material at X-band.
7. To determine the frequency & wavelength in a rectangular waveguide.
8. Measurement of coupling factor and Isolation of a Directional coupler using X-band.
9. To measure the Attenuation/Insertion Loss of an attenuator.
10. Determination of the phase-shift of a phase shifter.
11. To plot the Radiation pattern of an antenna.
12. To study Simple Dipole (λ/2 or λ/4 or 3λ/2) antenna (all or any of these single dipole antennas) and Folded Dipole λ/2 antenna.
13. To study 3/5/7-element Yagi-Uda Folded Dipole antenna.
14. To study the Radiation pattern, Gain, Directivity of a Slot/Loop Antenna.

Course: Microwave and Antenna Engineering Lab		
Subject Code - BTEC-612-18		
	Course Outcomes	**BT Level**
BTEC-612-18.1	Learn about general Microwave components and Microwave bench.	**4**
BTEC-612-18.2	Measure common parameters related to Microwave Oscillator(s).	2
BTEC-612-18.3	Determine frequency and wavelength of waveguides.	2
BTEC-6112-18.4	Measure and plot radiation patterns of various types of Antennas.	2

Project – I

Subject Code- BTEC-631-18

This is expected to provide a good initiation for the student(s) in R&D work. The assignment may normally include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility;
4. Preparing a Written Report on the Study conducted for presentation to the Department;
5. Final Seminar, as oral Presentation before a departmental committee.

The students shall have to design two Projects (i.e. Project-I and Project-II in 6th Semester and 7 th Semester, respectively). The projects must involve originality, innovation and business idea. Assessment will be based on the work performance & report submitted.

Course out come

The object of Project Work I is to enable the student to take up investigative study in the broad field of Electronics & Communication Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor.

Mentoring and Professional Development*

Subject Code- BMPD-361-18

Part – A (Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B (Outdoor Activities)

1. Sports/NSS/NCC
2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc. Evaluation shall be based on rubrics for Part – A & B

Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted and the same shall be submitted to the department..

Course: Mentoring and Professional Development*		
Subject Code - BMPD-361-18		
	Course Outcomes	BT Level
BMPD-361-18.1	Overall Personality	4
BMPD-361-18.2	Aptitude (Technical and General)	2
BMPD-361-18.3	General Awareness (Current Affairs and GK)	2
BMPD-361-18.4	Communication Skills	
BMPD-361-18.5	Presentation Skills	2

Internet Of Things (IOT) & Cloud Computing

Subject Code- BTEC-907A-18

Unit-I Introduction & Overview of Internet of things - The Internet of things today and tomorrow, Vision of internet of things, An IoT architecture outline ,Functional blocks of IOT ,industrial IOT, IOT enabled Smart devices in market, Application areas for IOT, Challenges in IOT. Hardware and Software tools required for IOT application development, Overview of IOT based on Texas instruments Hardware platforms and IDE's for development.

Unit- II Internet/Web and Networking Basics - Introduction to Internet & network topologies, TCP/IP protocol, TCP/IP Layers and their relative Protocols, IP addressing(IPV4), IP Address Classification & Subnetting, Local IP , Gateway IP and DNS,TCP & UDP Communication, Access point and Station model, Wireless networks, Encryption standards and signal strength of WiFi network, Overview of MAC Address, Energia WiFi Library API's .

Case Study : Connected microcontrollers essential to automation in buildings.

Unit-III Web servers and Client Communication- Introduction to a Web server and its types, Role of servers over internet, Port numbers, Socket Communication, WiFi Web Client, Client server Communication model with Example, Overview of HTTP protocol, HTTP based web server, Sensor interfacing with network, basics of HTML, Client and Server class API's.

Unit-IV Cloud Communication in IOT- IOT device to cloud storage communication Model, need of Cloud services in IOT, ,Different Cloud storage services available today, Cloud Data processing and frame format, Role of Smart phones in IOT, Examples on Home automation and Smart city development, Introduction to clouds like Temboo, Blynk, Pubnub etc.

Case Study : Advances in bio-inspired sensing help people lead healthier lives.

Unit-V IOT Plate form and Application development- Remote Monitoring & Sensing, Remote Controlling, Application development using MQTT Protocol, Sensors and sensor Node and interfacing using Embedded target boards (TM4C123x & CC31xx), IoT applications in home, infrastructures, Healthcare, Transport, buildings, security, Industries, and other IoT electronic equipment, Adapting IPV6 for IOT Requirement (overview).

Suggested Books

1. Dr. Ovidiu Vermesan, Dr. Peter Friess, Internet of Things: Converging Technologies for Smart Environments and Integrate Ecosystems, River Publishers 2010.
2. Jan Axelson, Embedded Ethernet And Internet Complete (Designing and Programming Small Devices for Networking) 2014.
3. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach, McGraw Hill 2013.
4. Jean-Philippe Vasseur,Adam Dunkels, Morgan Kuffmann. Interconnecting Smart Objects with IP: The Next Internet,
5. Raj Kumar Buyya, James Broberg, Cloud Computing: Principles and paradigms 2000.
6. Barrie Sosinsky, Cloud Computing Bible, Wiley Publications 1999.
7. Ricardo Puttini, Thomas Erl, and Zaigham Mahmood, Cloud Computing: Concepts, Technology & Architecture, Tata MacGrawHill 1997.

