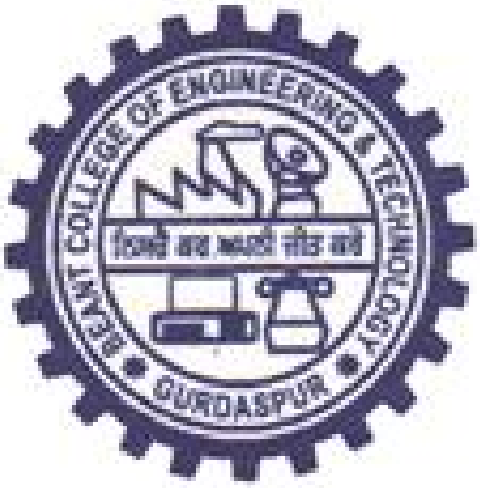
BEANT COLLEGE OF ENGINEERING & TECHNOLOGY, GURDASPUR

Scheme& Syllabus of
B. Tech.
Electronics & Communication Engineering [ECE]
Batch 2015 onwards

BCET



Department of Academics
BEANT COLLEGE OF ENGINEERING & TECHNOLOGY
GURDASPUR

B. Tech 3rdSem ECE **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	3	1	-	40	60	100	4
BTCS-305	Object Oriented Programming using C++	3	1	-	40	60	100	4
BTEC-301	Analog Devices & Circuits	4	1	-	40	60	100	5
BTEC-302	Electronic Measurement and Instrumentation	4	1	-	40	60	100	5
BTEC-303	Network Analysis and Synthesis	4	1	-	40	60	100	5
BTEC-304	Lab Analog Devices & Circuits	-	-	2	30	20	50	1
BTEC-305	Lab Electronic Measurement and Instrumentation	-	-	2	30	20	50	1
BTCS-309	Lab Object Oriented Programming	-	-	2	30	20	50	1
BTEC-306	Institutional Practical Training *				60	40	100	1
TOTAL		18	5	6	350	400	750	27

*The marks will be awarded on the basis of 04 weeks Institutional Practical Training conducted after 2nd Semester

B. Tech 4th Semester ECE **Contact Hours: 29 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	4	1	-	40	60	100	5
BTEC-402	Pulse wave shaping and Switching	3	1	-	40	60	100	4
BTEC-403	Digital Circuit & Logic Design	3	1	-	40	60	100	4
BTEC-404	Linear Integrated Circuit	4	1	-	40	60	100	5
BTEC-405	Lab Analog Communication Systems	-	-	2	30	20	50	1
BTEC-406	Lab Digital Circuit & Logic Design	-	-	2	30	20	50	1
BTEC-407	Lab Linear Integrated Circuit	-	-	2	30	20	50	1
BTGF-400	General Fitness				100	NA	100	1
TOTAL		18	5	6	390	360	750	27

B. Tech 5th Semester ECE **Contact Hours: 28 Hrs.**

Course Code	Course Title	Load Allocation			Marks Distribution		Total	Credits
		L	T	P	Internal	External		
BTEC-501	Digital Communication System	3	1	-	40	60	100	4
BTEC-502	Digital Signal Processing	4	1	-	40	60	100	5
BTEC-503	Micro processors & Micro controllers	4	1	-	40	60	100	5
BTEC-504	Electromagnetics and Antennas	4	1	-	40	60	100	5
	Open Elective-I	3	-	-	40	60	100	3
BTEC-505	Lab Digital Communication System	-	-	2	30	20	50	1
BTEC-506	Lab Digital Signal Processing	-	-	2	30	20	50	1
BTEC-507	Lab Hardware Programme& Interfacing	-	-	2	30	20	50	1
BTEC-508	Industrial Training *				60	40	100	1
TOTAL		18	4	6	350	400	750	26

*The marks will be awarded on the basis Industrial Training conducted after 4th Semester

B. Tech 6thSem ECE **Contact Hours: 28 Hrs.**

Course Code	Course Title	Load Allocation			Marks Distribution		Total	Credits
		L	T	P	Internal	External		
BTEC-601	Microwave & Radar Engineering	4	1	-	40	60	100	5
BTEC-602	Wireless Communication System	4	1	-	40	60	100	5
BTEC-603	Embedded System	4	1	-	40	60	100	5
	Open Elective-II	3	-	-	40	60	100	3
BTEC-XXX	Dept. Elective -I	3	1	-	40	60	100	4
BTEC-604	Lab Microwave Engineering	-	-	2	30	20	50	1
BTEC-605	Lab Embedded System	-	-	2	30	20	50	1
BTEC-606	Minor Project*	-	-	2	30	20	50	1
BTGF-600	General Fitness				100	NA	100	1
TOTAL		18	4	6	390	360	750	26

*The project work will be carried out in parts as minor project in 6th semester and major project in 7th/8th semester. The literature survey, problem formulation, assessment for viability of project, objectives and methodology for the project shall be decided in 6th semester. The same project problem is to be extended in the major project in 7th/8th semester. The minor project may be carried out by a group of students (2 to 3 students).

B. Tech 7th Semester ECE **Contact Hours: 30 Hrs.**

Course Code	Course Title	Load Allocation			Marks Distribution		Total	Credits
		L	T	P	Internal	External		
BTCS-403	Computer Network-1	3	1	-	40	60	100	4
BTEC-701	Digital System Design	3	1	-	40	60	100	4
BTEC-702	Optical Communication	3	1	-	40	60	100	4
BTEC-YYY	Dept. Elective -II	3	1	-	40	60	100	4
BTEC-ZZZ	Dept. Elective -III	3	1	-	40	60	100	4
BTEC-703	Lab Wireless and Optical Systems & Networks	-	-	2	30	20	50	1
BTEC-704	Lab Digital System Design	-	-	2	30	20	50	1
BTEC-705	Major Project**		-	6	100	50	150	3
BTGF-800	General Fitness				100	NA	100	1
TOTAL		15	5	10	460	390	850	26

**The problem of major project formulated during the 6th semester is to be extended and executed in major project by the same group of students in the 7th/8th semester. However under special circumstances HOD may allow the change of project title on the recommendation of project guide in the start of the semester. The design/construction/fabrication/ computer modeling/experimentation etc. is to be carried out. The result and analysis followed by discussion regarding sustainability/non-sustainability of the project or any positive gain in the project made with conclusions and recommendations for future extension of project must be covered.

B. Tech 8th Semester ECE

Industrial Training (One semester)	**Course Component**	**Internal Marks**	**External Marks**	**Total Marks**	**Credits**
BTEC-801	Industrial Training#	**450**	**300**	**750**	**24**

The students are required to undergo Industrial Training atleast 36 hrs/week during the semester.

Departmental Elective – I (Common Code XXX)

BTEC-911 Relational Data Base Management System
BTEC-912 Micro Electronics
BTEC- 913 Industrial Electronics
BTEC- 914 VLSI
BTEC- 915 Intellectual property rights & patent systems
BTEC-916 Intelligent Instrumentation
BTEC- 917 Information Theory& Coding

Departmental Elective –II (Common Code YYY)

BTEC- 931 CMOS based design
BTEC- 932 Biomedical signal processing
BTEC- 933 Satellite Communication
BTEC- 934 Artificial Intelligence Techniques & Applications
BTEC- 935 Speech & image Processing
BTEC- 936 Human Resource Management
BTEC- 937 Computer organization and Architecture

Departmental Elective – III (Common Code ZZZ)

BTEC- 941 Electromagnetic interference & compatibility
BTEC- 942 Neural Networks & Fuzzy logic
BTEC- 943 Robotics
BTEC- 944 Operation Research
BTEC- 945 Mobile Computing
BTEC- 946 Wireless Sensor network
BTEC- 947 Numerical Methods

Open Electives to be Offered to other departments

Open Elective-I

BTEC- -951 Electronics Measurements & Instrumentation
BTEC- -952 Reliability Engineering

Open Elective-II

BTEC-961 Principles of Communication Engineering
BTEC- 962 Micro-Controllers & Embedded Systems

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List of Open electives to be offered by other departments to the 5th semester ECE students

Course Code	Subject Name
BTAS-951	Physics of Nano Materials
BTAS-952	Advance Engineering Mathematics
BTAS-953	Entreprenurship Development
BTBT-951	Industrial waste management
BTBT-952	Bioinformatics
BTCH-951	Corrosion Engineering
BTCH-952	New & Renewable Energy Sources
BTCS-951	Data Structures
BTCS-952	Web Technologies
BTCS-953	Information Security
BTIT-951	Concept of Computer and Networking
BTIT-952	Operating System
BTME-951	Industrial Safety and Environment
BTME-952	Energy Conservation and Management

List of Open electives to be offered by other departments to the 6th semester ECE students

Course Code	Subject Name
BTAS-961	Human Resource Management
BTBT-961	Biomedical Instrumentation
BTBT-962	Human Disease and Control
BTCH-961	Environment Impact Assessment
BTCH-962	Hydrocarbon Engineering
BTCS-961	Computer Networks - I
BTCS-962	Operating systems
BTCS-963	Microprocessor and Assembly Language Programming
BTCS-964	Software Engineering
BTME-961	Entrepreneurship
BTME-962	Management Information System
BTME-963	Material Management
BTIT-961	Programming in Java
BTIT-962	Software Engineering

For B.Tech.(ECE) BCET Gurdaspur,Batch 2015 & Onwards,
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Third Semester

BTAM-301 Engineering Mathematics - III

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Internal Marks: 40
External Marks: 60
Total Marks: 100

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

Unit I Fourier Series:

Periodic functions, Euler's formula. Even and odd functions,half range expansions, Fourier series of different wave forms. (6)

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 equation. (8)

Unit III Special Functions:

Power series solution. of differential equations, Frobeniusmethod, Legendre's equation, Legendre polynomial, Bessel's equation, Bessel functions of the first and second kind. Recurrence relations, equations reducible to Bessel's equation. (8)

Unit IV Partial Differential Equations:

Formation of partial differential equations,Linear partial differential equations, homogeneous partial differential equations with constant coefficients,Solution by the method of separation of variables. (8)

Unit V Functions of Complex Variable:

Limits, continuity and derivative of thefunction of complex variable, Analytic function, Cauchy-Riemann equations, conjugate functions, harmonic functions; Conformal Mapping: Definition, standard transformations, translation, rotation, inversion, bilinear. (6)

Suggested Readings / Books:

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

BTCS-305 OBJECT ORIENTED PROGRAMMING USING C++

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Internal Marks: 40
External Marks: 60
Total Marks: 100

Objectives: To understand the basic concepts of object oriented programming languages and to learn the techniques of software development in C++.

