PUNJAB TECHNICAL UNIVERSITY

Scheme& Syllabus of
B. Tech. Electronics & Communication Engineering [ECE]

Batch 2011

By

Board of Studies Electronics & Communication Engineering

Third Semester **Contact Hours: 29 Hrs.**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTAM-301	Engineering Mathematics-III	4	1	-	40	60	**100**	**5**
BTCS-305	Object Oriented Programming using C++	3	1	-	40	60	**100**	**4**
BTEC-301	Analog Devices & Circuits	3	1	-	40	60	**100**	**4**
BTEC-302	Digital Circuit and Logic Design	3	1	-	40	60	**100**	**4**
BTEC-303	Network Analysis and Synthesis	3	1	-	40	60	**100**	**4**
BTEC-304	Lab Analog Devices & Circuits	-	-	2	30	20	**50**	**1**
BTEC-305	Lab Digital Circuit and Logic Design	-	-	2	30	20	**50**	**1**
BTCS-309	Lab Object Oriented Programming	-	-	4	30	20	**50**	**2**
Workshop Training *					60	40	**100**	
	TOTAL	**16**	**5**	**8**	**350**	**400**	**750**	**25**

***The marks will be awarded on the basis of 4 weeks workshop training conducted after 2nd Semester**

Fourth Semester **Contact Hours: 32 Hrs**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTEE-402	Linear Control Systems	4	1	-	40	60	**100**	**5**
BTEC-401	Analog Communication Systems	3	1	-	40	60	**100**	**4**
BTEC-402	Signal & Systems	3	1	-	40	60	**100**	**4**
BTEC-403	Electromagnetics & Antennas	4	1	-	40	60	**100**	**5**
BTEC-404	Electronic Measurement & Instrumentation	3	1	-	40	60	**100**	**4**
BTEC-405	Pulse Wave Shaping and Switching	3	1	-	40	60	**100**	**4**
BTEC-406	Lab Analog Communication Systems	-	-	2	30	20	**50**	**1**
BTEC-407	Lab Electronic Measurement & Instrumentation	-	-	2	30	20	**50**	**1**
BTEC-408	Lab Signal & Systems using MATLAB/Mentor DSP	-	-	2	30	20	**50**	**1**
General Fitness					100	NA	**100**	
	TOTAL	**20**	**6**	**6**	**430**	**420**	**850**	**29**

Fifth Semester **Contact Hours: 30 Hrs**

Course Code	Course Title	Load Allocation			Marks Distribution		Total	Credits
		L	T	P	Internal	External		
BTCS-304	Data Structures	3	1	-	40	60	**100**	**4**
BTEC-501	Digital Communication System	3	1	-	40	60	**100**	**4**
BTEC-502	Digital Signal Processing	4	1	-	40	60	**100**	**5**
BTEC-503	Linear Integrated Circuit	3	1	-	40	60	**100**	**4**
BTEC-504	Micro processors & Micro controllers.	4	1	-	40	60	**100**	**5**
BTEC-505	Lab Digital Signal Processing	-	-	2	30	20	**50**	**1**
BTEC-506	Lab Linear Integrated Circuit	-	-	2	30	20	**50**	**1**
BTEC-507	Lab Digital Communication System	-	-	2	30	20	**50**	**1**
BTEC-508	Lab Hardware Programme & Interfacing	-	-	2	30	20	**50**	**1**
Industrial Training *					60	40	**100**	**1**
	TOTAL	**17**	**5**	**8**	**380**	**420**	**800**	**26**

***The marks will be awarded on the basis of 06 weeks workshop training conducted after 4th Semester**

Sixth Semester **Contact Hours: 30 Hrs**

Course Code	Course Title	Load Allocation			Marks Distribution		Total	Credits
		L	T	P	Internal	External		
BTCS-401	Operating Systems	3	1	-	40	60	**100**	**4**
BTEC-601	Microwave & Radar Engineering	4	1	-	40	60	**100**	**5**
BTEC-602	Wireless Communication System	3	1	-	40	60	**100**	**4**
BTEC-603	Engineering Economics & Industrial Management	3	1	-	40	60	**100**	**4**
BTEC-604	VLSI Design	4	1	-	40	60	**100**	**5**
BTEC-XXX	Elective-I	3	1	-	40	60	**100**	**4**
BTEC-605	Lab VLSI	-	-	2	30	20	**50**	**1**
BTEC-606	Lab Microwave Engineering	-	-	2	30	20	**50**	**1**
General Fitness					100	NA	**100**	
	TOTAL	**20**	**6**	**4**	**400**	**400**	**800**	**28**