References

1. *http://www.ti.com/ww/en/internet_of_things/iot-overview.html.*
2. *http://energia.nu/reference/*
3. *Internet of Things (IoT): A vision, architectural elements, and future directions Jayavardhana Gubbia, Rajkumar Buyyab, *, Slaven Marusic a, Marimuthu Palaniswami a*
4. *http://www.ti.com/wireless-connectivity/simplelink-solutions/overview/overview.html.*

https://www.hivemq.com/blog/mqtt-essentials-part2-publish-subscribe

Course:Internet Of Things (IOT) & Cloud Computing		
Subject Code - BTEC-907A-18		
	Course Outcomes	**BT Level**
BTEC-907A-18.1	Understanding concept of cloud computing and analyze trade-off between deploying application on cloud and using local infrastructure	2
BTEC-907A-18.2	Identify issues and design challenges in IoT applications.	4
BTEC-907A-18.3	Select appropriate hardware and software components for IoT applications.	3
BTEC-907A-18.4	Conceptual knowledge will help students to build IOT applications	2

Antenna Radiating Systems

Subject Code- BTEC-907B-18

Unit 1: Antenna Fundamentals - Power density, directivity, gain, radiation resistance, input impedance, radiation patterns, beam width, bandwidth and polarization. Retarded potential, Matching – Baluns, Polarization mismatch, Antenna noise temperature & SNR, Linear and array antennas - Arrays of two point sources – Broad side and end fire arrays, binomial array - Principle of pattern multiplication –Adaptive arrays.

Unit 2: Fundamentals of Radiation - Radiation from a current element and monopole – Radiation from a Quarter-wave dipole, half-wave and centre-fed dipole – Near and far fields, current distribution of dipole antennas. Radiation from oscillating dipole, Half wave dipole, Folded dipole. Radiation through an Aperture, Radiation from Electromagnetic Horns.

Unit 3: Special Purpose Antennas: (Qualitative treatment only) Loop antennas, Travelling wave antennas, V and rhombic antennas, Horn antennas, Yagi-Uda arrays, Wideband antennas, Log periodic antennas. Babinet's principle – Slot radiators- Parabolic reflectors – Radiation pattern, aperture efficiencies – Feeding techniques for parabolic antennas.

Unit 4: Antenna Measurements - Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods).

Unit 5: Environmental effects - Concept of Electromagnetic interference (EMI); EMC and its advantages. effect of radiating systems on environment, techniques to suppress EMI.

Recommended Books:

1. Constantine A. Balanis, Antenna Theory: Antenna & Design 4th Edition, 2016, Wiley.
2. A. R. Harish, M. Sachidananda, Antennas and Wave Propogation, 2011, Oxford University Press.
5. Edward Conrad Jordan and Keith George Balmain, Electromagnetic Waves and Radiating Systems, PHI.
6. R.L. Yadava, Electromagnetic Waves, Khanna Publishing House, Delhi.
7. A. Das, Sisir K. Das, Microwave Engineering, Tata McGraw Hill.

John D Krauss, Ronald J Marhefka and Ahmad S. Khan, Antennas and Wave Propagation, Fourth Edition, 1980, Tata McGraw Hill.

Course: Antenna Radiating Systems		
Subject Code - BTEC-907B-18		
	Course Outcomes	**BT Level**
BTEC-907B-18.1	To understand the basic concepts of radiation.	2
BTEC-907B-18.2	To understand various antenna types.	2
BTEC-907-18.3	To analyze the radiation pattern of antenna arrays.	4
BTEC-907A-18.4	To understand the concept of various wave propagation techniques.	2

Robotics and Embedded Systems

Subject Code- BTEC-907C-18

UNIT I - BASIC CONCEPTS

Brief history-Types of Robot–Technology-Robot classifications and specifications-Design and control issues-Various manipulators–Sensors-work cell-Programming languages.

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UNIT II - DIRECT AND INVERSE KINEMATICS

Mathematical representation of Robots-Position and orientation–Homogeneous Transformation-Various Joints-Representation using the Denavit Hattenberg parameters-Degrees of freedom-Direct Kinematics-Inverse kinematics-SCARA robots-Solvability–Solution Methods-Closed form solution.

UNIT III - MANIPULATOR DIFFERENTIAL MOTION AND STATICS

Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints–Inverse-Wrist and arm singularity-Static Analysis-Force and moment Balance.

UNIT IV - PATH PLANNING

Definition-Joint space technique-Use of p-degree polynomial-Cubic polynomial-Cartesian space technique-Parametric Descriptions-Straight line and circular paths-Position and orientation planning.

UNIT V - ROBOTICS SYSTEM DESIGN

Running Code on Microcontroller-Voltage, Current and power-ARM Cortex M-Software Design-Battery and Voltage Regulation-GPIO-Interfacing Input and Output-DC Motors-Timers-Bluetooth Low Energy.

Suggested Books:

1.R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi,4th Reprint, 2005.

2.JohnJ.Craig ,Introduction to Robotics Mechanics and Control, Third edition, Pearson Education,2009.

3. M.P.Groover, M.Weiss, R.N. Nageland N. G.Odrej, Industrial Robotics, McGraw-HillSingapore, 1996.

4. Jonathan W. Valvano, Embedded Systems: Introduction to Robotics, First Edition,2019

5. TI Robotic System Design Lab-RSLK (https://university.ti.com/en/faculty/ti-robotics-system-learning-kit/ti-robotics-system-learning-kit)

Course: Robotics and Embedded Systems		
Subject Code - BTEC-907C-18		
	Course Outcomes	**BT Level**
BTEC-907C-18.1	Ability to understand basic concept of robotics.	2
BTEC-907C-18.2	To analyze Instrumentation systems and their applications to various	4
BTEC-907C-18.3	To know about the differential motion, add statics in robotics	2
BTEC-907C-18.4	To know about the various path planning techniques.	2
BTEC-907C-18.5	To know about the dynamics and control in robotics industries.	3

Python Programming

Subject Code- BTEC-907D-18

Unit I: Introduction - The Programming Cycle for Python, Python IDE, Interacting with Python Programs, Elements of Python, Type Conversion. Basics: Expressions, Assignment Statement, Arithmetic Operators, Operator Precedence, Boolean Expression.

