

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

## **BEANT COLLEGE OF ENGINEERING & TECHNOLOGY, GURDASPUR**

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



**Department of Academics  
BEANT COLLEGE OF ENGINEERING & TECHNOLOGY  
GURDASPUR**

**B. Tech 3<sup>rd</sup>Sem 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
<b>TOTAL</b>		<b>18</b>	<b>5</b>	<b>6</b>	<b>350</b>	<b>400</b>	<b>750</b>	<b>27</b>

\*The marks will be awarded on the basis of 04 weeks Institutional Practical Training conducted after 2<sup>nd</sup>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
<b>TOTAL</b>		<b>18</b>	<b>5</b>	<b>6</b>	<b>390</b>	<b>360</b>	<b>750</b>	<b>27</b>

**B. Tech 5<sup>th</sup> 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
<b>TOTAL</b>		<b>18</b>	<b>4</b>	<b>6</b>	<b>350</b>	<b>400</b>	<b>750</b>	<b>26</b>

\*The marks will be awarded on the basis Industrial Training conducted after 4<sup>th</sup> Semester

**B. Tech 6<sup>th</sup> Sem 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
<b>TOTAL</b>		<b>18</b>	<b>4</b>	<b>6</b>	<b>390</b>	<b>360</b>	<b>750</b>	<b>26</b>

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

**B. Tech 7<sup>th</sup> 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
<b>TOTAL</b>		<b>15</b>	<b>5</b>	<b>10</b>	<b>460</b>	<b>390</b>	<b>850</b>	<b>26</b>

\*\*The problem of major project formulated during the 6<sup>th</sup> semester is to be extended and executed in major project by the same group of students in the 7<sup>th</sup>/8<sup>th</sup> 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 8<sup>th</sup> Semester ECE**

<b>Industrial Training (One semester)</b>	<b>Course Component</b>	<b>Internal Marks</b>	<b>External Marks</b>	<b>Total Marks</b>	<b>Credits</b>
BTEC-801	Industrial Training <sup>#</sup>	<b>450</b>	<b>300</b>	<b>750</b>	<b>24</b>

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

**List of Open electives to be offered by other departments to the 5<sup>th</sup> 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 6<sup>th</sup> 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

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# BCET

***Third Semester***

**BTAM-301 Engineering Mathematics - III**

**L T P**  
**3 1 0**

**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, Frobenius method, Legendre's equation, Legendre polynomial, Bessel's equation, Bessel functions of the first and second kind. Recurrence relations, equations reducible to Bessel's equation. (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 the function 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. Snedon, Elements of Partial Differential Equations, McGraw-Hill, Singapore, 1957.
4. Peter. V. O'Neil, 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++**

**L T P**  
**3 1 0**

**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 programming paradigm 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 member 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 through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory management using *new* and *delete* operators, pointer to an object, *this* pointer, pointer related problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures.

(6)

**Constructors and Destructors:**

Need for constructors and destructors, copy constructor, dynamic constructors, 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 multipath inheritance, 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 handling mechanism, throwing mechanism, catching mechanism, rethrowing an exception, specifying exceptions. (2)

**Templates and Generic Programming:**

Template concepts, Function templates, class templates, illustrative examples. (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. Bjarne Stroustrup, 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.

**BTEC-301 ANALOG DEVICES & CIRCUITS**

**L T P**  
**4 1 0**

**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  $I_{CO}$ ,  $V_{BE}$  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 by Boylested, 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**

**L T P**  
**4 1 0**

**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

L T P  
4 1 0

**Internal Marks: 40**

**External Marks: 60**

**Total Marks: 100**

### Unit I

#### Circuit Concepts:

Introduction to Independent 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 State & 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 Impulse Train. 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 Polynomial, 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, characteristic impedance and propagation constant of pure reactive network, Ladder network, T-section,  $\pi$ -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, Dhanpat Rai.
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**

**L T P**  
**0 0 2**

**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

## **BTEC-305 ELECTRONIC MEASUREMENT & INSTRUMENTATION**

**L T P**  
**0 0 2**

**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.

**BTCS-309 OBJECT ORIENTED PROGRAMMING USING C++ LAB**

**L T P**  
**0 0 2**

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



18. **[Polymorphism]** Write a program to demonstrate the runtime polymorphism.
19. **[Exception Handling]** Write a program to demonstrate the exception handling.
20. **[Templates and Generic Programming]** Write a program to demonstrate the use of function template.
21. **[Templates and Generic Programming]** Write a program to demonstrate the use of class template.
22. **[File Handling]** Write a program to copy the contents of a file to another file byte by byte. The name of the source file and destination file should be taken as command-line arguments,
23. **[File Handling]** Write a program to demonstrate the reading and writing of mixed type of data.
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 into an Object Oriented system.
2. Implement coding standard and verification practices
3. Build expertise in Object Oriented programming language