Seventh / Eighth Semester **Contact Hours: 30 Hrs.**

Course Code	Course Title	Load Allocation			Marks Distribution		Total	Credits
		L	T	P	Internal	External		
BTCS-403	Computer Networks	3	1	-	40	60	**100**	**4**
BTEC-701	Embedded Systems	3	1	-	40	60	**100**	**4**
BTEC-702	Optical Communication	3	1	-	40	60	**100**	**4**
BTEC-YYY	Elective-II	3	1	-	40	60	**100**	**4**
BTEC-ZZZ	Elective-III	3	1	-	40	60	**100**	**4**
BTEC-703	Lab Wireless and Optical Systems & Networks	-	-	2	30	20	**50**	**1**
BTEC-704	Lab Embedded Systems	-	-	2	30	20	**50**	**1**
BTEC-705	Major Project	-	-	6	100	50	**150**	**3**
General Fitness					100	NA	**100**	
	TOTAL	**15**	**5**	**10**	**460**	**390**	**850**	**25**

Seventh / Eighth Semester

Course Component	Internal Marks	External Marks	Total Marks
For Software Training *	150 Marks	100 Marks	250 Marks
For Industry Oriented Project Training	300 Marks	200 Marks	500 Marks

Note:
*The institution may provide training on any of the softwares from amongst

- ORCAD,
- MATLAB,
- Mentor DSP,
- MULTISIM,
- OPTSIM,
- OPTISYSTEM
- NS2
- OPNET etc.

Departmental Elective – I (Common Code XXX)

BTEC 901 Relational Data Base Management System
BTEC 902 Micro Electronics
BTEC 903 Industrial Electronics
BTEC 904 Digital System Design
BTEC 905 Intellectual property rights & patent systems
BTEC 906 Intelligent Instrumentation
BTEC 907 Information Theory & Coding

Departmental Elective –II (Common Code YYY)

BTEC 908 CMOS based design
BTEC 909 Biomedical signal processing
BTEC 910 Satellite Communication
BTEC 911 Artificial Intelligence Techniques & Applications
BTEC 912 Speech & image Processing
BTEC 913 Human Resource Management
BTEC 914 Computer organization and Architecture

Departmental Elective – III (Common Code ZZZ)

BTEC 915 Electromagnetic interference & compatibility
BTEC 916 Neural Networks & Fuzzy logic
BTEC 917 Robotics
BTEC 918 Operation Research
BTEC 919 Mobile Computing
BTEC 920 Wireless Sensor network
BTEC 921 Numerical Methods

Third Semester

BTAM301 Engineering Mathematics-III

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

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

Unit III Special Functions: Power series solution of differential equations, Frobenius method, Legendre's equation, Legendre polynomial, Bessel's equation, Bessel functions of the first and second kind. Recurrence relations, equations reducible to Bessel's equation.

Unit IV Partial Differential Equations: Formation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients.

Unit V Applications of PDEs: Wave equation and Heat conduction equation in one dimension. Two dimensional Laplace equation in Cartesian Coordinates, solution by the method of separation of variables.

Unit VI Functions of Complex Variable: Limits, continuity and derivative of the function of complex variable, Analytic function, Cauchy-Riemann equations, conjugate functions, harmonic functions; Conformal Mapping: Definition, standard transformations, translation, rotation, inversion, bilinear. Complex Integration: Line integrals in the complex plane, Cauchy's theorem, Cauchy's integral formula and derivatives of analytic function. Taylor's and Laurent's expansions (without proofs), singular points, poles, residue, Integration of function of complex variables using the method of residues.

Suggested Readings/ Books:

- Kreyszing, E., Advanced Engineering Mathematics, Eighth edition, John Wiley, New Delhi.
- Grewal, B. S., Higher Engineering Mathematics, Khanna Publishers, New Delhi.
- Ian N. Sneedon, Elements of Partial Differential Equations, McGraw- Hill, Singapore, 1957.
- Peter. V. O'Nil, Advanced Engineering Mathematics, Wadsworth Publishing Company.
- Taneja, H. C., Engineering Mathematics, Volume-I & Volume-II, I. K. Publisher.
- Babu Ram, Advance Engineering Mathematics, Pearson Education.
- Bindra, J. S., Applied Mathematics, Volume-III, Kataria Publications.
- Advanced Engineering Mathematics, O'Neil, Cengage Learning.

BTCS 305 Object Oriented Programming Using C++

Unit I Object-Oriented Programming Concepts: Introduction, comparision between procedural programming paradigm and object-oriented proramming paradigm, basic concepts of object-oriented programming — concepts of an object and a class, interface and implementation of a class, operations on objects, relationship among objects, abstraction, encapsulation, data hiding, inheritance, overloading, polymorphism, messaging.

Unit II Standard Input/Output: Concept of streams, hierarchy of console stream classes, input/output using overloaded operators >> and << and memberv functions of i/o stream classes, formatting output, formatting using ios class functions and flags, formatting using manipulators.

Unit III Classes and Objects: Specifying a class, creating class objects, accessing class members, access specifiers, static members, use of *const* keyword, friends of a class, empty classes, nested classes, local classes, abstract classes, container classes, bit fields and classes**.**

Unit IV Pointers and Dynamic Memory Management: Declaring and initializing pointers, accessing data through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory management using *new* and *delete* operators, pointer to an object, *this* pointer, pointer related problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures**.**

Unit V Constructors and Destructors: Need for constructors and destructors, copy constructor, dynamic constructors, explicit constructors, destructors, constructors and destructors with static members, initializer lists.