Unit 2: Functions - Parts of A Function, Execution of A Function, Keyword and Default Arguments, Scope Rules. String: Length of the string and perform Concatenation and Repeat operations in it. Indexing and Slicing of Strings. Python Data Structure: Tuples, Unpacking Sequences, Lists, Mutable Sequences, List Comprehension, Sets, Dictionaries Higher Order Functions: Treat functions as first class Objects, Lambda Expressions.

Unit 3: Sieve of Eratosthenes - Generate prime numbers with the help of an algorithm given by the Greek Mathematician named Eratosthenes, whose algorithm is known as Sieve of Eratosthenes. File I/O: File input and output operations in Python Programming Exceptions and Assertions

Unit 4: Modules and Classes - Modules: Introduction, Importing Modules, Abstract Data Types: Abstract data types and ADT interface in Python Programming. Classes: Class definition and other operations in the classes, Special Methods (such as _init_, _str_, comparison methods and Arithmetic methods etc.), Class Example, Inheritance, Inheritance and OOP.

Recommended Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist, 2nd edition, Updated for Python 3, Shroff/OReilly Publishers, 2016.
2. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python-Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. John V Guttag, Introduction to Computation and Programming Using Python, Revised and expanded Edition, MIT Press , 2013
4. Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
5. Timothy A. Budd, Exploring Python, Mc-Graw Hill Education (India) Private Ltd.,,2015.
6. Kenneth A. Lambert, Fundamentals of Python: First Programsl, CENGAGE Learning, 2012.

Charles Dierbach, Introduction to Computer Science using Python: A Computational ProblemSolving Focus, Wiley India Edition, 2013.

Course: Python Programming		
Subject Code - BTEC-907D-18		
	Course Outcomes	**BT Level**
BTEC-907D-18.1	Read and write simple Python programs.	2
BTEC-907D-18.2	Develop Python programs with conditionals and loops.	6
BTEC-907D-18.3	Define Python functions and to use Python data structures–lists, tuples, dictionaries.	2
BTEC-907D-18.4	Perform input/output operations with files in Python.	4
BTEC-907D-18.5	Execute Searching, sorting and merging in Python.	3

Adaptive Signal Processing

Subject Code- BTEC-907E-18

Unit 1: General concepts of Adaptive Signal Processing – General Aspects of adaptive filtering and estimation, applications and motivation, Review of probability, random variables and stationary random processes, Correlation structures, properties of correlation matrices.

Unit 2: Adaptive Signal Processing Algorithms - Optimal (Wiener) filter, Method of steepest descent, extension to complex valued, LMS algorithm (real, complex), convergence analysis, weight error correlation matrix, excess mean square error and mis-adjustment Variants of the LMS algorithm: the sign LMS family, normalized LMS algorithm, block LMS and FFT based realization, frequency domain adaptive filters, Sub-band adaptive filtering.

Unit 3: Signal space concepts - introduction to finite dimensional vectors pace theory, subspace, basis, dimension, linear operators, rank and nullity, inner product space, orthogonality, Gram- Schmidt orthogonalization, concepts of orthogonal projection, orthogonal decomposition of vector spaces. Vector space of random variables, correlation as inner product, forward and backward projections, Stochastic lattice filters, recursive updating of forward and backward prediction errors, relationship with AR modeling, joint process estimator, gradient adaptive lattice.

Unit 4: Introduction to recursive least squares (RLS) - vector space formulation of RLS estimation, pseudo-inverse of a matrix, time updating of inner products, development of RLS lattice filters, RLS transversal adaptive filters. Advanced topics: affine projection and subspace based adaptive filters, partial update algorithms, QR decomposition and systolic array.

Recommended Books:

1. S. Haykin, Adaptive filter theory, Prentice Hall, 1986.
2. C.Widrow and S.D. Stearns, Adaptive signal processing, Prentice Hall, 1984.
Alexender Thomas 1984/86.

Course: Adaptive Signal Processing		
Subject Code - BTEC-907E-18		
	Course Outcomes	**BT Level**
BTEC-907E-18.1	Understand the non-linear control and the need and significance of changing the control parameters with respect to real-time situation.	2
BTEC-907E-18.2	Mathematically represent the 'adaptability requirement'.	5
BTEC-907E-18.3	Understand the mathematical treatment for the modeling and design of the signal processing systems.	2

Artificial Intelligence

Subject Code- BTEC-908A-18

Unit 1: Cellular concepts- Cell structure, frequency reuse, cell splitting, channel assignment, handoff, interference, capacity, power control; Wireless Standards, Introduction to Generations – 2G to 5G.

Unit 2: Signal propagation- Propagation mechanism- Reflection, Refraction, Diffraction and Scattering, Large scale signal propagation, Fading channels-Multipath and small scale fading- Doppler shift, Statistical multipath channel models, Narrowband and Wideband fading models, Delay spread, Coherence bandwidth and Coherence time, Flat and frequency selective fading, Slow and Fast fading, Average fade duration and level crossing rate.

Unit 3: Othrogonal Frequency Division Multiplexing (OFDM) – OFDM Receiver & Transmitter structures- Diversity receivers- selection and MRC receivers, RAKE receiver, Equalization, Transmit diversity-Altamonte scheme.

Unit 4: MIMO and Space time signal processing - Spatial multiplexing, diversity/multiplexing tradeoff, Performance measures- Outage, SNR, symbol/bit error rate, examples- GSM, EDGE, GPRS, IS-95, CDMA 2000 and WCDMA.

Text/Reference Books:

1. WCY Lee, Mobile Cellular Telecommunications Systems, McGraw Hill, 1990.
2. WCY Lee, Mobile Communications Design Fundamentals, Prentice Hall, 1993.
3. Raymond Steele, Mobile Radio Communications, IEEE Press, New York, 1992.
4. AJ Viterbi, CDMA: Principles of Spread Spectrum Communications, Addison Wesley, 1995.
5. VK Garg &JE Wilkes, Wireless & Personal Communication Systems, Prentice Hall,1996.