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# BCET

***Fourth Semester***

## **BTEE- 402 LINEAR CONTROL SYSTEMS**

**L T P**  
**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

BCET

## **BTEC-401 ANALOG COMMUNICATION SYSTEMS**

**L T P**  
**4 1 0**

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

(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 excited 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 heterodyne 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.

## **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**  
**External Marks: 60**  
**Total Marks: 100**

**L T P**  
**3 1 0**

**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, Effect 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: APPLICATIONS OF OP-AMP:**

DC and AC amplifiers, Peaking Amp, Summing, Scaling and Averaging Amp, Instrumentation Amplifier, V to I and I 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 Astable Multivibrator., 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 Ramakant Gayakwad.
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 Seeley & 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

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.

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<sup>th</sup> Semester*

### **BTEC-501 Digital Communication System**

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

**L T P**  
**3 1 0**

**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 &  $\mu$  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 criteria 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,  $\pi/4$  QPSK, Comparison of conventional QPSK, Offset QPSK and  $\pi/4$  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, 5<sup>th</sup> ed., Pearson Education.
2. Simon Haykin, Communication Systems, Fourth Edition, Wiley publication.
3. Gary M. Miller, Modern Electronic Communication, 6<sup>th</sup> ed., Prentice-Hall.
4. F. G. Stremler, Introduction to Communication Systems, 3<sup>rd</sup> 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**  
**External Marks: 60**  
**Total Marks: 100**

**L T P**  
**4 1 0**

**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 Jarvis- Digital Signal Processing, Pearson Education India.
6. Johny R. Johnson-Introduction to Digital Signal Processing Prentice Hall.



**BTEC-503 Microprocessors & Microcontrollers**

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

**L T P**  
**4 1 0**

**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 behaviour 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-Tschebyscheff 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.

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

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

BCET

**BTEC-505 Lab Digital Communication System**

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

L	T	P
0	0	2

**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.

**BTEC-506 Lab Digital Signal Processing**

**Internal Marks: 30**

**External Marks: 20**

**Total Marks:50**

**L T P**

**0 0 2**

**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.

**BTEC-507 Lab Hardware Programme & Interfacing**

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

**L T P**  
**0 0 2**

**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 4<sup>th</sup> semester examinations.

## **BTEC-601 Microwave and Radar Engineering**

**Internal Marks: 40**

**External Marks: 60**

**Total Marks: 100**

**L T P**

**4 1 0**

**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**

**External Marks: 60**

**Total Marks: 100**

**L T P**

**4 1 0**

**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**  
**External Marks: 60**  
**Total Marks: 100**

<b>L</b>	<b>T</b>	<b>P</b>
<b>4</b>	<b>1</b>	<b>0</b>

**Course Objective/s:** The course is designed to understand ARM processor architecture and its families, assembly programming 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 Programming 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, Addison 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](http://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.

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**BTEC-604 Lab Microwave Engineering**

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

**L T P**  
**0 0 2**

**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.

### **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**

**Internal Marks: 30**

**External Marks: 20**

**Total Marks: 50**

<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>2</b>

**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 6<sup>th</sup> semester and major project in 7<sup>th</sup>/8<sup>th</sup> semester. The literature survey, problem formulation, assessment for viability of project, objectives and methodology for the project shall be decided in 6<sup>th</sup> semester. The same project problem is to be extended in the major project in 7<sup>th</sup>/8<sup>th</sup> 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 6<sup>th</sup> 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.