Unit VI Operator Overloading and Type Conversion: Overloading operators, rules for overloading operators, overloading of various operators, type conversion - basic type to class type, class type to basic type, class type to another class type.

Unit VII Inheritance: Introduction, defining derived classes, forms of inheritance, ambiguity in multiple and multipath inheritance, virtual base class, object slicing, overriding member functions, object composition and delegation, order of execution of constructors and destructors.

Unit VIII Virtual functions & Polymorphism: Concept of binding - early binding and late binding, virtual functions, pure virtual functions, abstract clasess, virtual destructors.

Unit IX Exception Handling: Review of traditional error handling, basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, rethrowing an exception, specifying exceptions.

Unit X Templates and Generic Programming: Template concepts, Function templates, class templates, illustrative examples.

Unit XI Files: File streams, hierarchy of file stream classes, error handling during file operations, reading/writing of files, accessing records randomly, updating files.

Suggested Readings/ Books:

- Lafore R., **Object Oriented Programming in C++**, Waite Group.
- E. Balagurusamy, **Object Oriented Programming with C++**, Tata McGraw Hill.
- R. S. Salaria, **Mastering Object-Oriented Programming with C++**, Salaria Publishing House.
- Bjarne Stroustrup, **The C++ Programming Language**, Addison Wesley.
- Herbert Schildt, **The Complete Reference to C++ Language**, McGraw Hill-Osborne.
- Lippman F. B, **C++ Primer,** Addison Wesley.

BTEC301 Analog Devices & Circuits

Unit I Semiconductor diode Theory of PN junction diode, Band structure of open circuited PN junction, Volt Ampere Characteristics, Temperature Dependence of PN diode, LED, LCD and Photo- diodes, Tunnel diode, Zener diode as Voltage Regulator.

Unit II Transistors, Characteristics and Biasing Transistor, Types of Transistor, Transistor current components, Transistor as an Amplifier, Transistor characteristics in CB, CE and CC modes. Operating point, bias stability, various biasing circuits, stabilization against Ico, V_{BE} and beta, Construction, Characteristics & applications of Junction Field Effect Transistor (JFET), UJT and MOSFET.

Unit III Large Signal Amplifiers: Class A direct coupled with resistive load, Transformer coupled with resistive load, harmonic distortion, variation of output power with load, Push-Pull Amplifiers, operation of class- B push-pull amplifier, crossover distortion, transistor phase inverter, complementary- symmetry amplifier.

Unit IV Feedback Amplifiers and Oscillator: Feedback Concept, Effect of negative feedback on gain, bandwidth, stability, distortion and frequency Response, Sinusoidal Oscillators, Sinusoidal oscillators; criterion for oscillation, Different types of oscillators: RC Phase Shift, Wein Bridge, Hartley, Colpitts and Crystal Oscillators. Derivation of expression for frequency and amplitude of these oscillators.

Unit V Low & High Frequency Transistor Model: Transistor Hybrid Model, h parameter equivalent circuit of transistor, Analysis of transistor amplifier using h-parameters in CB, CE and CC configuration, The high frequency T model, hybrid pi CE transistor model, hybrid pi conductance in terms of low frequency h parameters.

Suggested Readings/ Books:

- Electronic Devices & Circuits by Millman- Halkias, Tata Mcgraw Hill
- Electronic Devices & Circuits Theory by Boylested, Pearson Education.
- Electronic Fundamentals & Application, by J.D. Ryder, PHI.
- Electronic Devices, by Floyd, Pearson Education.
- Electronics Devices & Circuits by J.B.Gupta, Katson.

BTEC302 Digital Circuit and Logic Design

Unit I Number System and Binary Code: Introduction, Binary, Octal and Hexadecimal Number System (Conversion, Addition & Subtractions). Signed and unsigned numbers, Binary Subtractions using 1's and 2's compliment, ASCII code, Excess 3 code, Grey code, BCD code and BCD additions.

Unit II Minimization of logic function: OR, AND,NOT,NOR,NAND,EX-OR, EX-NOR, Basic theorem of Boolean Algebra, Sum of Products and Product of Sums, canonical form, Minimization using K-map and Q-M method.

Unit III Combinational Circuits: Introduction, Combinational circuit design, Encoders, decoders, Adders, Sub tractors and Code converters. Parity checker, seven segment display, Magnitude comparators. Multiplexers, De-multiplexer, Implementation of Combinational circuit using MUX.

Unit IV Sequential Circuits: Introduction, flip flops, Clocked flip flops, SR, JK, D, T and edge triggered flip-flops. Excitation tables of Flip flops. Shift Registers, Type of Shift Registers, Counter, Counter types, counter design with state equation and state diagrams.