T.S. Rappaport, Wireless Communications: Principles and Practice, 2nd Edition, Pearson Education Asia, 2010

Course: Artficial Intelligence		
Subject Code - BTEC-908-A-18		
	Course Outcomes	**BT Level**
BTEC-908A-18.1	Learn about the basic understanding of Artificial Intelligent system	2
BTEC-908A-18.2	explain about various types of Artificial Neural Networks & their models	5
BTEC-908A-18.3	describe Artificial Neural networks methods, operation and parameters	2
BTEC-908A-18.4	explore Neural Network MATLAB Toolbox	2
BTEC-908A-18.5	Learn about the basic understanding of Artificial Intelligent system	2

Mobile Communication and Networks

Subject Code- BTEC-908B-18

Unit 1 - Introduction

Approaches to intelligent control, Architecture of intelligent control, Linguistic reasoning, Rulebase, Knowledge representation.

Unit 2 - Artificial Neural Networks

Biological neuron, Artificial Neural Network (ANN), Mathematical Models, McCulloch Neural Model, Perceptron, Adaline and Madaline, Learning & Training in ANN, Hopfield Neural Network, Self Organizing Networks, Recurrent Networks, Associative memories.

Unit 3 - Fuzzy Logic System

Crisp Vs Fuzzy set theory, Membership functions, Fuzzy set operations, Fuzzy rules, Mamdani and Sugeno fuzzy inference systems, Defuzzification methods.

Unit 4 – ANN Methods and Parameters

Introduction and biological background of GA, String Encoding of chromosomes, Selection methods, Single & multi-point crossover operation, Mutation, Adjustment of strategy parameters such as Population size, Mutation & Crossover probabilities.

Unit 5 – Fuzzy Logic MATLAB Toolbox

Fuzzy Logic Toolbox, Neural Network Toolbox, FLS for Antilock Breaking System (ABS), GA in route planning for Travelling Sales Person, Time-Series forecasting using ANN.

Recommended Books

1. Jacek M. Zurada - Introduction to Artificial Neural Systems, PWS Publishing Company 1995.
2. S N Sivanandam, S N Deepa - Principles of Soft Computing, Wiley Publications, 2007.
John Yen, Reza Langari - Fuzzy Logic Intelligence, Control, and Information, Pearson 1998.

Course: Mobile Communication and Networks		
Subject Code - BTEC-908-B-18		
	Course Outcomes	**BT Level**
BTEC-908B-18.1	Understand the working principles of the mobile communication systems.	2
BTEC-908B-18.2	Understand the relation between the user features and underlying technology.	2
BTEC-908B-18.3	Analyze mobile communication systems for improved performance	4

VLSI Design

Subject Code- BTEC-908C-18

Unit 1: Cellular concepts- Cell structure, frequency reuse, cell splitting, channel assignment, handoff, interference, capacity, power control; Wireless Standards, Introduction to Generations – 2G to 5G.

Unit 2: Signal propagation- Propagation mechanism- Reflection, Refraction, Diffraction and Scattering, Large scale signal propagation, Fading channels-Multipath and small scale fading- Doppler shift, Statistical multipath channel models, Narrowband and Wideband fading models, Delay spread, Coherence bandwidth and Coherence time, Flat and frequency selective fading, Slow and Fast fading, Average fade duration and level crossing rate.

Unit 3: Othrogonal Frequency Division Multiplexing (OFDM) – OFDM Receiver & Transmitter structures- Diversity receivers- selection and MRC receivers, RAKE receiver, Equalization, Transmit diversity-Altamonte scheme.

Unit 4: MIMO and Space time signal processing - Spatial multiplexing, diversity/multiplexing tradeoff, Performance measures- Outage, SNR, symbol/bit error rate, examples- GSM, EDGE, GPRS, IS-95, CDMA 2000 and WCDMA.

Text/Reference Books:

6. WCY Lee, Mobile Cellular Telecommunications Systems, McGraw Hill, 1990.
7. WCY Lee, Mobile Communications Design Fundamentals, Prentice Hall, 1993.
8. Raymond Steele, Mobile Radio Communications, IEEE Press, New York, 1992.
9. AJ Viterbi, CDMA: Principles of Spread Spectrum Communications, Addison Wesley, 1995.
10. VK Garg &JE Wilkes, Wireless & Personal Communication Systems, Prentice Hall,1996.

T.S. Rappaport, Wireless Communications: Principles and Practice, 2nd Edition, Pearson Education Asia, 2010

Course: VLSI Design		
Subject Code - BTEC-908-C-18		
	Course Outcomes	**BT Level**
BTEC-908-C-18.1	Understand the concepts and various processes related to VLSI	2
BTEC-908-C-18.2	Understand the VLSI Circuit Design processes and Gate level design	2
BTEC-908-C-18.3	Learn about VHDL Synthesis and the tools involved	4
BTEC-908-C-18.4	Describe about CMOS Testing techniques	5

Soft Computing

Subject Code- BTEC-908-D-18

Unit 1: Introduction - What is soft computing? Differences between soft computing and hard computing, Soft Computing constituents, Methods in soft computing, Applications of Soft Computing. Introduction to Genetic Algorithms- Introduction to Genetic Algorithms (GA), Representation, Operators in GA, Fitness function, population, building block hypothesis and schema theorem.; Genetic algorithms operators- methods of selection, crossover and mutation, simple GA(SGA), other types of GA, generation gap, steady state GA, Applications of GA

Unit 2: Neural Networks- Concept, biological neural system,. Evolution of neural network, McCullochPitts neuron model, activation functions, feed forward and feedback networks, learning rules – Hebbian, Delta, Perceptron learning and Windrow-Hoff,winner-take-all. Supervised learning- Perceptron learning, single layer/multilayer perceptron, Adaptive resonance architecture, applications of neural networks to pattern recognition systems such as character recognition, face recognition, Application of Neural networks in Image processing.