Object-Oriented Programming Concepts:
Introduction, comparison between procedural programmingparadigm and object-oriented programming 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. **(**5)

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. **(**4)

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. (4)

Pointers and Dynamic Memory Management:
Declaring and initializing pointers, accessing data throughpointers, 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**.** (6)

Constructors and Destructors:
Need for constructors and destructors, copy constructor, dynamicconstructors, explicit constructors, destructors, constructors and destructors with static members, initialize lists. **(**2)

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.**(**4)

Inheritance:
Introduction, defining derived classes, forms of inheritance, ambiguity in multiple and multipathinheritance, virtual base class, object slicing, overriding member functions, object composition and delegation, order of execution of constructors and destructors. **(**5)

Virtual functions & Polymorphism:
Concept of binding - early binding and late binding, virtual functions, pure virtual functions, abstract classes, virtual destructors. (3)

Exception Handling:
Review of traditional error handling, basics of exception handling, exception handlingmechanism, throwing mechanism, catching mechanism, reshowing an exception, specifying exceptions. (2)

Templates and Generic Programming:
Template concepts, Function templates, class templates, illustrativeexamples. (2)

Files:
File streams, hierarchy of file stream classes, error handling during file operations, reading/writing of files, accessing records randomly, updating files. (3)

Suggested Readings/ Books:

1. Lafore R., Object Oriented Programming in C++, Waite Group.
2. E. Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill.
3. R. S. Salaria, Mastering Object-Oriented Programming with C++, Salaria Publishing House.
4. BjarneStroustrup, The C++ Programming Language, Addison Wesley.
5. Herbert Schildt, The Complete Reference to C++ Language, McGraw Hill-Osborne.
6. Lippman F. B, C++ Primer, Addison Wesley.
7. Farrell- Object Oriented using C++,Cengage Learning.

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BTEC-301 ANALOG DEVICES & CIRCUITS

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Internal Marks: 40
External Marks: 60
Total Marks: 100

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. (6)

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, VBE and beta, Construction, Characteristics & applications of Junction Field Effect Transistor (JFET), UJT and MOSFET. (11)

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. (9)

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. (10)

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. (4)

Suggested Readings/ Books: ·

1. Electronic Devices & Circuits by Millman- Halkias, Tata Mcgraw Hill
2. Electronic Devices & Circuits Theory byBoylested, Pearson Education.
3. Electronic Fundamentals & Application, by J.D. Ryder, PHI.
4. Electronic Devices, by Floyd, Pearson Education.
5. Electronics Devices & Circuits by J.B.Gupta, Katson.

BTEC-302 ELECTRONICS MEASUREMENTS AND INSTRUMENTATION

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Internal Marks: 40
External Marks: 60
Total Marks: 100

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. (7)

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. (8)

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.
(8)

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. (5)

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. (6)

Unit VI Transducers and DATA Acquisition Systems:

Strain gauge, LVDT, thermocouple, piezoelectric, crystal and photoelectric transducers and their applications. Data acquisition systems. (8)

Unit VII Telemetry:

Introduction, method of data transmission, types of telemetry systems and applications. (3)

Suggested Readings / Books:

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

BTEC-303: NETWORK ANALYSIS & SYNTHESIS

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Internal Marks: 40
External Marks: 60
Total Marks: 100

Unit I

Circuit Concepts:

Introduction toIndependent and dependent sources, Loop and Mesh Analysis of D.C and A.C Networks, Network Theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer, Reciprocity &Tellegan Theorem. Applications of Theorems for the analysis of DC & AC network.(13)

Unit II

Steady Stae& Transient Analysis:

Introduction to Signals: Step Signal, Ramp Signal, Impulse Signal,Exponential Signal. Shifted Signals.Synthesis of Gate Signals & Triangular Signals in terms of Step & Ramp Signals. Unit ImpuseTrain.Laplace Transform of Functions& Signals, Inverse Laplace Transform. Application of Laplace Transform for finding transient and steady response of Networks subjected to different input signals like D.C Signal, Gate Signal, Triangular Signal. (12)

Unit III

Network Synthesis:

Network functions;Impedance and admittance functions, Transfer functions. Relationship between transfer & impulse response, poles and zeros and restrictions for network functions and transfer functions. Hurwitz Polynomail, Positive Real Functions. Realizability condition for synthesis of LC,RL and RC circuits, Foster and Cauer synthesis of LC, RL & RC networks. (11)

Unit IV

Passive Filters:

Classification of passive filters, characteristics impedance and propagation constant of pure reactive network, Ladder network, T-section, π-section, Pass bands and stop bands, Design of constant-K, m-derived filters & Composite filters. (9)

Suggested Readings/ Books:

1. Van Valkenberg, M.E., *Network Analysis and Synthesis*, PHI learning.
2. Mohan, Sudhakar Sham, *Circuits and Networks Analysis and Synthesis*, Tata McGraw Hill.
3. Chakraborty, Abhijit, *Circuit Theory*, 2nd Edition, DhanpatRai.
4. Chaudhury D. Roy, *Networks and Synthesis*, New Age International.
5. Edminister J.A., *Electric Circuits*,Tata McGraw Hill.
6. Iyer T.S.K.V., *Circuit Theory*, Tata McGraw Hill.

BTEC-304 LAB ANALOG DEVICES & CIRCUITS

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Internal Marks: 30
External Marks: 20
Total Marks: 50

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

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BTEC-305 ELECTRONIC MEASUREMENT & INSTRUMENTATION

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Internal Marks: 30
External Marks: 20
Total Marks: 50

1. Measurement of Inductance by Maxwell's Bridge.
2. Measurement of small resistance by Kelvin's Bridge.
3. Measurement of Capacitance by Schering Bridge.
4. Measurement of Frequency by Wein Bridge.
5. Measurement of medium resistance by Wheat Stone's Bridge.
6. Determination of frequency & phase angle using C.R.O.
7. To find the Q of a coil using LCR-Q meter.
8. To determine output characteristic of a LVDT and determine its sensitivity.
9. Study characteristics of temperature transducer like Thermocouple, Thermistor and RTD with implementation of small project using signal conditioning circuit.
10. Study characteristics of Light transducer like Photovoltaic cell, Phototransistor and Pin Photodiode with implementation of small project using signal conditioning circuit.
11. To study input- output characteristics of a potentiometer and to use two potentiometers as an error detector.
12. To study transmitter- receiver characteristics of a synchro set to use the set as control component.

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BTCS-309 OBJECT ORIENTED PROGRAMMING USING C++ LAB

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Internal Marks: 30
External Marks: 20
Total Marks: 50

OBJECTIVES: Hands on experience of Object Oriented Programming Concepts with C++, Preparedness to study independently any other Object Oriented Programming language and apply to variety of real time problem scenarios

1. **[Classes and Objects]** Write a program that uses a class where the member functions are definedinside a class.
2. **[Classes and Objects]** Write a program that uses a class where the member functions are definedoutside 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 andparameterized 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 anddecrement 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 managementoperators.
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. Thename 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.
24. **[File Handling]** Write a program to demonstrate the reading and writing of objects.

COURSE OUTCOMES (CO): The student is expected to:

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

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For B.Tech.(ECE) BCET Gurdaspur,Batch 2015 & Onwards,
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Beant College of Engineering & Technology, Gurdaspur

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Fourth Semester

BTEE- 402 LINEAR CONTROL SYSTEMS

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4 1 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

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. (2)

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. (8)

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. (10)

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.
(9)

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. (9)

Unit VI

Compensation:
Necessity of compensation, series and parallel compensation, compensating networks, applications of lag and lead-compensation. (4)

Unit VII

Control Components: Error detectors – potentiometers and synchros, servo motors, a.c. and d.c. techno generators, Magnetic amplifiers. (3)

Suggested Readings / Books

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

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BTEC-401 ANALOG COMMUNICATION SYSTEMS

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Internal Marks: 40
External Marks: 60
Total Marks: 100

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.

(4)

Unit II Analog Modulation Techniques:

Introduction, theory of amplitude modulation; AM powercalculations, 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 phasemodulation, phase modulation obtained from frequency modulation, comparison of AM & FM, Comparison of PM & FM.