Unit V D/A and A/D Converters: Introduction, Weighted register D/A converter, binary ladder D/A converter, steady state accuracy test, D/A accuracy and resolution, parallel A/D converter, Counter type A/D converter Successive approximation A/D converter. Single and dual slope A/D converter, A/D accuracy and resolution.

Unit VI Semiconductor Memories: Introduction, Memory organisation, Classification and characteristics of memories, Sequential memories, ROMs, R/W memories. Content addressable memories. PLA and PAL.

Unit VII Logic Families: RTL, DCTL, DTL, TTL, ECL, CMOS and its various types, Comparison of logic families.

Suggested Readings / Books:

- Morris Mano, **Digital Design**, Prentice Hall of India Pvt. Ltd
- Donald P.Leach and Albert Paul Malvino, **Digital Principles and Applications**, 5 ed., Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
- R.P.Jain, Modern **Digital Electronics**, 3 ed., Tata McGraw–Hill publishing Company limited, New Delhi, 2003.
- Thomas L. Floyd, **Digital Fundamentals**, Pearson Education, Inc, New Delhi, 2003
- Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, **Digital System -Principles and Applications**, Pearson Education.
- Srivastava/Srivastava/Srivastava**, Digital Design: HDL Based Approach,** Cengage Learning.
- Roth, **Fundamentals of Logic Design,** Cengage Learning

BTEC301 Network Analysis and Synthesis

Unit I Circuit Concepts: Independent and dependent sources, Signals and wave forms: Periodic and singularity voltages, step, ramp, impulse, doublet, loop currents and loop equations, node voltage and node equations, Network Theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer, and Reciprocity.

Unit II Time and Frequency Domain Analysis: Representation of basic circuits in terms of generalized frequency and their response, Laplace transform of shifted functions, transient and steady response, Time domain behaviors from poles and zeros, Convolution Theorem.

Unit III Network Synthesis: Network functions, Impedance and admittance function, Transfer functions, Relationship between transfer and impulse response, poles and zeros and restrictions, Network function for two terminal pair network, Sinusoidal network in terms of poles and zeros, Real liability condition for impedance synthesis of RL and RC circuits, Network synthesis techniques for 2-terminal network, Foster and Cauer forms.

Unit IV: Classification of filters, characteristics impedance and propagation constant of pure reactive network, Ladder network, T-section, π-section, terminating half section, Pass bands and stop bands, Design of constant-K, m-derived filters, Composite filters.

Suggested Readings/ Books:

- Bird John, *Electrical Circuit Theory and Technology*, 2nd Ed., Newnes.
- Chakraborty, Abhijit, *Circuit Theory*, 2nd Edition, Dhanpat Rai, 2001.
- Chaudhury D. Roy, *Networks and Synthesis*, New Age International.
- Edminister J.A., *Electric Circuits*, 4th Edition, Tata McGraw Hill, 2002.
- Iyer T.S.K.V., *Circuit Theory*, Tata McGraw Hill, 2006.
- Mohan, Sudhakar Sham, *Circuits and Networks Analysis and Synthesis*, 2nd Edition, Tata Mc Graw Hill, 2005.
- Van Valkenberg, M.E., *Network Analysis and Synthesis*, PHI learning, 2009.

BTEC303 Lab Analog Devices & Circuits

1. Study of Zener regulator as voltage regulator
2. Study of Half wave, full wave & Bridge rectifiers.
3. To plot the input and output characteristics of CE configuration.
4. To study the characteristics of a Class- A amplifier.
5. To study the characteristics of Class- B amplifier.
6. To study the characteristics of Class- B push-pull amplifier.
7. To study the characteristics of complementary symmetry amplifier.
8. To study the response of RC phase shift oscillator and determine frequency of oscillation.
9. To study the response of Hartley oscillator and determine frequency of oscillation.
10. To study the response of Colpitt's oscillator and determine frequency of oscillation.
11. To study the response of Wien Bridge oscillator and determine frequency of oscillation

BTEC-304 Lab Digital Circuit and Logic Design

1. Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates; Realization of OR, AND, NOT and XOR functions using universal gates.
2. Realization Half Adder / Full Adder using Logic gates.
3. Realization Half Subtractor / Full Subtractor using Logic gates
4. Design 4-Bit Binary-to-Gray & Gray-to-Binary Code Converter.
5. Design 4-Bit magnitude comparator using logic gates.Multiplexer: Truth-table verification and realization of Half adder and Full adder using MUX.
6. Demultiplexer: Truth-table verification and realization of Half subtractor and Full subtractor using DEMUX.
7. Flip Flops: Truth-table verification of RS, JK , D, JK Master Slave Flip Flops.

8. Design MOD-7 Synchronous up-counter using JK/RS/D Flip Flops.
9. Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO & Shift left operations using IC7495 chip.