## **BTEC-911 Relational Database Management System**

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

**L T P**  
**3 1 0**

**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.

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## BTEC-912 Micro Electronics

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

**L T P**  
**3 1 0**

**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 SiO<sub>2</sub>. (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. The 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

**Internal Marks: 40**

**External Marks: 60**

**Total Marks: 100**

L	T	P
3	1	0

**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**

**Internal Marks: 40**

**L T P**

**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.

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## **BTEC-916 Intelligent Instrumentation**

**Internal Marks: 40**

**L T P**

**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**

**External Marks: 60**

**Total Marks: 100**

L	T	P
3	1	0

**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 be 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

## **BTEC-951 Electronics Measurements & Instrumentation**

**Internal Marks :40**

**L T P**

**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**

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

**L T P**  
**3 0 0**

**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**  
**External Marks: 60**  
**Total Marks : 100**

**L T P**  
**3 0 0**

**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.

For Batches 2015 & Onwards

Academic Autonomous Status vide letter No. F22-1/2014 (AC)

2. Bernald Sklan, 'Digital Communication' 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**

<b>Internal Marks: 40</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>External Marks: 60</b>	<b>3</b>	<b>0</b>	<b>0</b>
<b>Total Marks: 100</b>			

**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.



**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

*Syllabus of B.Tech.*

*Electronics & Communication*

*Engineering [ECE]*

*7<sup>th</sup> & 8<sup>th</sup> Semester*

*Batch 2015 onwards*

### BTEC-701 Digital System Design

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

L T P  
3 1 0

**Course Objective/s:** The course is designed to understand the basic concepts of computer-aided design tools for digital systems, behavioral, dataflow and structural models with VHDL, combinational and sequential logic design with VHDL, designing with Mealy and Moore Machine, also get familiar with the designing using Xilinx series FPGAs. After the study of this course student is expected to learn the designing of synchronous & asynchronous sequential circuits and VHDL based modeling of digital systems.

#### 1. Introduction

Introduction to Computer-Aided Design tools for Digital Systems. Hardware Description Languages, Introduction to VHDL, Data Objects, Classes and Data Types, Operators, Overloading, and Logical Operators. Types of Delays, Entity and Architecture Declaration Introduction to Behavioral, Dataflow and Structural Models. (6)

#### 2. VHDL Statements

Assignment Statements, Sequential Statements and Process, Conditional Statements, Case Statements, Array and Loops, Resolution Functions, Packages & Libraries, Concurrent Statements. (6)

#### 3. Combinational Logic

Design of Adders, Subtractor, Multipliers, Multiplexers, Tri-state Buffer, ALU, Binary to Gray, Gray to Binary, Encoder, Priority Encoder, Parity Generator, ROM/RAM Using VHDL. (6)

#### 4. Synchronous Sequential Logic

Design of Flip-Flops, Triggering of Flip-Flops and Their Excitation Tables, Clocked Sequential Circuits, State Reduction and Assignment, Design Procedure, Design of Shift Register, Design of Counters Using VHDL. (6)

#### 5. Finite State Machines

Finite State Model, Memory Elements and Their Excitation Functions, Synthesis of Synchronous Sequential Circuits, Capabilities and limitations of FSM, Design, Modeling and Simulation of Moore and Mealy Machines using VHDL. (6)

#### 6. Asynchronous Sequential Logic

Analysis Procedure, Design Procedure, Reduction of State and Flow tables, Race-Free State Assignment, Hazards, Design examples. (6)

#### 7. Designing with Programmable Logic Devices and Programmable Gate Arrays

Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Designing with FPGAs, Xilinx Series FPGAs. (4)

#### Suggested Books:

1. Stephen Brown, Zvonko Vranesic –Fundamentals of Digital Logic with VHDL design, TMH.
2. Volnei A. Pedroni- Circuit Design with VHDL, MIT Press.
3. Douglas Perry –VHDL , 3rd Edition ,TMH.
4. Chales H. Roth.-Digital System Design Using VHDL .
5. John Wakerley-Digital System Design.
6. Z. Navabbi-VHDL.
7. William I Fletcher-Digital Design Principles,PHI.

## BTEC-702 Optical Communication

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

**L T P**  
**3 1 0**

**Course Objective/s:** To expose the students to the basics of signal propagation through optical fibers, fiber impairments, components and devices and system design.

### 1. Introduction

Need of Fiber Optic Communications, Evolution of Light wave Systems, Basic Concepts; Analog & Digital Signals, Channel Multiplexing, Modulation Formats, Optical Communication Systems, Lightwave System Components; Optical Fibers as a Communication Channel, Optical Transmitters, Optical Receivers. (2)

### 2. Optical Fibers

Geometrical-Optics Description; Step-Index Fibers, Graded Index Fibers, Wave Propagation; Maxwell's Equations, Fiber Modes, Single-Mode-Fibers, Dispersion in Single-Mode Fibers; Group Velocity Dispersion, Material Dispersion, Wave guide Dispersion, Higher-order Dispersion, Polarization-Mode Dispersion, Dispersion-Induced Limitations; Basic Propagation Equation, Chirped Gaussian Pulses, Limitations on the Bit Rate, Fiber Bandwidth, Fiber Losses; Attenuation Coefficient, Material Absorption, Rayleigh Scattering, wave guide Imperfections, Nonlinear Optical effects; Stimulated Light Scattering, Nonlinear Phase Modulation, Four Wave Mixing, Fiber Manufacturing; Design Issues, Fabrication Methods, Cables and Connectors (10)