(5)

Unit III AM Transmission & Reception:

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

Receiver Parameters; Selectivity, Sensitivity, Fidelity, Tuned Ratio Frequency (TRF) Receiver, Super heterodyne Receiver; Basic elements of AM super heterodyne Receiver; RF 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.

(13)

Unit IV FM Transmission & Reception:

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

Frequency demodulators, Tuned circuit frequency discriminators; Slope Detector, Balance Slope Detector, Foster Seeley discriminator, Ratio Detector, FM detection using PLL, Zero crossing detector as a Frequency Demodulator, quadrature FM demodulator, pre emphasis and de emphasis, limiter circuits, FM Capture effect, FM receiver, FM stereo transmission and reception, Two way FM Radio Transmitter and Receiver. (9)

Unit V SSB Transmission & Reception:

Introduction, Single Side band systems, AM-SSB; Full carrier, Suppressed carrier , reduced carrier, Independent side band, and Vestigial side band, Comparison of SSB Transmission to conventional AM, Generation of SSB; Filter method, Phase Shift Method, Third Method. SSB Product Demodulator, Balanced Modulator as SSB Demodulator, Single Side band receivers; Single side band BFO Receivers, Coherent Single side band BFO Receivers, Single Side band Envelop detection receiver, Multi Channel Pilot Carrier SSB Receiver. (9)

Unit VI 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. (5)

Suggested / Recommended Books:

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

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BTEC-402: PULSE WAVE SHAPING AND SWITCHING

L T P
3 1 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

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. (6)

Unit II: 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.(7)

Unit III: 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. (5)

Unit IV: Non-Linear Wave Shaping:
Clipping circuits (diode & transistor), Diode comparators, Transistor differential comparator, clamping circuits, Practical clamping circuit, clamping circuit theorem. (7)

Unit V: Bi-stable Multi-vibrators:
Role of feedback in electronic circuits, Fixed bias and self-bias bi-stable multi-vibrator, 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, Bi-stable multi-vibrator as T Flip-Flop, Schmitt trigger circuit, Calculation of Upper Tripping Point and Lower Tripping Point.
(8)

Unit VI: Mono-stable and A-stable Multi-vibrators:
Collector Couple and Emitter Coupled Mono-stable multi-vibrator, Expression for Gate width, A-stable Collector coupled and emitter coupled multi-vibrator, complementary Transistor A-stable multi-vibrator.
(7)

Recommended Text Books:

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

BTEC-403 DIGITAL CIRCUIT & LOGIC DESIGN

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

Unit-I Number System and Binary Code: Introduction, Binary, Octal, Decimal 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. (06)

Unit-II Minimization of logic function: OR, AND,NOT,NOR,NAND,EX-OR, EX-NOR Gates, basic theorem of boolean algebra, sum of products and product of sums, canonical form, minimization using K-map and Q-M. (06)

Unit-III Combinational Circuits: Introduction, combinational circuit design, encoders, decoders, adders, subtractors and code converters, parity checker, seven segment display, magnitude comparators, multiplexers, de-multiplexer. Implementation of combinational circuit using MUX. (06)

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. (06)

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. (06)

Unit-VI Semiconductor Memories: Introduction, memory organisation, classification and characteristics of memories, sequential memories, ROMs, R/W memories. content addressable memories. PLA and PAL. (06)

Unit-VII Logic Families: Introduction to RTL, DTL, TTL, ECL, CMOS, comparison of logic families. (04)

Suggested Readings / Books:

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

BTEC-404 LINEAR INTEGRATED CIRCUIT

L T P
4 1 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

UNIT I: DIFFERENTIAL AND CASCADE AMPLIFIERS:

Introduction, Differential Amplifier, Differential Amplifier Circuit Configuration, Dual Input-Balanced output Differential Amplifier, Dual Input-Unbalanced output Differential Amplifier, Single Input-Balanced output Differential Amplifier, Single Input-unbalanced output Differential Amplifier with their DC and AC analysis, Differential Amplifier with swamping resistors, Constant current bias, Current Mirror, Cascaded differential Amplifier Stages, Level Translator, CE-CB configuration. (7)

UNIT II : INTRODUCTION TO OPERATIONAL AMPLIFIERS:

Block diagram of a typical Op-Amp, Schematic symbol, integrated circuits and their types, IC package types, Pin Identification and temperature range, Interpretation of data sheets, Overview of typical set of data sheets, Characteristics and performance parameters of and Op-Amp, Ideal Op-Amp, Equivalent circuit of an Op-Amp, Ideal voltage transfer curve, Open loop configurations : Differential, Inverting & Non Inverting. Practical Op-Amp: Input offset voltage, Input bias current, Input offset current, total output offset voltage, Thermal drift, Effcet of variation in power supply voltages on offset voltage, Change in Input offset voltage and Input offset current with time, Temperature and supply voltage sensitive parameters, Noise, Common Mode configuration and common mode rejection Ratio. Feedback configurations.
(15)

UNIT III: APLICATIONS OF OP-AMP:

DC and AC amplifiers, Peaking Amp, Summing, Scaling and Averaging Amp, Instrumentation Amplifier, V to I and I and to V converter, Log and Antilog Amp, Integrator, Differentiator. Active filters: First order LP Butterworth filter, Second order LP Butterworth filter, First order HP Butterworth filter, Second order HP Butterworth filter, Higher order filters, Band pass filter, Band reject filters, All pass filter, Phase shift oscillator, Wein bridge oscillator, Quadrature oscillator, Square wave generator, Triangular wave generator, Sawtooth wave generator, Voltage controlled oscillator, Basic comparator, Zero crossing detector, Schmitt trigger, window detector, V to F and F to V converters, A to D and D to A converters, Peak Detector, Sample and Hold Circuit. (15)

UNIT IV : SPECIALIZED IC APPLICATIONS:

IC 555 Timer: Pin configuration, Block diagram, application of IC 555 as Monostable and AstableMultivibrator., Phase Lock Loops: Operating principles & applications of IC 565, Voltage Regulators: Fixed voltage regulators, Adjustable voltage regulators, Switching Regulators. (8)

Suggested Readings / Books

1. Op Amps & Linear Integrated circuits by RamakantGayakwad.
2. Op Amps & Linear Integrated circuits by Coughlin
3. Op Amps & Linear Integrated circuits by Ravi Raj Dudeja.

BTEC-405 LAB ANALOG COMMUNICATION SYSTEMS

L T P
0 0 2

Internal Marks: 30
External Marks: 20
Total Marks: 50

1. Generation of DSB & DSB-SC AM signal using balanced modulator & determine modulation Index & detection of DSB using Diode detector.
2. Generation of SSB AM signal & detection of SSB signal using product detector.
3. To generate a FM Signal using Varactor& reactance modulation.
4. Detection of FM Signal using PLL & foster seelay& resonant detector.
5. To Study Super heterodyne AM receiver and measurement of receiver parameters viz. sensitivity, selectivity & fidelity.
6. To study the circuit of PWM & PPM modulator & Demodulator
7. Study of Frequency Division Multiplexing / Demultiplexing with sinusoidal & audio inputs Using DSBSC.
8. Generation & study of Analog TDM at least 4 channels.
9. Sampling Theorem & Reconstruction of Signal from its samples using Natural Sampling, Flat Top Sampling & Sample & Hold Circuits & effect of duty cycle.
10. To study the circuit of PAM modulator & Demodulator

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BTEC-406 LAB DIGITAL CIRCUIT & LOGIC DESIGN

L T P
0 0 2

Internal Marks: 30
External Marks: 20
Total Marks: 50

Note :

(a) A student is required to perform at-least ten experiments.
(b) The Lab teacher may introduce new experiments as per the need of the course.

List of Experiments:

1. Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates.
2. Realization of OR, AND, NOT and XOR functions using universal gates.
3. Realization of half adder / full adder using logic gates.
4. Realization of half subtractor / full subtractor using logic gates.
5. Design a 4-bit binary-to-gray & gray-to-binary code converter.
6. Design a 4-bit magnitude comparator using logic gates.
7. Truth-table verification and realization of half adder and full adder using MUX.
8. Truth-table verification and realization of half subtractor and full subtractor using DEMUX.
9. Truth-table verification of RS, JK , D & T flip flops.
10. Design a MOD-7 synchronous up-counter using JK/RS/D/T flip flops.
11. Study shift right /left operations SIPO, SISO, PIPO & PISO of a universal shift register.
12. Study the operations of D/A converter and A/D converters.

BTEC-407 LAB LINEAR INTEGRATED CIRUIT

L T P
0 0 2

Internal Marks: 30
External Marks: 20
Total Marks: 50

List of Experiments:

1. To study differential amplifier configurations.
2. To measure the performance parameters of an Op amp.
3. Application of Op amp as Inverting and Non Inverting amplifier.
4. To study frequency response of an Op Amp
5. To use the Op-Amp as summing, scaling & averaging amplifier.
6. To use the Op-Amp as Instrumentation amplifier
7. Design differentiator and Integrator using Op-Amp.
8. Application of Op Amp as Log and Antilog amplifier. Design Low pass, High pass and Band pass 1st order butterworth active filters using Op Amp.
9. Design Phase shift oscillator using Op-Amp.
10. Design Wein Bridge oscillator using Op-Amp.
11. Application of Op Amp as Sawtooth wave generator.
12. Application of Op Amp as Zero Crossing detector and window detector.
13. Application of Op Amp as Schmitt Trigger.
14. Design a delay circuit using 555.
15. To examine the operation of a PLL and to determine the free running frequency, the capture range and the lock in range of PLL.