Unit 3: Fuzzy systems - Basic Definition and Terminology, Set-theoretic operations, Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions, Fuzzy Rules & Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making; Neuro-fuzzy modeling- Adaptive Neuro-Fuzzy Inference Systems, Coactive Neuro-Fuzzy Modeling, Classification and Regression Trees, Data Clustering Algorithms, Rule base Structure Identification.

Unit 4: Swarm Intelligence- What is swarm intelligence? Various animal behavior which have been used as examples, ant colony optimization, swarm intelligence in bees, flocks of birds, shoals of fish, ant-based routing, particle swarm optimization

Recommended Books:

1. S.N. Shivanandam, Principle of soft computing, Wiley. ISBN13: 9788126527410, 2011.
2. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, PrenticeHall of India, 2003.
3. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1995.
4. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Edn., 2003.
5. Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998.
6. David E. Goldberg, Genetic Algorithms in Search, Optimization & Machine Learning, Addison Wesley, 1997.

Course: Soft Computing		
Subject Code - BTEC-908-D-18		
	Course Outcomes	**BT Level**
BTEC-908-D-18.1	Understand the concepts of Soft Computing and Algorithms involved there-in	2
BTEC-908-D-18.2	Understand Genetic Algorithms with its operators and applications	2
BTEC-908-D-18.3	Learn about the Neural Network models and its applications	4
BTEC-908-D-18.4	Describe the Fuzzy systems and Swarm Intelligence	4

Digital Image and Video Processing

Subject Code- BTEC-908-E-18

Unit 1: Digital Image Fundamentals - Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures. Image Enhancements and Filtering- Gray level transformations, histogram equalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domain sharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequency domain filters – low-pass and high-pass.

Unit 2: Color Image Processing - Color models–RGB, YUV, HSI; Color transformations– formulation, Color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation. Image Segmentation - Detection of discontinuities, edge linking and boundary detection, region-based segmentation. Multi-resolution image processing**-** Uncertainty principles of Fourier Transform, Time-frequency localization, Continuous wavelet transforms, Wavelet bases and multi-resolution analysis, Wavelets and Sub band filter banks, Wavelet packets. Image Compression-Redundancy–inter-pixel and psycho-visual; Still image compression standards – JPEG and JPEG-2000.

Unit 3: Fundamentals of Video Coding- Inter-frame redundancy, motion estimation techniques – full search, fast search strategies, forward and backward motion prediction, frame classification – I, P and B; Video sequence hierarchy – Group of pictures, frames, slices, macro-blocks and blocks; Elements of a video encoder and decoder; Video coding standards – MPEG and H.26X.

Unit 4: Video Segmentation- Temporal segmentation–shot boundary detection, hard-cuts and soft-cuts; spatial segmentation – motion-based; Video object detection and tracking.

Recommended Books:

1.R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008.

2. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India.2nd edition 2004.

3. Murat Tekalp, Digital Video Processing" Prentice Hall, 2nd edition 2015.

Course: Digital Image and Video Processing		
Subject Code - BTEC-908-E-18		
	Course Outcomes	**BT Level**
BTEC-908-E-18.1	Mathematically represent the various types of images and analyze them.	5
BTEC-908-E-18.2	Process these images for the enhancement of certain properties or for optimized use of the resources.	4
BTEC-908-E-18.3	Develop algorithms for image compression and coding.	6

Big Data Fundamentals

Subject Code- BTEC-909-A-18

Unit 1 - Evolution & Introduction to Big data: Best Practices for Big data Analytics, Big data characteristics, Validating – The Promotion of the Value of Big Data, Big Data Use Cases, Characteristics of Big Data Applications, Perception and Quantification of Value, Understanding Big Data Storage.

Unit 2 - A General Overview of High Performance Architecture: HDFS, Map Reduce and YARN – Map Reduce Programming Model. Big Data Overview Analysis of data at Rest- Hadoop analytics: Limitations of existing distributing systems, Hadoop Approach, Hadoop Architecture, Distributed file system: HDFS and GPFS, Internals of Hadoop MR engine, Hadoop cluster components, Hadoop Ecosystem, Evaluation criteria for distributed Map Reduce runtimes, Enterprise-grade Hadoop Deployment, Hadoop Implementation

Unit 3 - Advanced Analytical Theory and Methods: Overview of Clustering – K-means, Use Cases, Overview of the Method, Determining the Number of Clusters, Clustering, Classification, Segmentation, Linear regression, ML Search: Indexing and Indexing Techniques, Create inverted index using JAQL, Data Explorer Bundling Hadoop job: Application, Diagnostics, Reasons to Choose and Cautions, Classification: Decision Trees, Overview of a Decision Tree, The General Algorithm – Decision Tree Algorithms, Evaluating a Decision Tree

Unit 4 - Real time analytics: Introduction to streams computing, Challenges/limitations of conventional Systems, Solving a real time analytics problem using conventional system, Challenges to be solved - scalability, thread pooling, etc., Understanding the challenges in handling streaming data from the real world and how to address those using stream computing, Benefits of stream computing in Big Data world, Realtime Analytics Platform (RTAP), Real Time Sentiment Analysis.

Recommended Books:

1. Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, by Chris Eaton, Paul Zikopoulos, Wiley Publication 2015.
2. Big Data Analytics: Turning Big Data into Big Money By Frank J. Ohlhorst, McGraw Hill 2012.
3. Ethics of Big Data: Balancing Risk and Innovation By Kord Davis, 2011.
Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends, By Michael Minelli, Michele Chambers, Ambiga Dhiraj, Wiley Publication 2013

Course: Soft Computing		
Subject Code - BTEC-909-A-18		
	Course Outcomes	**BT Level**
BTEC-909-A-18.1	Understand the Evolution and basics of Big Data.	2
BTEC-909-A-18.2	Understand the Architecture of Hadoop with its file system and its Programming.	2
BTEC-909-A-18.3	Explain the Advanced analytical theory and methods.	6
BTEC-909-A-18.4	Describe the challenges in handling streaming data from the real world.	3

Information Theory and Coding

Subject Code- BTEC-909-B-18

Unit 1 – Basic Concepts of Information Theory: The concept of Amount of Information, Average Information, Entropy, Information rate, Shannon's Theorem, Mutual information; Channel capacity; BSC and other channels, Capacity of a Gaussian Channel, Bandwidth - S/N Trade-off, Introduction to Channel Capacity & Coding, Channel Models, Channel Capacity Theorem, Shannon Limit. Huffman source coding algorithm, Lempel Ziv source coding algorithm.