### 3. Optical Transmitters

Basic Concepts; Emission and Absorption Rates, p-n Junctions, Non radiative Recombination, Semiconductor Materials, Light Emitting Diodes; Power-current Characteristics, LED spectrum, Modulation Response, LED Structures, Semiconductor Lasers; DFB Lasers, Coupled Cavity semiconductor Lasers, Tunable Semiconductor Lasers, Vertical Cavity Semiconductor Lasers, Laser Characteristics, Small & Large Signal Modulation, Spectral Line width, Source Fiber Coupling. (8)

### 4. Optical Receivers

Basic concepts, p-n Photo Diodes, p-i-n Photo Diodes, Avalanche Photo Diode, MSM Photo detector, Receiver Design, Receiver Noise; Noise mechanism, Receiver sensitivity; Bit error rate, Minimum Receiver Power, Sensitivity Degradation, Receiver Performance. (8)

### 5. Light Wave Systems

System Architecture, Loss limited Light wave systems, Dispersion limited Light wave systems, Power Budget, Long Haul systems, Sources of Power Penalty; Model Noise, Dispersive Pulse Broadening, Mode Partition Noise, Frequency Chirping, Reflection Feedback Noise. (8)

### 6. Multi channel Systems

WDM Light wave systems, Optical TDM Systems, Subscriber Multiplexing, Code Division Multiplexing. (4)

**Suggested Books:**

- 1.Senior J. Optical Fiber Communications, Principles & Practice, PHI.
- 2.Keiser G., Optical Fiber Communication Mc graw-hill.
- 3.Govind P. Agrawal, Fiber Optics Communication Systems John Wiley & Sons (Asia) Pvt. Ltd.
- 4.Djafar K. Mynbeav, —Fiber-Optics Communications Technology, Pearson.

BCET

**BTEC-703 Lab Wireless and Optical Systems & Networks**

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

<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>2</b>

**List of Experiments:**

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

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

**BTEC-704 Lab Digital System Design**

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

<b>L</b>	<b>T</b>	<b>P</b>
<b>0</b>	<b>0</b>	<b>2</b>

**List of Experiments:**

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

1. Design of basic gates: And, OR, NOT and Universal gates .
2. Design of half-Adder, full Adder, half Subtractor, full Subtractor.
3. Design of 3:8 Decoder.
4. Design of 8:3 Priority Encoder.
5. Design of 4-bit Binary to Gray Code Converter.
6. Design of 4-bit Binary to BCD Converter using Sequential statement.
7. Design an 8-bit Parity Generator ( with for loop and Generic statements).
8. Design of all type of Flip-Flops using ( if-then-else) Sequential constructs.
9. Design of 8-bit Shift Register with shift right, shift left, load and Synchronous reset.
10. Design of Synchronous 8-bit Johnson Counter.
11. Design of Synchronous 8-bit Universal Shift Register ( PIPO).
12. Design MOD Counters (MOD 3, MOD 5, MOD 8, MOD 16).
13. Design of ALU.
14. Design of Mealy and Moore FSM.

### BTEC-705 Major Project

**Internal Marks: 100**  
**External Marks: 50**  
**Total Marks: 150**

L	T	P
0	0	6

**Course Objective/s:** Student will develop innovative and creative ideas, interpersonal skills and team work, sense of environmental responsibility and leadership. The student will be able to interpret the circuits/simulations, assemble, debug the project work. The student will be able to use the latest industrial perspective, technologies and platforms.

The project work will be carried out in parts as minor project in 6th semester and major project in 7th/8th semester. The synopsis which includes literature survey, problem formulation, assessment for viability of project, objectives and methodology for the project was decided in 6th semester. The same project problem is to be extended in the major project in 7th/8th semester. The major project will be carried out by the same group of students as in minor project. 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 during 7th/8th semester. 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. The midterm progress report should be submitted including block diagram, data sheets and objectives accomplished. The major project report should be submitted in a specified format with certificate from the project guide. Each candidate will be evaluated on the basis of project logic, documented report and presentation in both internal and external examinations.