BCET

For B.Tech.(ECE) BCET Gurdaspur,Batch 2015 & Onwards,
Academic Autonomous Institute (No. F22-1/2014 (AC))

Beant College of Engineering & Technology, Gurdaspur
Department of Electronics and Communication Engineering

BCET

5^{th} Semester

BTEC-501 Digital Communication System

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

Course Objective/s: The course is designed to understand the detailed concepts of digital communication systems using various techniques of modulation and demodulation. The students are expected to learn about the techniques to optimize the digital communication systems in terms of the bandwidth requirements, noise reduction and enhancing the transmitted data rates.

1. **Elements of Digital Communication System**

   Block diagram of digital communication system, Digital representation of analog signals, Advantages and disadvantages of digital communication system, Bandwidth –S/N trade off, Hartley Shannon Law, Sampling theorem. Concept of amount of Information and Entropy, Shannon Fano Source Coding, Huffman Source Coding and Lampel-Ziv Source Coding Algorithm**.** **(8)**

2. **Pulse Code Modulation**

   Sampling, Sampling rate, Aliasing, Quantization error, Uniform and Non-uniform quantization, Dynamic Range, Coding efficiency, A law & μ law Companding, Bandwidth of PCM, Block diagram of PCM system, Delta Modulation, Continuously Variable Slope Delta Modulator (CVSDM) or Adaptive Delta Modulation, Differential Pulse Code Modulation, Intersymbol Interference, Eye Patterns, Signal power in binary digital signals. **(10)**

3. **Line Coding & Multiplexing Techniques**

   Line Coding & its properties. NRZ & RZ types, Signaling format for unipolar, polar, bipolar (AMI) & Manchester coding and their power spectra (no derivation), HDB and B8ZS Signaling, Nyquist's criterions for pulse shaping, Fundamentals of time division multiplexing, Bit versus Word Interleaving, Statistical TDM, Codecs & Combo Chips. Basics of TDMA, FDMA and CDMA **(8)**

4. **Digital Carrier Modulation & Demodulation Techniques**

   Introduction, Amplitude Shift Keying (ASK), ASK spectrum, ASK modulator, Coherent ASK detector, Noncoherent ASK Detector, Frequency Shift Keying (FSK), FSK bit rate and baud rate, Bandwidth and frequency spectrum of FSK, FSK transmitter, Non-coherent FSK detector, Coherent FSK detector, FSK detection using PLL, Binary Phase Shift Keying, Binary PSK Spectrum, BPSK transmitter, Coherent PSK detection, Quadrature Phase Shift Keying (QPSK), QPSK demodulator, Offset QPSK, π/4 QPSK, Comparison of conventional QPSK, Offset QPSK and π/4 QPSK, M-Ary BPSK, Quadrature Amplitude Modulation (QAM); MQAM transmitters and receivers, Bandwidth efficiency, Carrier recovery; Squaring Loop & Costas Loop, Differential PSK, DBPSK transmitter and receiver, Constant Envelop Modulation; Minimum

Shift Keying (MSK) & Gaussian Minimum Shift Keying (GMSK), Matched filter receivers, Bandwidth consideration and probability of error calculations for ASK, PSK, FSK schemes. **(12)**

Suggested Books:

1. Wayne Tomasi, Electronic Communication System Fundamentals through Advanced, 5th ed., Pearson Education.
2. Simon Haykin, Communication Systems, Fourth Edition, Wiley publication.
3. Gary M. Miller, Modern Electronic Communication, 6th ed., Prentice-Hall.
4. F. G. Stremler, Introduction to Communication Systems, 3rd ed., Addison Wesley.
5. E.A. Lee and D.G. Messerschmitt, Digital Communication, Kluwer Academic Publishers.

BCET

BTEC-502 Digital Signal Processing

Internal Marks: 40 **L T P**
External Marks: 60 **4 1 0**
Total Marks: 100

Course Objective/s: It is of utmost importance to understand the signal characteristics and system behavior when signals are digitized. So understanding of the fundamentals of processing of different signals is very important. This subject aims to provide the students the understanding of discrete time and digital signals in time and frequency domain. The subject also aims at providing the students to understanding of different tools used for processing of digital signals and implementation of digital filters.

1. Introduction

Introduction to continuous time and discrete signals: DC signal, step, ramp, impulse, sinc, signum, & exponential signals. Classification of signals.

Introduction to systems, types of discrete time systems, LTI systems, convolution sum, relation between input and output of LTI system, properties of LTI systems. **(9)**

2. Discrete Fourier Transform

Introduction to Fourier Transform & Discrete Time Fourier Transform, Circular Convolution, Discrete Fourier Transform(DFT) and its properties; Analysis of Discrete Time signals using DFT, Fast Fourier Transform. **(10)**

3. Z-Transform

Introduction to Z-Transform, Region of convergence; Inverse Z-Transform methods, Properties of Z transform. Signal analysis using Z-Transform. **(9)**

4. Analysis of Discrete Time Systems

System representation with block diagram and by difference equation, Calculation of Transfer Function of LTI systems using Z-transform & DTFT, Introduction to FIR and IIR systems. **(8)**

5. Design of Digital Filters

Structures of realization of discrete time system, direct form, Cascade form, Parallel form and lattice structure of FIR and IIR systems. Linear Phase FIR filters; Design methods for FIR filters; IIR filter design by Impulse Invariance, Bilinear Transformation, Matched Z-Transformation, Analog and Digital Transformation in the Frequency Domain. **(11)**

6. DSP Processors

Introduction to DSP processors. Architectures of DSP processors. **(5)**

Suggested Books:

1. Digital Signal Processing principles, Algorithms and application, John G Proakis, Dimtris G Manolakis.
2. Alan V Oppenheim, Ronald W Schafer, John R Back-Discrete-Time Signal Processing,Prentice Hall.
3. S. Salivahan, A Vallavaraj, Gnanpiya-Digital Signal Processing, Tata McGraw Hill.
4. S. K. Mitra- Digital Signal Processing-A computer based approach, Tata McGraw Hill
5. Emmanuel Ifeachor and Barrie Jervis- Digital Signal Processing, Pearson Education India.
6. Johny R.Johnson-Introduction to Digital Signal Processing Prentice Hall.

BTEC-503 Microprocessors & Microcontrollers

		L	T	P
Internal Marks:	**40**	**4**	**1**	**0**
External Marks:	**60**			
Total Marks:	**100**			

Course Objective/s: The course is designed to understand the concepts of assembly level programming and to provide the basics of the microprocessors and microcontrollers. It will provide solid foundation on interfacing of external devices to the 8085 microprocessor, 8051 microcontroller according to the user requirements to create novel products and solutions for the real time problems. After the successful completion of this course, a student is expected to understand the architecture, instruction set, programming, interfacing of 8085, 8051, Arduino and get familiarize with design of various applications.

1. Introduction to 8085 Microprocessor

History and Evolution of Microprocessors, Architecture Philosophy, 8085 Microprocessor, Memory Interfacing, Memory Mapped I/O and Peripheral Mapped I/O 8085 Microprocessor Programming Model. Introduction to 8085 Instructions, Programming Techniques, Time Delays, Stack and Subroutines, Interrupts. **(12)**

2. 8051 Microcontroller

Comparison of Microprocessor and Microcontroller, Microcontroller and Embedded Processors, Architecture and Pin Configuration of 8051. **(7)**

3. 8051 Assembly Language Programming

Introduction to 8051, 8051 Flag bits and PSW Register, Assembly Programming, Register Banks and Stack, 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, Timer/Counter Programming and Interrupts in 8051. **(13)**

4. Serial Communication

8051 connection to RS-232, 8051 Serial Communication programming, Interfacing of 8051 Microcontroller with LCD, ADC and DAC, stepper motor. **(8)**

5. Introduction to Arduino

Arduino Uno & Arduino Mega Platform, Block diagram, Architecture, Pin functions, Overview of main features such as I/O Ports. **(8)**

Suggested Books:

1. Gaonkar -Microprocessor Architecture, Programming and application with 8085.
2. Ali Mazidi- The 8051 Microcontroller and embedded Systems, Pearson Education
3. K. J. Ayala- The 8051 Microcontroller by , Cengage Learning.
4. Massimo Banzi- Getting started with Arduino.

BTEC-504 Electromagnetics and Antennas

Internal Marks: 40	**L**	**T**	**P**
External Marks: 60	**4**	**1**	**0**
Total Marks: 100			

Course Objective/s: The course is designed to understand the bbehaviour of electromagnetic waves in different media, difference between transmission lines and waveguides, and the basic terminology used in antennas. Further the concept of different antennas used in different applications and propagation of wave in ground, troposphere, and ionosphere. After the study of this course, a student is expected to analyze the different media of EM waves, application of different antennas and analyze the region in which the wave of particular frequency is transmitted.