BTCS 309 Object Oriented Programming Using C++ Lab

1. **[Classes and Objects]** Write a program that uses a class where the member functions are defined inside a class.
2. **[Classes and Objects]** Write a program that uses a class where the member functions are defined outside a class.
3. **[Classes and Objects]** Write a program to demonstrate the use of static data members.
4. **[Classes and Objects]** Write a program to demonstrate the use of const data members.
5. **[Constructors and Destructors]** Write a program to demonstrate the use of zero argument and parameterized constructors.
6. **[Constructors and Destructors]** Write a program to demonstrate the use of dynamic constructor.
7. **[Constructors and Destructors]** Write a program to demonstrate the use of explicit constructor.
8. **[Initializer Lists]** Write a program to demonstrate the use of initializer list.
9. **[Operator Overloading]** Write a program to demonstrate the overloading of increment and decrement operators.
10. **[Operator Overloading]** Write a program to demonstrate the overloading of binary arithmetic operators.
11. **[Operator Overloading]** Write a program to demonstrate the overloading of memory management operators.
12. **[Typecasting]** Write a program to demonstrate the typecasting of basic type to class type.
13. **[Typecasting]** Write a program to demonstrate the typecasting of class type to basic type.
14. **[Typecasting]** Write a program to demonstrate the typecasting of class type to class type.
15. **[Inheritance]** Write a program to demonstrate the multilevel inheritance.
16. **[Inheritance]** Write a program to demonstrate the multiple inheritance.
17. **[Inheritance]** Write a program to demonstrate the virtual derivation of a class.
18. **[Polymorphism]** Write a program to demonstrate the runtime polymorphism.
19. **[Exception Handling]** Write a program to demonstrate the exception handling.
20. **[Templates and Generic Programming]** Write a program to demonstrate the use of function template.
21. **[Templates and Generic Programming]** Write a program to demonstrate the use of class template.

22. **[File Handling]** Write a program to copy the contents of a file to another file byte by byte. The name of the source file and destination file should be taken as command-line arguments,
23. **[File Handling]** Write a program to demonstrate the reading and writing of mixed type of data.

Fourth Semester

BTEE 402 Linear Control Systems

Unit I Introductory Concepts: Plant, Systems, Servomechanism, regulating systems, disturbances, Open loop control system, closed loop control systems, linear and non-linear systems, time variant and invariant, continuous and sampled-data control systems, Block diagrams, some illustrative examples.

Unit II Modeling: Formulation of equation of linear electrical, mechanical, thermal, pneumatic and hydraulic system, electrical, mechanical analogies. Transfer function, Block diagram representation, signal flow graphs and associated algebra, characteristics equation.

Unit III Time Domain Analysis: Typical test – input signals, Transient response of the first and second order systems. Time domain specifications, Dominant closed loop poles of higher order systems. Steady state error and coefficients, pole-zero location and stability, Routh-Hurwitz Criterion.

Unit IV Root Locus Technique: The extreme points of the root loci for positive gain. Asymptotes to the loci, Breakaway points, intersection with imaginary axis, location of roots with given gain and sketch of the root locus plot.

Unit V Frequency Domain Analysis: Closed loop frequency response, Bode plots, stability and loop transfer function. Frequency response specifications, Relative stability, Relation between time and frequency response for second order systems. Log. Magnitude versus Phase angle plot, Nyquist criterion for stability.

Unit VI Compensation: Necessity of compensation, series and parallel compensation, compensating networks, applications of lag and lead-compensation.

Unit VII Control Components: Error detectors – potentiometers and synchros, servo motors, a.c. and d.c. techno generators, Magnetic amplifiers.

Suggested Readings / Books

- Dorf Richard C. and Bishop Robert H., *Modern Control System*, Addison –Wesley, Pearson New Delhi
- Ogata K., *Modern Control Engineering*", Prentice Hall,
- Kuo B. C., *Automatic Control System*", Prentice Hall
- Nagrath I.J. and Gopal M., *Control System Engineering*, Wiley Eastern Ltd.
- Singh / Janardhanan, Modern Control Engineering, Cengage Learning
- Kilian, Modern Control Technology: Components and Systems, Cengage Learning

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BTEC 401 Analog Communication Systems

Unit I Base Band Signals and Systems: Introduction, Elements of communication system, Noise & its types; Noise Figure & noise factor, Noise equivalent temperature. Modulation & Demodulation, Mixing; Linear & Nonlinear, need of modulation, types of modulation systems, basic transmission signals, Frequency multiplexing technique.

Unit II Analog Modulation Techniques: Introduction, theory of amplitude modulation; AM power calculations, AM current calculations, AM modulation with a complex wave, theory of frequency modulation; mathematical analysis of FM, spectra of FM signals, narrow band of FM, Wide band FM, Theory of phase

modulation, phase modulation obtained from frequency modulation, comparison of AM & FM, Comparison of PM & FM.