#### **Suggested learning resources:**

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

### **BTEC-801 Industrial Training**

**Internal Marks: 450**

**External Marks: 300**

**Total Marks: 750**

**Course Objective/s:** The fundamental objective of Industrial Training is to prepare students for future employment in their chosen engineering discipline. Industrial Training enhances the academic material studied at college by allowing students to practice what they have learned and to develop key professional attributes. Industrial Training also gives employers an opportunity to assess future employees. Industrial Training should provide an opportunity for students to:

1. Experience the discipline of working in a professional engineering organisation.
2. Develop understanding of the functioning and organisation of a business.
3. Interact with other professional and non-professional groups.
4. Apply engineering methods such as design and problem solving.
5. Develop technical, interpersonal and communication skills, both oral and written.

**Course Description:**

As a part of the B.Tech ECE curriculum, student must undergo industrial training of minimum one semester in reputed Private/Public Sector/Government Organization/Companies.

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



## BTEC-931 CMOS based Design

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

L T P  
3 1 0

**Course Objective/s:** The course is designed to understand the basic structure of MOSFET, modelling of MOS and non-ideal effects in MOS, CMOS based circuit designing and layout fabrication, power consumption and its reduction in CMOS based circuit, adiabatic concept. After the study of this course, a student is expected to design low power CMOS based circuit and its layout fabrication.

### 1. Introduction to MOS Device

MOS transistor, MOS models MOS transistor under static conditions, Threshold voltage-resistive operation, Saturation region, Channel length modulation, Body effect, DC transfer characteristics, Tristate inverters, Velocity saturation, Hot carrier effect, Drain current vs. voltage charts, Sub-threshold conduction, MOS structure capacitance, CMOS logic, Fabrication and layout. (10)

### 2. CMOS Processing

CMOS technologies, Wafer formation, Photolithography, Channel formation, Isolation, Gate oxide, Source and drain formation, Contacts and metallization, Layout design rules, Design rule checking. (8)

### 3. Circuit Characterization & Performance Estimation

Delay estimation, Transistor sizing, Power dissipation, Sheet resistance, Area capacitance, Design margin, Reliability, Scaling models, Scaling factor for device parameters, Advantages and limitations of scaling. (8)

### 4. Design of Combinational Logic

Static CMOS design, Complementary CMOS, Static properties, Complementary CMOS design, Power consumption in CMOS logic gates, Dynamic or glitching transitions, Design to reduce switching activity, Ratioed logic, DCVSL, Pass transistor logic, Differential pass transistor logic, Sizing of level restorer, Sizing in pass transistor, Dynamic CMOS design, Domino logic, Optimization of Domino logic, NPCMOS, Designing logic for reduced supply voltages, Introduction to Adiabatic Logic. (12)

### Suggested Books:

1. Nail H.E. Weste, David Harris, Ayan Banerjee - CMOS VLSI Design, Pearson Education.
2. Kang and Leblebici - CMOS Digital Integrated Circuits, Tata McGraw-Hill.
3. Wayne Wolf - Modern VLSI Design, 2nd Edition, Prentice Hall.
4. Weste & Harris - CMOS VLSI Design: A Circuits and Systems Perspective, 3rd ed, Addison Wesley.
5. Philip Teichmann - Adiabatic Logic: Future Trend and System Level Perspective, Springer Series in Advanced Microelectronics.

### BTEC- 932 Biomedical Signal Processing

**Internal Marks: 40**

**L T P**

**External Marks: 60**

**3 1 0**

**Total Marks: 100**

**Course Objective/s:** It is of utmost importance to understand the signal characteristics of biomedical signals. So understanding of the fundamentals of processing of different signals is very important. This subject aims to provide the students the understanding of analysis of different kinds of biomedical signals. The subject also aims at providing the students to understanding of different tools used for processing of biomedical signals and reduction of noise in these signals.

#### 1. Biomedical Signals and Noise

Introduction to Biomedical Signals Tasks in Biomedical Signal Processing, Computer Aided Diagnosis, Examples of Biomedical signals: ECG, EEG, EMG etc., Review of linear systems, Fourier Transform and Time Frequency Analysis (Wavelet) of biomedical signals, Processing of Random & Stochastic signals, spectral estimation, Properties and effects of noise in biomedical instruments, Filtering in biomedical instruments. **(9)**

#### 2. ECG Signal Processing

Cardio-logical Signal Processing Pre-processing, QRS Detection Methods, Rhythm analysis, Arrhythmia Detection Algorithms, Automated ECG Analysis, ECG Pattern Recognition, Heart rate variability analysis. **(10)**