1. **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 wave. Surface Impedance, Poynting Theorem. **(9)**
2. **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.
   (9)
3. **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. **(8)**
4. **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. **(9)**
5. **Aperture Antennas**
   Field Equivalence Principle, Rectangular and Circular Aperture Antennas, Horn Antenna, Babinet's Principle, Slot Antenna, Reflector antenna. **(7)**
6. **Wave Propagation**
   Free space equation, Reflection from earth's surface, Surface & 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. **(10)**

Suggested Books:

1. Mathew N.O. Sadiku, Principles of Electromagnetics, Oxford, Fourth edition.
2. Jordan E.C., Electromagnetics and radiating systems, PHI.
3. Balanis C.A, Antenna Theory, John Wiley & sons.

4. R.L.Yadava, Antenna and wave propagation, PHI.
5. W H Hayt and J A buck, Problem and solutions in electromagneics, Tata McGraw Hill
6. Antenna Theory, Krauss J.D., McGraw Hill.

BCET

BTEC-505 Lab Digital Communication System

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

List of Experiments:
Note: Teacher can introduce any new experiment as per the requirement of the syllabus.

1. Study of Time Division Multiplexing system.
2. Study of Pulse Code Modulation and demodulation.
3. Study of Delta Modulation and demodulation and observe effect of slope overload.
4. Study pulse data coding techniques for various formats.
5. Study pulse data decoding techniques for various formats.
6. Study of amplitude shift keying modulator and demodulator.
7. Study of frequency shift keying modulator and demodulator.
8. Study of phase shift keying modulator and demodulator.
9. Error detection & correction using Hamming Code.
10. Digital link simulation; error introduction & error estimation in a digital link using MATLAB (SIMULINK)/ communication simulation packages.

BCET

BTEC-506 Lab Digital Signal Processing

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

List of Experiments:
Note: Teacher can introduce any new experiment as per the requirement of the syllabus.

6. To develop elementary signal function modules (m-files) for unit sample, unit step, exponential and unit ramp sequences in MATLAB.
7. Write a program in MATLAB to generate standard sequences.
8. Write a program in MATLAB to compute power density spectrum of a sequence.
9. To develop program using MATLAB for operation on sequences like signal Shifting, signal folding, signal addition and signal multiplication.
10. Write a program in MATLAB to verify linear convolution.
11. Write a program in MATLAB to verify the circular convolution.
12. To develop program for computing inverse Z-transform.
13. To develop program for computing DFT and IDFT.
14. To develop program for conversion of direct form realization to cascade form realization.
15. To develop program for cascade realization of IIR and FIR filters.
16. To develop program for designing FIR filter.
17. To develop program for designing IIR filter.

BCET

BTEC-507 Lab Hardware Programme & Interfacing

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

List of Experiments using 8085/8051/Arduino Uno

Note: Minimum sixteen experiments are to be performed in lab however the teacher may introduce new experiments as per the course requirement.

1. Study of 8085 Microprocessor kit.
2. Write a program to add two 8/16-bit number using 8085.
3. Write a program to subtract two 8/16-bit number using 8085.
4. Write a program to multiply two 8 bit numbers by repetitive addition method using 8085.
5. Write a program to sort series using bubble sort algorithm using 8085.
6. Write a program to control the operation of stepper motor using 8085 microprocessor.
7. Write a program to control speed of DC motor using 8085 microprocessor.
8. Study of 8051 Microcontroller kit.
9. Write a program to add two numbers lying at two memory locations and display the result using 8051.
10. Write a program for multiplication of two numbers lying at memory location and display the result using 8051.
11. Write a Program to arrange 10 numbers stored in memory location in Ascending and Descending order in 8051.
12. Write a program to show the use of INT0 and INT1 in 8051.
13. Write a program of flashing LED connected to port 1 of the Micro Controller 8051.
14. Write a program to generate a ramp waveform using DAC with micro controller 8051.
15. Write a program to interface the ADC with 8051.
16. Write a program to control a stepper motor in direction, speed and number of steps using 8051.
17. Write a program to control the speed of DC motor using 8051.
18. Interfacing of Micro-controller port-lines with LED, relays, keyboard and LCD display.
19. Study of Arduino Uno & Arduino Mega board.
20. Introduction to Arduino IDE.

BTEC-508 Industrial Training

Internal Marks: 60
External Marks: 40
Total Marks: 100

Course Objective/s:

1. To expose students to the 'real' working environment and get acquainted with the organization structure, business operations and administrative functions.

2. To have hands-on experience in the students related field so that they can relate and reinforce what has been taught in the college.

3. To promote cooperation and to develop synergetic collaboration between industry and the college in promoting a knowledgeable society.

4. To set the stage for future recruitment by potential employers.

Course Description:

As a part of the B.Tech ECE curriculum, student must undergo industrial training of minimum four weeks (domain related) in reputed Private/Public Sector/Government Organization/Companies.

Training period : Minimum of four weeks, 36 hours/week during the summer vacation after 4th semester examinations.

BCET

BTEC-601 Microwave and Radar Engineering

Internal Marks: 40	**L**	**T**	**P**
External Marks: 60	**4**	**1**	**0**
Total Marks: 100			

Course Objective/s: This course is designed to provide knowledge of Radio-frequency spectrum, Microwave principles, working of microwave devices, microwave communication, RADAR and their applications. After the study of this course, student is expected to understand and gain complete knowledge about microwave generators, solid state device and microwave components and radar engineering problems and its application.

1. Microwave Tubes

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. **(7)**

2. Microwave Solid State Devices

Limitation of conventional solid state devices at microwaves, Transistors (Bipolar, FET), Diodes (Tunnel, Varactor, PIN), Transferred electron devices (Gunn diode), Avalanche transit time effect (IMPATT, TRAPATT, SBD), Microwave amplification by stimulated emission of radiation (MASER). **(6)**

3. Microwave Components

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. **(7)**

4. Microwave Measurements

Power measurements using calorimeters and bolometers, Measurement of standing wave ratio (SWR), Frequency and wavelength, Microwave bridges. **(6)**

5. Introduction to Radar Systems

Basic principle: block diagram and operation of radar, Radar range equation, Pulse repetition frequency (PRF) and Range ambiguities, Applications of radar. **(7)**

6. Doppler Radars

Doppler determination of velocity, Continuous wave (CW) radar and its limitations, Frequency modulated continuous wave (FMCW) radar, Basic principle and operation of moving target indicator (MTI) radar, Delay line cancellers, Blind speeds and staggered PRFs. **(7)**

7. Scanning and Tracking Techniques

Various scanning techniques (Horizontal, vertical, spiral, palmer, raster, nodding), Angle tracking systems (Lobe switching, conical scan, monopulse), Range tracking systems, Doppler (velocity) tracking systems. **(6)**

Suggested Books:

1. Samuel Liao- Microwave devices and circuits, PHI

2. M. Kulkarni- Microwave devices and Radar Engg, Umesh Publications

3. Merill I. Skolnik- Introduction to radar systems:

4. R.E. Collin- Foundation of Microwave Engg. McGraw Hill

BTEC-602 Wireless Communication System

Internal Marks: 40	**L**	**T**	**P**
External Marks: 60	**4**	**1**	**0**
Total Marks: 100			

Course Objective/s: The course is designed to understand the knowledge of technologies used in wireless communication system, Paging system, cordless telephone system. The students will understand the limitations of fixed networks, the need and trend towards mobility. It will also provide the knowledge about overall GSM cellular concept, Frequency reuse channels and to analyze its effect on interference, system capacity and grade of service. This course also provide the knowledge of multiple access techniques, the effect of fading, different fading models, different diversity techniques. Understand the concept of architecture behind 2G,3G and 4G mobile networks. After the study of this course, a student is able to understand the concept of mobility management in mobile communication system and also gain knowledge of evolution of wireless access networks including the cellular system, emergence from 2G-4G and beyond in terms of architecture, air interface and small cell technologies and advance systems.

1. Introduction

Basic cellular system, Performance criteria, Operation of Cellular Systems, Planning a Cellular System, Analog & Digital Cellular Systems. Examples of Wireless Communication Systems: Paging Systems, Cordless Telephone Systems, Cellular Telephone Systems. Blue Tooth and Zig Bee. **(6)**

2. Elements of Cellular Radio Systems Design

General description of the Problem, Concept of Frequency Reuse Channels, Co-Channel Interference Reduction Factor, Desired C/I from a normal case in an Omni Directional Antenna System, Cell Splitting, Consideration of the components of Cellular Systems. **(8)**

3. Digital Communication through fading multipath channels

Fading Channel and their Characteristics, Channel Modeling, Digital Signaling 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. **(8)**

4. 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, Packet Radio Protocols; Pure ALOHA, Slotted ALOHA. **(8)**

5. Wireless Systems & Standards

AMPS and ETACS, United states digital cellular (IS- 54 & IS 136), 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. **(10)**

6. Future trends

4G, 5G Mobile techniques, Wi Fi Systems **(8)**

Suggested Books:

1. T.S.Rappaport- Wireless Communications: Principles and Practice, 2nd Edition, Pearson Education Asia.
2. William C Y Lee-Mobile Cellular Telecommunications, 2nd Edition, MGH.
3. Raj Pandya ―Mobile and Personal Communication systems and services‖, Prentice Hall of India.
4. Dr. Kamilo Feher- Wireless and Digital Communications ,(PHI)
5. T L Singal-Wireless Communication.

BCET

BTEC-603 Embedded System

Internal Marks: 40	**L**	**T**	**P**
External Marks: 60	**4**	**1**	**0**
Total Marks: 100			

Course Objective/s: The course is designed to understand ARM processor architecture and its families, assembly progamming and efficient Embedded C programming using ARM processor, ARM interfacing with different peripherals and introduction to Raspberry pi and Embedded Linux. After the study of this course, a student is expected to understand architecture, features and need of ARM7 processors in embedded systems and to learn peripheral programming with ARM7 processor and Raspberry pi.