Unit 2 - Introduction to Error Control Coding: Linear Block Codes: Introduction to Linear Block codes, Syndrome and Error detection, Minimum distance of block code, Hamming Code. Cyclic Codes: Description of Cyclic codes, Generator and parity check matrices of cyclic codes, error detection decoding of cyclic codes. BCH Codes: Description of codes, Decoding of BCH codes, Implementation of error connection.

Unit 3 - Convolution Codes: Encoding of convolution codes, structural properties of Convolution codes, Distance Properties of convolution codes. Automatic Repeat Request Strategies: Stop and wait, Go back and selective repeat ARQ strategies, Hybrid ARQ Schemes.

Unit 4- Error Control Coding: Concatenated Codes and Turbo Codes, Single level Concatenated codes, Multilevel Concatenated codes, Soft decision Multistage decoding, Concatenated coding schemes with Convolutional Inner codes, Introduction to Turbo coding and their distance properties, Design of Turbo codes.

Text/Reference Books:

- 1. N. Abramson, Information and Coding, McGraw Hill, 1963.
- 2. M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987.
- 3. R.B. Ash, Information Theory, Prentice Hall, 1970.
- 4. Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983.
- Ranjan Bose, Information Theory, Coding and Cryptography, The McGraw Hill, 2007.

Related IEEE/IEE Publications

Course: Information Theory and Coding		
Subject Code - BTEC-909-B-18		
	Course Outcomes	**BT Level**
BTEC-909-B-18.1	Understand the concept of information and entropy	2
BTEC-909-B-18.2	Understand Shannon's theorem for coding	2
BTEC-909-B-18.3	Calculation of channel capacity	6
BTEC-909-B-18.4	Apply coding techniques	6

Embedded System Design

Subject Code- BTEC-909-C-18

UNIT-I: Introduction to Embedded systems

Embedded system overview and applications, features and architecture considerations-ROM, RAM, timers, data and address bus, Memory and I/O interfacing concepts, memory mapped I/O. CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture, instruction set, instruction formats, and various addressing modes of 32-bit. Fixed point and Floating point arithmetic operations.

Introduction ARM architecture and Cortex – M series, Introduction to the Tiva family viz. TM4C123x(Cortex M4F) and its targeted applications, block diagram, address space, on-chip peripherals (Analog and Digital) Register sets, Addressing modes and instruction set basics.

UNIT-II: Microcontroller Fundamentals for Basic Programming

I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Introduction to Interrupts, Interrupt vector table, interrupt programming.

UNIT- III: Timers, PWM and Mixed Signals Processing

Timer, Basic Timer, Real Time Clock (RTC), Timing generation and measurements, Analog interfacing and data acquisition: ADC, Analog Comparators, DMA, Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

UNIT-IV: Communication protocols and Interfacing with external devices

Synchronous/Asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, I2C protocol, SPI protocol & UART protocol. Implementing and programming I2C, SPI & UART interface and CAN & USB interfaces on TM4C123x.

UNIT V: Embedded networking

Embedded Networking fundamentals, Ethernet, TCP/IP introduction, Overview of wireless sensor networks and design examples. Various wireless protocols and its applications: NFC, ZigBee, Bluetooth, Bluetooth Low Energy, Wi-Fi.

Recommended Books:

1. J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.
2. Jack Ganssle, "The Art of Designing Embedded Systems", Newness, 1999.
3. V.K. Madisetti, "VLSI Digital Signal Processing", IEEE Press (NY, USA), 1995.
4. David Simon, "An Embedded Software Primer", Addison Wesley, 2000.

K.J. Ayala, "The 8051 Microcontroller: Architecture, Programming, and Applications", Penram Intl, 1996

Course: Information Theory and Coding		
Subject Code - BTEC-909-C-18		
	Course Outcomes	**BT Level**
BTEC-909-C-18.1	Learn about the basic architecture of 32-bit microcontrollers	4
BTEC-909-C-18.2	Understand hardware interfacing concepts to connect digital as well as analog sensors while ensuring low power considerations.	2
BTEC-909-C-18.3	Reviews and implement the protocols used by microcontroller to communicate with external sensors and actuators in real world.	6
BTEC-909-C-18.4	Understand Embedded Networking concepts based upon connected MCUs	2

Embedded System Design

Subject Code- BTEC-909-C-18

UNIT-I: Introduction to Embedded systems

Embedded system overview and applications, features and architecture considerations-ROM, RAM, timers, data and address bus, Memory and I/O interfacing concepts, memory mapped I/O. CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture, instruction set, instruction formats, and various addressing modes of 32-bit. Fixed point and Floating point arithmetic operations.

Introduction ARM architecture and Cortex – M series, Introduction to the Tiva family viz. TM4C123x(Cortex M4F) and its targeted applications, block diagram, address space, on-chip peripherals (Analog and Digital) Register sets, Addressing modes and instruction set basics.

UNIT-II: Microcontroller Fundamentals for Basic Programming

I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Introduction to Interrupts, Interrupt vector table, interrupt programming.

UNIT- III: Timers, PWM and Mixed Signals Processing

Timer, Basic Timer, Real Time Clock (RTC), Timing generation and measurements, Analog interfacing and data acquisition: ADC, Analog Comparators, DMA, Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

UNIT-IV: Communication protocols and Interfacing with external devices

Synchronous/Asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, I2C protocol, SPI protocol & UART protocol. Implementing and programming I2C, SPI & UART interface and CAN & USB interfaces on TM4C123x.