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

Unit IV AM Reception: Receiver Parameters; Selectivity, Sensitivity, Fidelity, Tuned Ratio Frequency (TRF) Receiver, Super heterodyne Receiver; Basic elements of AM super heterodyne Receiver; RF Amplifier, Neutralization of RF Amplifiers, Class of operation of RF Amplifiers, High power RF Amplifiers, Image Frequency Rejection, Cascade RF Amplifier, methods of increasing Bandwidth, frequency Conversion and Mixers; Additive Mixing, Bipolar Transistor Additive Mixer, self exicted Additive Mixers, multiplicative mixing, Multiplicative Mixer using dual gate MOSFET, Tracking & Alignment, IF Amplifier, AM detector; square law detector, Envelope or Diode detector, AM detector with AGC, Distortion in diode detectors, AM detector Circuit using Transistor, Double hetro-dyne receiver, AM receiver using a phase locked loop (PLL), AM receiver characteristics.

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

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

Unit VII SSB Transmission: Introduction, Single Side band systems, AM-SSB; Full carrier, Suppressed carrier , reduced carrier, Independent side band, and Vestigial side band, Comparison of SSB Transmission to conventional AM, Generation of SSB; Filter method, Phase Shift Method, Third Method.

Unit VIII SSB Reception: SSB Product Demodulator, Balanced Modulator as SSB Demodulator, Single Side band receivers; Single side band BFO Receivers, Coherent Single side band BFO Receivers, Single Side band Envelop detection receiver, Multi Channel Pilot Carrier SSB Receiver.

Unit IX Pulse Modulation Transmissions and Reception: Introduction, Sampling Theorem Pulse Amplitude Modulation (PAM), Natural PAM Frequency Spectra for PAM , Flat-top PAM, Sample and hold circuits, Time division Multiplexing, PAM Modulator Circuit, Demodulation of PAM Signals, Pulse Time Modulation (PTM); Pulse Width Modulation(PWM), Pulse Position Modulation (PPM), PPM Demodulator.

Suggested / Recommended Books:

- Electronic communication Systems by Kennedy & Davis, Tata Mcgraw Hill.
- Analog Communication Systems by Manoj Kumar & Manisha, Satya Prakashan, New Delhi, 2nd Edition.
- Electronic Communication System, Tomasi, Pearson Education.
- Electronic Communication, Roddy, Pearson Education.
- Analog Communication Systems by Symon Hykens, John Wiley & Sons .
- Principles of Communication System, Taub & Schilling, Tata Mc-Graw Hill.

BTEC402 Signals & Systems

Unit I Classification of Signals and Systems: Continuous time signals (CT signals), discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals - periodic & aperiodic, random &deterministic signals, Even& Odd Signals, Energy & Power Signals, Description of continuous time and discrete time systems.

Unit II Analysis of Continuous Time Signals: Fourier series analysis, Spectrum of C.T. signals, Fourier Transform and its properties in Signal Analysis, Power Spectral Density and Energy spectral density.

Unit III Linear Time Invariant –Continuous Time Systems: Linear Time invariant Systems and their properties. Differential equation & Block diagram representation, Impulse response, Convolution integral, Frequency response (Transfer Function), Fourier transforms analysis.

Unit IV Analysis of Discrete Time Signals: Sampling of CT signals and aliasing, DTFT and its properties, Z-transform and properties of Z-transform.

Unit V Linear Time Invariant - Discrete Time System: Difference equations, Block diagram representation, Impulse response, Convolution sum, LTI systems analysis using DTFT and Z-transforms.

Unit VI Random Signal Theory: Introduction to probabilities, Definition, probability of Random events, Joint and conditional probability, probability Mass function statistical averages. Probability density functions and statistical averages. Examples of P.D. function, transformation of random variables random processes, stationary, True averages and Ergodic.

Suggested Readings / Books:

- Signals and Systems by Allan V.Oppenheim, S.Wilsky and S.H.Nawab, Pearson Education.
- Fundamentals of Signals and Systems by Edward W Kamen & Bonnie's Heck, Pearson Education.
- Communication Signals & System by Simon Haykins, John Wiley & Sons.
- Signals and Systems by H P Hsu, Rakesh Ranjan, Schaum's Outlines, Tata McGraw Hill.
- Digital Signal Processing by S Salivahanan, A. Vallavaraj, C. Gnanapriya, McGraw Hill International.
- Signals and Systems by Simon Haykins and Barry Van Veen, John Wiley & sons, Inc.
- Signal, System & Transforms, Phillips, Pearson Education.
- Roberts, Signals & Linear Systems, by Robert A. Gabel and Richard A., John Wiley.
- Signals & systems, by Rodger E. Ziemer, William H. Tranter, D. Ronald Fannin. Pearson Education.

BTEC403 Electromagnetics & Antennas

Unit I Electromagnetic Waves: Maxwell's equations in differential and integral forms Wave equation and its solution in different media, polarization. Plane wave propagation in a dielectric medium, Reflection and transmission of an EM waves. Surface impedance, Poynting theorem.

Unit II Waveguides and Transmission Lines: Waves between parallel planes. TE, TM and TEM Waves, velocities of propagation, Attenuation in parallel plane guides, wave impedance. Circuit representation of parallel plane transmission lines. Low loss transmission lines. Distortion less condition. Smith charts. Rectangular and circular wave guides. Wave impedance and characteristics impedances. Transmission line analogy for wave guides.