1. ARM Processor Architecture

Architecture, Registers, Interrupts & Vector table, I/O Ports, ARM Processor Family, JTAG, I2C Bus.

(10)

2. ARM Programming Instructions

Instruction Set, Data Processing Instructions, Addressing Modes, Load Store Instructions, PSR (Program Status Register) Instructions, Conditional Instructions, Interrupt Instructions.
(9)

3. C Programming

Integrated Development Environment (IDE) for C/C++ Programming, C/C++ Programs using Function Calls, Pointers, Structures, Integers & Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, Conditional Execution & Loops.
(12)

4. Interfacing Peripherals

Interfacing of ADC & DAC, Sensors, Memory, LCD Display, Stepper Motor, DC Motor, SD-MMC Card, Biometric & RFID, Zigbee, GSM Interfaces, Debugging tools.
(12)

5. Introduction to Raspberry pi

Introduction to Raspberry pi and Embedded Linux, Basic Programmimg using Raspberry pi
(6)

Suggested Books:

1. Andrew N. Sloss, Dominic Symes, Chris Wright, John Rayfield, -ARM System Developer's Guide Designing and Optimizing System Software‖, Elsevier 2008.
2. Steve Furber, -ARM system on Chip Architecture‖, Addision Wesley
3. Brooks, Cole, -Embedded Microcontroller Systems, Real Time Interfacing, Thomson Learnin.
4. Trevor Martin, -The Insider's Guide to The Philips ARM7 - Based Microcontrollers, An Engineer's Introduction to The LPC2100 Series Hitex Ltd.
5. ARM Architecture Reference Manual.
6. Website www.ARM.com.

7. Eben Upton, - Raspberry pi User Guide.
8. Dr. Simon Monk - Programming the Raspberry Pi: Getting Started with Python, McGraw-Hill Education TAB.
9. Dr. Simon Monk- Raspberry Pi Cookbook, Software and Hardware Problems and Solutions .O'Reilly Media, Inc.,2ed ,2016.

BCET

BTEC-604 Lab Microwave Engineering

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

List of Experiments

Note: Teacher may introduce new experiments as per the course requirement.

1. Study of microwave components and instruments.
2. Measurement of crystal characteristics and proof of the square law characteristics of the diode.
3. Measurement of Klystron characteristics.
4. Measurement of VSWR and standing wave ratio.
5. Measurement of Dielectric constants.
6. Measurement of Directivity and coupling coefficient of a directional coupler.
7. Measurement of Q of a cavity.
8. Calibration of the attenuation constant of an attenuator.
9. Determination of the radiation characteristics and gain of an antenna.
10. Determination of the phase-shift of a phase shifter.
11. Study of E-Plane Tee, H-Plane Tee and Magic Tee.

BCET

BTEC-605 Lab Embedded System

Internal Marks: 30
External Marks: 20
Total Marks: 50

L	T	P
0	0	2

List of Experiments using LPC2148/Raspberry pi

Note: Teacher may introduce new experiments as per the course requirement.

1. Study of ARM7 & ARM9 Bit Processor Architecture and Pin Diagram.
2. Study of Interrupt structure in ARM Processors.
3. Write ARM Processor program to Flash LED.
4. Interfacing of an LCD Display.
5. Write a program to interface an ADC.
6. Write a program to generate a Ramp waveform using DAC interface.
7. Write a program to control a Stepper Motor.
8. Write a program to control the speed of DC motor.
9. Interface relays and write a program to control them.
10. Interface ZIGBEE with ARM to control more external devices.
11. Interfacing of Biometric information recorder.
12. Interfacing RFID module with ARM.
13. Study of Raspberry pi board.
14. Basic interfacing with Raspberry pi.

BTEC-606 Minor Project

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

Course Objective/s: Student will develop innovative and creative ideas, interpersonal skills and team work, sense of environmental responsibility and leadership. The students will be able to interpret the circuits/simulations, assemble, debug the project work. The student will become familiar with the fast changes in technology.

The project work will be carried out in parts as minor project in 6th semester and major project in 7th/8th semester. The literature survey, problem formulation, assessment for viability of project, objectives and methodology for the project shall be decided in 6th semester. The same project problem is to be extended in the major project in 7th/8th semester. The minor project may be carried out by a group of students (2 to 3 students).

The student will submit a synopsis which should include introduction, literature review and proposed objectives. The committee will approve the project work and title, give suggestions, if any in the interest of project proposals. The minor project will be evaluated related to the tentative topic, literature survey, problem formulation, assessment for viability of the project, objectives and methodology of the project. The student may demonstrate any amount of work done in minor project in the 6th semester.

Suggested learning resources

1. Library resources-reference books, handbooks, encyclopedia, magazines, periodicals, journals and standards.
2. Visits to industry, organizations related as per requirement.
3. Internet resources.

BCET

BTEC-911 Relational Database Management System

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

Course Objective/s: This course offers a good understanding of database systems concepts and prepares the student to be in a position to use and design databases for different applications.

1. Introduction to Database Systems

File Systems versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, Database System Architecture, DBMS Layers, Data independence.

(4)

2. Physical Data Organization

File Organization and Indexing, Index Data Structures, Hashing, B-trees, Clustered Index, Sparse Index, Dense Index, Fixed length and Variable Length Records.

(6)

3. Data Models

Relational Model, Network Model, Hierarchical Model, ER Model: Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Database Design with the ER Model, Comparison of Models.

(5)

4. The Relational Model

Introduction to the Relational Model, ER to Relational Model Conversion, Integrity Constraints over Relations, Enforcing Integrity Constraints, Relational Algebra, Relational Calculus, Querying Relational Data.

(5)

5. Relational Query Languages

SQL: Basic SQL Query, Creating Table and Views, SQL as DML, DDL and DCL, SQL Algebraic Operations, Nested Queries, Aggregate Operations, Cursors, Dynamic SQL, Integrity Constraints in SQL, Triggers and Active Database, Relational Completeness, Basic Query Optimization Strategies, Algebraic Manipulation and Equivalences.

(5)

6. Database Design

Functional Dependencies, Reasoning about Functional Dependencies, Normal Forms, Schema Refinement, First, Second and Third Normal Forms, BCNF, Multi-valued Dependency, Join Dependency, Fourth and Fifth Normal Forms, Domain Key Normal Forms, Decompositions.

(5)

7. Transaction Management

ACID Properties, Serializability, Two-phase Commit Protocol, Concurrency Control, Lock Management, Lost Update Problem, Inconsistent Read Problem, Read-Write Locks, Deadlocks Handling, 2PL protocol.

(5)

8. Database Protection: Threats, Access Control Mechanisms, Discretionary Access Control, Grant and Revoke, Mandatory Access Control, Bell LaPadula Model, Role Based Security,

Firewalls, Encryption and Digital Signatures.

(5)

Suggested Books:

1. Ramez Elmasri, Shamkant Navathe, Fundamentals of Database Systems, Fifth Edition, Pearson Education.
2. C.J. Date , An Introduction to Database Systems, Eighth Edition, Pearson Education.
3. Alexis Leon, Mathews Leon , Database Management Systems, Leon Press.
4. S. K. Singh, Database Systems Concepts, Design and Applications, Pearson Education.
5. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, Tata McGraw
6. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, Tata McGraw-Hill.

BCET

BTEC-912 Micro Electronics

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

Course Objective/s: The course is designed to understand the basic concepts of IC fabrication, Crystal growth and Epitaxy, various oxidation techniques, diffusion and ion implantation and MEMS. After the study of this course, a student is expected to explain IC packaging techniques and CMOS fabrication techniques (n-well and p-well process sequences).

1. Introduction

Advantages of IC's, General classification of IC's (Linear/Digital IC's, Monolithic/ Hybrid IC's), Basic IC fabrication steps. **(3)**

2. Crystal Growth and Epitaxy

Starting material for formation of crystal, Horizontal Bridgman Method, Czochralski growth, Distribution of dopants, Zone refining, Silicon Float Zone process, Si-Wafer preparation, Epitaxial growth, Techniques used for Epitaxial growth (LPE, VPE, MBE).
(6)

3. Silicon Oxidation

Thermal oxidation process (Kinetics of growth, Thin oxide growth), Effect of impurities on the oxidation rate, Pre-oxidation Cleaning, Various Oxidation techniques, Masking properties of SiO2. **(6)**

4. Photo lithography and Etching

Pattern generation/Mask making, Contact and Proximity Printing, Photoresists, Photo lithography process (Lift off technology, Fine line photo lithography), Wet/Dry etching, Reactive Plasma etching techniques and applications.
(6)

5. Diffusion and Ion Implantation

Basic diffusion process (Diffusion equation, Diffusion profiles), Extrinsic diffusion, Lateral diffusion, Ion implantation process (Ion distribution, Ion stopping), Implant damage and annealing process (Furnace and RTA).
(6)

6. IC Packaging

Isolation techniques, Testing of the chip, Wire bonding techniques, Flip chip technique, Various packaging methods and materials.
(5)

7. Fabrication of Monolithic Components

Fabrication of diodes, resistors, capacitors and inductors, Fabrication of BJT and FET, Fabrication of MOS devices, CMOS fabrication techniques (n-well and p-well process sequences), Introduction to MEMS.
(6)

Suggested Books:

1. Gray S. May and Simon M. Sze- Fundamental of Semiconductor Fabrication, Wiley.
2. Sze- VLSI Technology, McGraw Hill Education.
3. Jacob Millman and Arvin Grabel- Microelectronics, McGraw Hill Education.