UNIT V: Embedded networking

Embedded Networking fundamentals, Ethernet, TCP/IP introduction, Overview of wireless sensor networks and design examples. Various wireless protocols and its applications: NFC, ZigBee, Bluetooth, Bluetooth Low Energy, Wi-Fi.

Recommended Books:

5. J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.
6. Jack Ganssle, "The Art of Designing Embedded Systems", Newness, 1999.
7. V.K. Madisetti, "VLSI Digital Signal Processing", IEEE Press (NY, USA), 1995.
8. David Simon, "An Embedded Software Primer", Addison Wesley, 2000.

K.J. Ayala, "The 8051 Microcontroller: Architecture, Programming, and Applications", Penram Intl, 1996

Course: Information Theory and Coding		
Subject Code - BTEC-909-C-18		
	Course Outcomes	**BT Level**
BTEC-909-C-18.1	Learn about the basic architecture of 32-bit microcontrollers	4
BTEC-909-C-18.2	Understand hardware interfacing concepts to connect digital as well as analog sensors while ensuring low power considerations.	2
BTEC-909-C-18.3	Reviews and implement the protocols used by microcontroller to communicate with external sensors and actuators in real world.	4
BTEC-909-C-18.4	Understand Embedded Networking concepts based upon connected MCUs	2

AI & Machine Learning

Subject Code- BTEC-909-D-18

Unit –I: Foundations of AI and Intelligent Agents: What is AI, History of AI, Strong and weak AI, The State of the Art. Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

Unit –II: Basic AI Concepts and Machine Learning: Boolean Algebra, Expert Systems, Configuration of Device, Introduction to SWI Prolog, Installing prolog, Introduction to Fuzzy Logic, Basic of ML, Colour Selection Algorithm.

Unit –III: Solving Problems by Searching: Problem –Solving Agents, Example Problems, Searching for Solutions, uniformed search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.

Unit –IV: Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, The Internet Shopping World.

Unit –V: Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Learner Models, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning.

Suggested Text Books:

1.“Artificial Intelligence A Modern Approach”, Stuart J. Russell & Peter Norvig –Pearson.
2.“Artificial Intelligence”, Elaine Rich, Kevin Knight & Shivashankar B Nair –McGraw Hill Education.
3. Nils J. Nilsson: “Principles of Artificial Intelligence”, Elsevier
4. T. Hastie, R. Tibshirani, J. Friedman ---The Elements of Statistical Learning, 2e, 2008.
5. C. Bishop --- Pattern Recognition and Machine Learning. 2e 2010.
6. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
7. E. Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
S. Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009

Course: AI & Machine Learning		
Subject Code - BTEC-909-D-18		
	Course Outcomes	**BT Level**
BTEC-909-D-18.1	To learn the difference between optimal reasoning Vs human like reasoning	4
BTEC-909-D-18.2	To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities	2
BTEC-909-D-18.3	To learn different knowledge representation techniques	4
BTEC-909-D-18.4	To understand the applications of AI namely, Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing	2

Biomedical Signal Processing

Subject Code- BTEC-909-E-18

Unit 1: Fundamentals of Biomedical Signal Processing (BSP) - Different types of Bioelectric signals and its basic characteristics, Sampling and aliasing, simple signal conversion systems, spectral analysis, FFT - Decimation in Time algorithm and Frequency algorithm.

Unit 2: IIR and FIR Digital Filter Design and Application - Characteristics of IIR and FIR filters, Impulse invariant method, Design of Bilinear transformation and Impulse invariant method using Butterworth technique, Design of Bilinear transformation and Impulse invariant method using Chebyshev technique, Warping and pre-warping effect, Fequency transformation, FIR filter design using windowing techniques- Rectangular, Hamming, Hanning, Blackmann Windows, Time domain filters- synchronized averaging, moving average filters.

Unit 3: Analysis of Bio-Signals for Signal Processing - P-Wave detection, QRS complex detection-derivative based method, Pan Tompkins algorithm, Template matching method, Signal averaged ECG, Analysis of heart rate variability-time domain method and frequency domain methods, Synchronized averaging of PCG envelopes, Envelogram, analysis of PCG signal, EMG signal analysis, ECG rhythm analysis, normal and ectopic ECG beats, analysis of exercise ECG, Analysis of respiration, spectral analysis of EEG signals. Multimedia Applications.

Recommended Books:

1.Rangaraj.M.Rangayyan, Biomedical signal processing, Wiley-IEEE press, 2nd edition, 2015.
2.S.Salivahnan, C.Gnanapriya, Digital signal processing, Tata McGraw-Hill, New Delhi, 2nd edition 2011.
3. John G. Proakis and DimitrisG.Manolakis, Digital signal processing, algorithms and applications, PHI of India Ltd., New Delhi, 4th edition, 2007.
4. Reddy D.C, Biomedical signal processing: Principles and techniques, Tata McGraw-Hill, New Delhi, 2nd edition, 2005.

Course: Biomedical Signal Processing		
Subject Code - BTEC-909-E-18		
	Course Outcomes	**BT Level**
BTEC-909-E-18.1	Understand the fundamentals of signal processing for various bio-signal analysis	2
BTEC-909-E-18.2	Learn the Infinite impulse response (IIR) filter and study its applications	4
BTEC-909-E-18.3	Attain in-depth knowledge about the basic concepts of finite impulse response (FIR) filter and study its applications	4
BTEC-909-E-18.4	Apply different methods of signal processing techniques in analyzing the various bio-signals such as Electro cardiogram (ECG), Electro myogram (EMG) and Phonocardiogram (PCG)	4

Indian Constitution

Subject Code- BTEC-101-18

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does nottruly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been.

recognized throughout the world and it gradually made it "as one of the strongest court in the world".