Unit III Antennas: introduction, concept of radiation in single wire, two wire, and dipole, Antenna parameters, Retarded potential, infinitesimal dipole. Current distribution of short dipole and half wave dipole, Far-field, Radiating near-field and reactive near-field region, Monopole and Half wave dipole.

Unit IV Antenna Arrays: 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, Analysis of Binomial and Dolph-Tschebysceff array, Scanning Array, Super directive array.

Unit V Aperture Antennas: Field Equivalence principle, Rectangular and circular aperture antennas, Horn antenna, Babinet's Principle, Slot Antenna, Reflector antenna.

Unit VI Wave Propagation: Free space equation, Reflection from earth's surface, Surface and Space wave propagation, Range of space wave propagation, Effective earth's radius, Duct propagation, Troposphere propagation. Structure of ionosphere, propagation of radio waves through ionosphere, Critical frequency, Maximum usable frequency, Optimum working frequency, lowest usable high frequency, virtual height, Skip Distance, Effect of earth's magnetic field.

Suggested Readings / Books:

- Electromagnetics and radiating systems, Jordan E.C., PHI.
- Antenna Theory, Balanis C.A, John Wiley & sons.
- Antenna and wave propagation, R.L.Yadava, PHI
- Problem and solutions in electromagneics, W H Hayt and J A buck, Tata McGraw Hill
- Antenna Theory, Krauss J.D., McGraw Hill.
- Shen/Kong/Patnaik, Engineering Electromagnetics, Cengage Learning.

BTEC-404 Electronics Measurements and Instrumentation

Unit I Fundamentals: Generalized instrumentation system – Units and Standards, Calibration Methods, Standards of measurements, Classification of errors, error analysis. Static Characteristics- Accuracy, Precision, sensitivity, linearity, resolution, hysteresis, threshold, input impedance, loading effects etc. Dynamic Characteristics.

Unit II Electronic Meters: Electronic Analog voltmeter: DC voltmeters-Choppers type-DC amplifier, solid state voltmeter, Differential voltmeter, peak responding voltmeter, True RMS voltmeter, calibration of DC voltmeters. Digital Voltmeter:- Introduction, Ramp Techniques, dual slope, integrating type DVM, Successive approximation type DVM, Resolution and sensitivity of digital meters, general specification of a DVM. CRO's

study of various stages in brief, measurement of voltage, current phase and frequency, special purpose oscilloscope.

Unit III Measuring Instruments: Principle of operation of galvanometer, PMMC, Moving Iron instruments, Resistance measurements using Wheatstone bridge, Kelvin Double Bridge, Ohm meter, AC bridges: Maxwell bridge, Maxwell wein bridge, Hey's Bridge, Schering Bridge, Anderson Bridge, Campbell Bridge.

Unit IV Instrumentation for Generation and Analysis of Waveforms: Signal generators: Fixed and variable AF oscillators, AF sine and square wave generator, Function generator: Square and pulse generator, Sweep generator, wave analyzer, harmonic distortion analyzer, spectrum analyzer, spectrum analysis.

Unit V Storage and Display Devices: Necessity of recorders, recording requirements, graphic recorders, strip chart recorders, magnetic tape recorders, digital tape recorders. Electronic indicating instruments, seven segment display, fourteen segmental display Nixie tube.

Unit VI Transducers and DATA Acquisition Systems: Strain gauge, LVDT, thermocouple, piezoelectric, crystal and photoelectric transducers and their applications. Data acquisition systems.

Unit VII Telemetry: Introduction, method of data transmission, types of telemetry systems and applications.

Suggested Readings / Books:

- Electrical and Electronic Measurements and Instrumentation, by K. SAWHNEY.
- Electronic Instrumentation and Measurement Techniques, by D Cooper.
- Electronic Instrumentation, by H.S. Kalsi, Tata McGraw Hill
- Applied Electronics Instrumentation and measurement, David Buchla, Wayne Melachlan:
- Electronics Measurement and Instrumentation,Oliver by B.H and Cag J.M. McGrawHill.
- Element of Electronic Instrumentation & Measurment, by Carr, Pearson Education.
- Electronic Measurments & Instrumentation, by Kishore, Pearson Education.
- Process Control Systems and Instrumentation, Bartelt, Cengage Learning

BTEC405 Pulse Wave Shaping and Switching

Unit I Introduction to Basic Elements and Waveforms: Passive and Active circuit elements, AC through inductor and capacitor, AC through Resistor-inductor and resistor-capacitor in series, Series and parallel resonance circuit, Different input signals, Average and RMS value.

Unit II Bistable Multivibrators: Role of feedback in electronic circuits, Fixed bias and self-bias bistable multivibrator, Speed-up Capacitors, unsymmetrical and symmetrical triggering, Application of Trigger input at the base of OFF Transistor, Application of Trigger input at the base of ON Transistor, Bisatble multivibrator as T Flip-Flop, Schmitt trigger circuit, Calculation of Upper Tripping Point and Lower Tripping Point.