BCET

BTEC-913 Industrial Electronics

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

Course Objective/s: The course is designed to understand the basic concepts the power – electronic devices and their applications. Students are expected to learn about characteristics and performance parameters of controlled rectifier, different modulation techniques of pulse width modulated inverters and the harmonic reduction methods. he students will be able to understand working operation of choppers and cycloconverters. They will also be made aware of controlled operation of industrial drives.

1. Characteristics of Selected Devices

Fast recovery diodes, Schottky diode, Diac, Triac, UJT, Power MOSFETs, SCR, Gate Trigger and Commutation circuits, Series and Parallel Connection of SCRs. **(8)**

2. Controlled Rectifiers

Half wave and Full wave with Resistive & R-L-E and resistive- inductive loads. Free-Wheeling Diode, Three Phase Rectifiers, Bridge Rectifiers -half controlled and fully controlled. **(8)**

3. Inverters

Voltage Driven, Current Driven, Bridge, Parallel, SCR Versions, Control of Output Voltage-PWM Schemes, Harmonic Reduction. **(7)**

4. Choppers

Principle and Basic Circuit Operation, Choppers– Step Up, Step Down Choppers, Chopper classification –Class A,B,C,D,E.
(7)

5. Cyclo Converters

Single Phase to Single Phase Cycloconverters, Single Phase to Three Phase Cycloconverters, Three Phase to Three Phase Cycloconverters.
(5)

6. Motor Control

D.C. and A.C. Motor Control, Closed Loop Control, Types of AC Voltage Controllers, Integral Cycle control, Single phase voltage controller. **(5)**

Suggested Books:

1. Power Electronics - P.C. Sen, Tata McGraw Hill Publishing Co., Ltd.
2. Power Electronics and Control - S.K. Dutta, Prentice Hall of India Pvt. Ltd.
3. Power Electronics – Dr. P.S. Bimbhra, Khana Publishers.

BTEC-914 VLSI

L	T	P
3	1	0

Internal Marks: 40
External Marks: 60
Total Marks: 100

Course Objective/s: The course is designed to understand the semiconductors physics and modelling of MOSFETs, basic theory of fabrication steps and layout of CMOS integrated circuits, basic theory of power dissipation in CMOS digital circuits and ability to work with static and dynamic logic circuits. After the study of this course, a student is expected to have knowledge of building blocks of VLSI circuit design.

1. Semiconductor Physics and Modelling of MOSFETs

MOS structure and operation: accumulation, depletion and inversion region, weak and strong inversion, MOSFET work function, Enhancement & depletion transistor, Threshold voltage, MOS device design equations, MOS transistor models, NMOS and PMOS transistors, CMOS, Scaling principles and fundamental limits, Propagation delays. **(9)**

2. CMOS Inverter

The NMOS inverter and transfer characteristics, Pull up and pull down ratios of NMOS, Alternative forms of pull up: the CMOS inverter and transfer characteristics, Electrical properties of CMOS circuits and device modelling, Latch-up, CMOS inverter scaling. **(7)**

3. Fabrication and Layout of CMOS Integrated Circuits

Overview of integrated circuit processing: oxidation, photo-lithography, etching, isolation and wells, CMOS process flow, Design rules, Mask design, Stick diagram, Layout diagrams. **(6)**

4. Combinational & Sequential Circuits

Logic circuit switch with depletion NMOS loads, CMOS logic circuits, Complex logic circuits, Pass gate, Transmission gate, Double gate transistor, Behavior of bistable elements, SR latch circuit, Clocked latch and flip flop circuits, CMOS D-latch and edge triggered flip-flop, Subsystem design-adders, Shifters. **(9)**

5. VLSI Design Methodologies

Semi-custom and full-custom design including cell library and gate array based design, FPGA, Design for testability. **(7)**

Suggested Books:

1. DA Pucknell and K . Eshraghian - Basic VLSI Design, Systems and Circuits, P H I.
2. Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic -Digital Integrated Circuits: A Design Perspective, Prentice Hall.
3. S M Kang and Y Lebici - CMOS Digital Integrated Circuits Analysis and Design, McGraw Hill.
4. Douglas R. Holberg, P. E. Allen - CMOS Analog Circuit Design, Oxford University Press.
5. Michael J S Smith - Application-Specific Integrated Circuits, Addison Wesley Professional.
6. J. Baker - CMOS: Circuit Design, Layout, and Simulation, Wiley IEEE Press.

BTEC-915 Intellectual Property Rights & Patent Systems

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

Course Objective/s : The subject aims to provide an overview of methods and approaches to manage intellectual property as strategic resources for enhancing the competitiveness for organizations. Upon completion of this subject, students should be able to accomplish the following objectives:

1. Understanding, defining and differentiating different types of intellectual properties (IPs) and their roles in contributing to organizational competitiveness
2. Understanding the Framework of Strategic Management of Intellectual Property (IP) and Patent systems.
3. Appreciating and appraising different IP management (IPM) approaches and describing how pioneering firms initiate, implement and manage IPM programs,
4. Explaining how to derive value from IP and leverage its value in new product and service development
5. Exposing to the Legal management of IP and understanding of real life practice of Patent Systems.

1. Basic of intellectual property Rights

Introduction, Justification and Classification of intellectual property Rights, Classification of Treaties relating to intellectual property Rights, Stranded setting treaties, Global protection system treaties, and Classification treats.

(8)

2. Patent System

History of the patent system, Patent on genetic resources, patents on chemicals, designs, patent based on software, business methods, internet patent, Exception to exclusive rights conferred to a patent holder, Remember for infringement of a patent.

(8)

3. Copyrights and related rights

Nature and scope of protection of copyrights and related rights, Protection of copyrights in the digital media. Defense of fair use, Moral rights of the author, Copyrights societies, Remedies for infringement of Copyrights.

(8)

4. Design rights

Nature and scope of protection of design rights, protection of layout designs (topographies) of integrated circuits, protection of undisclosed information, protection of trademarks, domain names and geographical indications.

(8)

5. Practical aspects of a patent

Drafting of a patent, Few Exercises on the preliminary rules on preparing an application seeking a patent. **(6)**

Suggested Books:

1. Cornish W.R., Intellectual property: patents, copyright, trademarks and allied rights, sweet and Maxwell.
2. P. Narayana, Intellectual property law, eastern law house 2nd ed.
3. Robin Jacob and Daniel Alexander, a guide book to Intellectual property patent trademarks, Copy rights and design, sweet and Maxwell 4th ed.

BCET

BTEC-916 Intelligent Instrumentation

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

Course Objective/s: After the study of this course, a student is expected to have good knowledge different Instrumentation systems. The course is designed to understand the basic concepts of PLC, Predictive control, Artificial Intelligent based controller. Students are expected to have good knowledge of SCADA, Neuro-Fuzzy controller and Experts controller.

9. **Instrumentation**

Introduction about Instrumentation Systems, Types of Instrumentation Systems, Data Acquisition System (DAS) and its Uses in Intelligent Instrumentation System, Signal Conditioners: as DA, IA, Signal Converters (ADC & DAC), Sample and Hold, Designing of Pressure, Temperature Measuring Instrumentation System using DAS, Data Logger.

(9)

10. **Automation**

Introduction about Automation System, Concepts of Control Schemes, Types of Controllers, Components involved in Implementation of Automation System i.e., DAS, DOS, Converter (I to P) and Actuators: pneumatic cylinder, relay, solenoid (final control element), Computer Supervisory Control System (SCADA), Direct Digital Control's Structure and Software.

(11)

11. **PLC**

Introduction of Programmable Logic controller, Principles of Operation, Architecture of Programmable Controllers, Programming the Programmable Controller.

(9)

12. **Intelligent Controller**

Introduction to Intelligent Controllers, Model based Controllers, Predictive Control, Artificial Intelligent based Systems, Experts Controller, Fuzzy Logic System and Controller, Artificial Neural Networks, Neuro-Fuzzy controller system.