Course content

1 Meaning of the constitution law and
constitutionalism 2 Historical perspective of the
Constitution of India
3 Salient features and characteristics of the Constitution of
India 4 Scheme of the fundamental rights
5 The scheme of the Fundamental Duties and its legal status
6 The Directive Principles of State Policy–Its importance and implementation
7 Federal structure and distribution of legislative and financial powers between the Union and the States
8 Parliamentary Form of Government in India – The constitution powers and status of the President of India
9 Amendment of the Constitutional Powers and Procedure

10 The historical perspectives of the constitutional amendments in India
11 Emergency Provisions : National Emergency, President Rule, Financial Emergency 12 Local Self Government – Constitutional Scheme in India
13 Scheme of the Fundamental Right to Equality
14 Scheme of the Fundamental Right to certain Freedom under Article19 15 Scope of the Right to Life and Personal Liberty under Article21

Course Objectives: The objective of the course is to provide the basic knowledge about the Political System of the Country. The basic idea is to make the students aware of their duties and rights. Apart from it the course will aim to educate the pupils about the working of different organs of the government, various constitutional bodies and the agencies of the government. In addition to it, students will be given brief knowledge regarding the different challenges of Indian Political System, forms of Government in India and nature & dimensions of Indian Federal System. Course Pedagogy: Since the course is of Practical Importance, it is recommended that during the course students will be taken out for one visit to any place with the potential of imparting practical knowledge to the students about the Indian Political System. Such places can be Indian Parliament. State Legislative Assembly, Youth Parliament Pune. It is expected that students should be given case studies about the Indian Political System and Debates on Constitutional Issues should be organised in the campus.

Suggested Reading:

1. Indian Political System by J C Johri
2. Indian Political System by Mahendra Prasad Singh
3. Fundamentals of Indian Political System by Rajesh K Jha.
4. Our Constitution by Subhash C Kashyap
5. Our Political System by Subhash C Kashyap
6. Indian Federalism – An Introduction by Mahendra Prasad Singh
Indian Federalism and Autonomy by S Chandrasekhar

Course Outcome: After the successful completion of the course students will be to understand the different dimensions of Indian Political System. They will be aware about their duties towards the fellow citizens. Students will be able to challenges of the democratic institutions and theoretical aspects of the state and its organs.

Essence of Indian Traditional knowledge

Subject Code- BTEC-102-18

Part-1 Course objective

The course aims at imparting basis principals of thought process. Reasoning and inferencing Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit Literature are also important in modern society with rapid technological advancements and societal disruptions.

Part-1 focuses on introduction to Indian Knowledge System. Indian perspective of modern scientific world -view and basis principal of Yoga and holistic health care system.

Course Outcomes

-Ability to understand connect up and explain basics of Indian traditional Knowledge in Modern scientific perspective.
-Ability to understand connects up and explain basics of Indian traditional Knowledge in Modern scientific perspective.

Course contents

i. Basic Structure of Indian Knowledge system
ii. ii. Modern Science and Indian Knowledge system
iii. Yoga and Holistic Health Care
iv. iv. Case studies

References

- Fritz of Capra Too of Physics
- Fritz of Capra The Wave of life
- Yoga Sutra of Patanjali. Ramakrishna Mission. Kolkata.
- RN Jha Science of Consciousness Psychotherapy and Yoga Practices. Vidyanidhi Prakashan. Delhi2016
- PB Sharma (English translation) Shodashang Hridayam

Pedagogy: Problem based learning, group discussion, collaborative mini projects

Part-2 Course objective

The course aims at imparting basis principals of thought process. Reasoning and inferencing Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit Literature are also important in modern society with rapid technological advancements and societal disruptions

Part-2 focuses on Indian philosophical traditions. Indian linguistic Tradition, and Indian artistic tradition.

Course contents

i. Philosophical Tradition
ii. Indian Linguistic Tradition (Phonology, morphology, syntax and semantics)
iii. Indian Artistic Tradition
iv. Case studies

References

• V.Sivaramakrishnan (Ed.), Cultural Heritage of India-Course material, Bhartiya Vaidya Bhawan Mumbai 5th Edition 2014
• S.C Chaterjee &D.M .Datta , An introduction to Indian Philosophy ,University of Calcutta 1984.
• KS Subrahmanialyer ,Vakyapadiya of Bhattaraihari (Brahma Kanda), Deccan College Pune 1965
• VN Jha, Language Thought and Reality
• Pramod Chandra. India Arts Howard Univ. Press 1983
• Krishna Chaitanya Arts of India. Abhinav Publications. 1987
• R Nagaswamy , Foundations of Indian Art Tamil Arts Academy.2002

Pedagogy: Problem based learning, group discussion, collaborative mini projects

Project Stage - II

Subject Code- BTEC-731-18

The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up during Project-I, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned in the light of the Report prepared under EC P1;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modeling/Simulation/Design/Problem Solving/Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Prototyping or Product development/Patent and Video demonstration;
6. Preparing a paper for Conference presentation/Publication in Journals;
7. Preparing a Dissertation in the standard format for being evaluated by the Department;
8. Final Seminar Presentation before a Departmental Committee.

Mentoring and Professional Development

Subject Code- BMPD-371-18

The course shall be split in two sections i.e. outdoor activities and class activities. For achieving the above, suggestive list of activities to be conducted are:

Part – A
(Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B
(Outdoor Activities)

1. Sports/NSS/NCC

2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B

Mentors/Faculty in charges shall maintain proper record student wise of each activity conducted and the same shall be submitted to the department.

Course: Mentoring and Professional Development		
Subject Code - BMPD-371-18		
	Course Outcomes	**BT Level**
BMPD-371-18.1	Overall Personality	2
BMPD-371-18.2	Aptitude (Technical and General)	4
BMPD-371-18.3	General Awareness (Current Affairs and GK)	2
BMPD-371-18.4	Communication Skills	2