Unit III Monostable and Astable Multivibrators: Collector Couple and Emitter Coupled Monostable multivibrator, Expression for Gate width, Astable Collector coupled and emitter coupled multivibrator, complementary Transistor Astable multivibrator.

Unit IV Switching Characteristics of Devices: Diode and transistor as electronic switch, Breakdown mechanism in diode, Effect of temperature on diode, Charge storage phenomena, Switching times in diode and transistor, Delay time, Rise time, Storage time and fall time, Use of Schotkey diode for reducing storage time.

Unit V Linear Wave Shaping: Low pass RC Network, Response to standard waveforms circuits, Integrator High Pass RC circuits, Response to standard waveforms, Differentiator, Double differentiation, Attenuator.

Unit VI NON- Linear Wave Shaping: Clipping circuits (diode & transistor), Diode comparators, Transistor differential comparator, Operational amplifier comparator, clamping circuits, Practical clamping circuit, clamping circuit theorem.

Suggested Readings / Books:

- Pulse and Digital Switching Circuits by Milliman, Taub; Tata Mcgraw Hill
- Pulse and Digital Circuits by Mothiki S. Prakash Rao; Tata Mcgraw Hill
- Pulse & Digital Circuits, by Rao K, Pearson Education.
- Switching Theory & Logic Design, by Rao , Pearson Education.
- Wave Generation and Shaping by Strauss McGraw Hill.
- Pulse and Switching Circuits by Sanjeev Kumar; Dhanpat Rai & Company

BTEC406 LAB Analog Communication Systems

- Generation of DSB & DSB-SC AM signal using balanced modulator & determine modulation Index & detection of DSB using Diode detector.
- Generation of SSB AM signal & detection of SSB signal using product detector.
- To generate a FM Signal using Varactor & reactance modulation.
- Detection of FM Signal using PLL & foster seelay & resonant detector.
- To Study Super heterodyne AM receiver and measurement of receiver parameters viz. sensitivity, selectivity & fidelity.
- To study the circuit of PWM & PPM modulator & Demodulator
- Study of Frequency Division Multiplexing / Demultiplexing with sinusoidal & audio inputs Using DSBSC.
- Generation & study of Analog TDM at least 4 channels.
- Sampling Theorem & Reconstruction of Signal from its samples using Natural Sampling, Flat Top Sampling & Sample & Hold Circuits & effect of duty cycle.
- To draw & study Polar plots & polarization of Helical, Ground plane, Yagiuda & dipole Antenna & calculate Antenna gain, Antenna beam width, Element current & Front-back ratio of antenna.
- To study Antenna matching using stubline.
- To study a transmission line attenuation & frequency characteristics.

BTEC407 Electronic Measurement & Instrumentation

- Measurement of Inductance by Maxwell's Bridge.
- Measurement of small resistance by Kelvin's Bridge.
- Measurement of Capacitance by Schering Bridge.
- Measurement of Frequency by Wein Bridge.
- Measurement of medium resistance by Wheat Stone's Bridge.
- Determination of frequency & phase angle using C.R.O.
- To find the Q of a coil using LCR-Q meter.
- To determine output characteristic of a LVDT and determine its sensitivity.
- Study characteristics of temperature transducer like Thermocouple, Thermistor and RTD with implementation of small project using signal conditioning circuit.
- Study characteristics of Light transducer like Photovoltaic cell, Phototransistor and Pin Photodiode with implementation of small project using signal conditioning circuit.
- To study input- output characteristics of a potentiometer and to use two potentiometers as an error detector.
- To study transmitter- receiver characteristics of a synchro set to use the set as control component.
- To study the operation of a d-c positional servo system and to investigate the effect of damping and supply voltage on its response.
- To study the operation of an a.c. position servo-system and to obtain effects of supply voltage and system parameter on its transient response.
- To study a stepper motor and control its direction speed and number of steps with the help of a microprocessor.

BTEC408 Lab Signal & Systems Using MATLAB / MENTOR DSP

- Generation of continuous and Discrete Unit step signal.
- Generation of exponential and Ramp Signal in Continuous and Discrete Domain.
- Continuous and Discrete time Convolution.
- Adding and subtracting two Given Signals (Continues as well as Discrete Signals)
- To generate a random binary wave.
- To Generate a Random Sequences with arbitrary distribution, means and Variances for following:
- Rayleigh Distribution
- Uniform distribution
- Gaussian distribution.
- To Plot Probability density functions. Find Mean and Variance for the above distribution

- To study Power Spectrum Density
- To study Difference Equation to develop elementary signal function modules (m-files) for unit sample, unit step, exponential and unit ramp sequences.
- To develop program modules based on operation on sequences like signal shifting, signal folding, signal addition and signal multiplication.
- To develop program for discrete convolution and correlation .
- To develop program for finding response of the LTI system described by the difference equation.
- To develop program for computing inverse Z-transform.