(10)

Suggested Books:

1. "Process Control Instrumentation Technology" 6/e, by Curtis D Johnson, Pearson Ed.
2. "Electrical and Electronics Measurement and Instrumentation "by A. K. Swahney.
3. "Electronics instrumentation" by H. S. Kalsi, TMH.
4. "Computer-Based Industrial Control" by Krishna Kant, PHI.
5. "Process Control Instrumentation Technology", by Curtis D Johnson, Pearson Ed

BTEC-917 Information Theory & Coding

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

Course Objective/s: The course is designed to understand the basic concepts of Information Theory and coding. The concept of Channel Capacity & source Coding are also discussed. Students are expected to have good knowledge of Linear Block, Cyclic Codes, BCH Codes and Convolution Codes. Student is expected to able to understand the concept of different Automatic Repeat Request Strategies

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, Band width – S/N Trade-off, introduction to channel capacity & coding, channel models, Channel Capacity Theorem, Shannon Limit. Huffman source coding, Lempel Ziv source coding algorithm. **(8)**

2. Linear block codes

Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of Block Code, Hamming Code. **(6)**

3. Cyclic codes

Description of Cyclic Codes, Generator and Parity Check Matrices of Cyclic Codes, Error Detection Decoding of Cyclic Codes. **(6)**

4. BCH codes

Description of Codes, Decoding of BCH codes, Implementation of Error Correction. **(6)**

5. Convolution codes

Encoding of Convolution Codes, Structural Properties of Convolution Codes, Distance Properties of Convolution Codes. **(6)**

6. Automatic Repeat Request Strategies

Stop and Wait, Go back and Selective Repeat ARQ Strategies, Hybrid ARQ Schemes. **(6)**

Suggested Books:

1. F.M Reza- Information Theory, Mc Graw Hill
2. ShuLin & J Costeib- Error Control Coding, PHI
3. Dass, Mullick & Chatterjee- Digital Communication, John Wiley.
4. Robert G. Gallanger-Information Theory and Reliable Communication: Mc Graw Hill,
5. B.P. Lathi, Zhi Ding- Modern Digital and Analog Communication Systems: OXFORD University Press

BCET

BTEC-951 Electronics Measurements & Instrumentation

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

Course Objective/s: The course aims to introduce and develop the fundamental understanding of various measurement principles and measuring instruments mainly used in various electrical and electronic applications. The course is primarily meant for helping the students to choose suitable measuring instruments for their application keeping in view the factors like limitations and errors of a particular instrument. After completion of the course students are expected to learn about Electronic Measurement devices and are expected to have good knowledge of CRO, function generators, signal analyzers, recorders and digital displays. Students are expected to have greater insight regarding transducers and will be able to design/ select any transducer for measurement applications.

1. 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, Dynamic Characteristics. **(7)**

2. Electronic Meters

Electronic analog voltmeter: DC Voltmeters-chopper type-DC amplifier, differential voltmeter, Calibration of DC Voltmeters. Digital Voltmeter: introduction, ramp techniques, dual slope, integrating type DVM, General Specification of a DVM.CRO: Basic Block Diagram, Functions of Blocks & Basic circuits, Measurement of Voltage, Current, Frequency & Phase Angle using CRO. **(10)**

3. Measuring Instruments

Principle of operation of galvanometer, Moving Coil instruments, Moving Iron instruments. R,L,C Measurements: measurement of DC medium resistance (Wheatstone bridge), AC Maxwell Bridge, Wien and Schering Bridge, Q Meter. **(6)**

4. Instrumentation for Generation and Analysis of Waveforms

Signal generators: Fixed & variable AF oscillators, AF sine & square wave generator, Function generator: Square & Pulse generator, Wave analyzer, Harmonic Distortion Analyzer, Spectrum Analyzer, Spectrum Analysis. **(7)**

5. 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, LED and LCD. **(5)**

6. Transducers and DATA Acquisition Systems

Strain Gauge, LVDT, Thermocouple, Piezoelectric, Crystal and Photoelectric Transducers and their Applications. Data Acquisition Systems. **(5)**

Suggested Books:

1. Electrical and Electronic Measurements and Instrumentation, by K. Sawhney.
2. Electronic Instrumentation and Measurement Techniques, by D Cooper.
3. Electronic Instrumentation, by H.S. Kalsi, Tata McGraw Hill
4. Applied Electronics Instrumentation and measurement, David Buchla, Wayne Melachlan:
5. Electronics Measurement and Instrumentation,Oliver by B.H and Cag J.M. McGrawHill.
6. Element of Electronic Instrumentation &Measurment, by Carr, Pearson Education.

BCET

BTEC-952 Reliability Engineering

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

Course Objective/s: The objective of this course is to get the students familiar with the concept of reliability, analysis of data for reliability, system reliability and modeling, maintainability, reliability and safety margins in devices. The students will be able to identify factors affecting reliability of the engineering systems and will be conversant with data analysis methods for reliability improvements.

1. Concept of Reliability

Failures of Systems and its Modes, Measure of Reliability, Reliability Function, Hazard Rate MTBF and their Interrelations.

(5)

2. Reliability Data and Analysis Data sources

Data Collection, Use of Reliability Data, Reliability Analysis, Performance Parameters, Calculation of Failure Rate, Application of Weibull Distribution.

(6)

3. System Reliability and Modeling

Series Systems, Parallel System, Series Parallel Systems, Time Dependence, Reliability Determination, Stand by Systems, r out of n, Configurations, Methods of Tie Set and Cut Sets of or Reliability Evaluation, Simulation and Reliability Prediction, Monte Carlo Method, Concepts of Network Topology, Overall Reliability Evolution.

(10)

4. Maintainability and Availability

Maintainability and its Equation, Factors Affecting Maintainability, Measures of Maintainability, Mean Down Time, Availability Intrinsic Availability Equipment Availability & Mission Availability, Replacement Processes and Policies.

(8)

5. Life Testing of Equipment

Non-destructive Tests, Destruction Tests and their Mathematical Modeling. Quality and Reliability, Measurement & Prediction of Human Reliability, Reliability and Safety, Safety Margins in Critical Devices, Case Studies.

(8)

6. Value Engineering

Techniques in value Engg., Structure of Value Engg., Reliability Management.

(3)

Suggested Books:

1. Govil- Reliability Engg.
2. Dr. A.K.Aggarwal -Reliability Engg.
3. Patrick D. T., O'Connor- Practical Reliability Engineering, John Wiley & Sons 4th edition.
4. E. Balagurusamy-Reliability Engineering, Tata McGraw- Hill.

BCET

BTEC-961 Principles of Communication Engineering

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

Course Objective : To introduce basic communication systems and to demonstrate the importance of communication in a variety of contexts including innovative Engineering and technology and to understand basic analog and digital communication system theory and design, with an emphasis on wireless communications methods.

1. Baseband Signals & Systems

Introduction, Elements of Communication System, Types of Communication Systems, 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.

(4)

2. Analog Modulation Systems

Basic Principles of AM, FM, and PM. Spectra, Power Consideration, Receivers, Characteristics and Detection of AM, FM, and PM and Systems Performance, Comparison of Different Analog Modulation Techniques.

(8)

3. Base Band Data Communication

Sampling and Quantization – PCM, ADPCM, DM, ADM, Base Band Pulse Shaping, Binary Data Formats, Base Band Transmission , ISI, Correlative Coding, Optimum SNR, Matched filter detection.**(8)**

4. Digital Modulation

Digital Modulation, Coherent Binary Modulation Techniques, Coherent Quadrature Modulation Techniques, Non-Coherent Binary Modulation, M-Ary Modulation, Performance of Digital Modulation Systems Based on Probability of Error, Band Width, ISI.

(8)

5. Spread Spectrum and Error Correction Techniques

Introduction**,** Fundamental Concepts, Direct Sequence Spread Spectrums and Frequency Hopping Spread Spectrum, Block Codes, Cyclic Codes and Hamming Codes, Wireless Communication - TDMA and CDMA,

(5)

6. Recent Standards

Bluetooth. Zigbee, 4G and 5G Technologies.

(3)

Suggested Books:

1.Singhal, ‘Wireless Communication’Mc Graw Hill.

2.Bernald Sklan, 'Digital Communocation' Pearson Education, 2nd Edition.
3.Taub & Schilling, 'Principles of Communication', Tata McGraw Hill Publication.
4.Simon Haykins, 'Digital Communication', John Wiley.
5.B.P.Lathi, 'Analog and Digital Communication Systems', PHI.
6.Proakis, 'Digital Communication', McGraw-Hill.
7.A.B.Carlson, 'Communication Systems' McGraw-Hill.
8.K.Sam Shanmugam,'Digital and Analog Communication Systems, John Wiley.

BCET

BTEC-962 Microcontrollers & Embedded Systems

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

Course Objective/s: The course is designed to understand the basic concepts of Embedded Systems and 8051 microcontroller. Interfacing with 8051 microcontroller and introduction to advanced processors such as ARM. After the study of this course, a student is expected to know about the basic concepts of microcontroller and its interfacing with sensors, LCD, motors and external memory.

1. Introduction

8051 Microcontroller, Comparison of Microprocessor and Microcontroller, Microcontroller and Embedded Processors, Overview of 8085 Families. 8051 Assembly Language Programming, Introduction to 8051 Assembly Programming, Assembling and Running an 8051 Program, Data Types and Directives, 8051 Flag Bits and PSW Register. Register Banks and Stack. 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, Timer/Counter Programming In The 8051. **(12)**

2. Serial Communication

8051 Connection to RS 232, 8051 Serial Communication Programming. **(6)**

3. Real World Interfacing

LCD, ADC and Sensors, Stepper Motor, Keyboard, DAC and External Memory. **(8)**

4. Introduction to an Embedded System and its Design

Introduction to ES& its Applications, Design Parameters of an ES and Its Significance (With Respect to all Parameter), Present Trends In ES, Embedded System Design Life Cycle, Product Specifications and Hardware, Software Partitioning, Codesign. **(8)**

5. ARM Processors

Introduction to ARM Processors and its Applications. **(6)**

Suggested Books:

1) Ali Mazidi-The 8051 Microocntroller and embedded Systems.
2) David e Simon-An embedded software primer, Pearson Education
3) Frank Vahid and Tony Givargus- Embedded system design by
4) Andrew N. Sloss, Dominic Symes, Chris Wright, John Rayfield, -ARM System Developer's Guide Designing and Optimizing System Software‖, Elsevier.