#### 3. Noise

Adaptive Noise Canceling Principles of Adaptive Noise Canceling, Adaptive Noise Canceling with the LMS adaptation, Algorithm, Noise Canceling Method to Enhance ECG Monitoring, Fetal ECG Monitoring. **(7)**

#### 4. EEG Signal Processing

Neurological Signal Processing Modeling of EEG Signals, Detection of spikes and spindles, Detection of Alpha, Beta and Gamma Waves, Auto Regressive (A.R.) modeling of seizure EEG, Sleep Stage analysis, Inverse Filtering, least squares and polynomial modeling. **(10)**

#### Suggested Books:

1. D.C.Reddy—Biomedical Signal Processing: Principles and techniques, Tata McGraw Hill, New Delhi.
2. Willis J Tompkins - Biomedical Signal Processing, Prentice Hall.
3. R. Rangayan —Biomedical Signal Analysis, Wiley.
4. Bruce —Biomedical Signal Processing & Signal Modeling, Wiley.
5. K. Najarian and R. Splinter —Biomedical Signal and Image Processing, Second Edition, The CRC Press.

## BTEC-933 Satellite Communication

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

L T P  
3 1 0

**Course Objective/s :** The objectives is to understand the current status of Satellite communication, the basics of orbital aspects, the types of Satellite orbits, the location of ground stations, launching of Satellite, link budget equations with different attenuation and interference effects, multiplexing techniques used in Satellite communication. The students are expected to understand Satellite communication and motivate them to pursue research in the area of space communication.

### 1.Introduction to Satellite Communication

Origin, Brief history, Current State and advantages of Satellite communication, Active & Passive Satellite, Orbital aspects of Satellite communication, Angle of Evaluation, Propagation Delay, Orbital Spacing, System Performance, Launching Procedures : Launch Vehicles and Propulsion.  
(8)

### 2.Satellite Link Design

Link Design Equation, system Noise Temperature, C/N & G/T ratio, Atmospheric & Ionospheric effects on link Design, complete link Design, interference effects on complete link Design, earthstation parameters, Earth space propagation effects, Frequency window, Free space loss, Atmospheric absorption, Rainfall attenuation, Ionospheric scintillation, Telemetry, Tracking and command of Satellites.  
(7)

### 3.Satellite Multiple Access System

FDMA techniques, SCPC & CSSB systems, TDMA frame structure, burst structure, frame efficiency, super-frame, frame acquisition & synchronization, TDMA vs FDMA, burst time plan, beam hopping, Satellite switched, Erlang call congestion formula, DA-FDMA, DA-TDMA.  
(7)

### 4.Satellite Services

INTELSAT, INSAT Series, VSAT, Weather forecasting, Remote sensing, LANDSAT, Satellite navigation, Mobile Satellite service.  
(8)

### 5.Laser & Satellite Communication

Link analysis, optical Satellite link Tx & Rx, Satellite, beam acquisition, tracking & pointing, cable channel frequency, head end equation, distribution of signal, h/w specifications and architecture, optical fibre CATV system.  
(8)

### Suggested Books:

1. Trimothy Pratt, Charles W. Bostian, —Satellite Communications‡, John Wiley & Sons.
2. Dr. D.C. Aggarwal, —Satellite Communications‡, Khanna Publishers.
3. Dennis Roddy, —Satellite Communications‡, McGraw Hill.

### BTEC-934 Artificial Intelligence Techniques & Applications

<b>Internal Marks: 40</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>External Marks: 60</b>	<b>3</b>	<b>1</b>	<b>0</b>
<b>Total Marks: 100</b>			

**Course Objective/s:** The course is designed to understand the basic concepts of various intelligent techniques. After the study of this course, a student is expected to design intelligent system for different domestic and industrial applications.

#### 1. Introduction

Approaches to intelligent control, Architecture of intelligent control, Linguistic reasoning, Rulebase, Knowledge representation. **(08)**

#### 2. Artificial Neural Networks

Biological neuron, Artificial Neural Network, Mathematical Models, McCulloch Neural Model, Perceptron, Adaline and Madaline, Learning & Training in ANN, Hopfield Neural Network, Self-Organizing Networks, Recurrent Networks, Associative memories. **(11)**

#### 3. Fuzzy Logic System

Crisp Vs Fuzzy set theory, Membership functions, Fuzzy set operations, Fuzzy rules, Mamdani and Sugeno fuzzy inference systems, Defuzzification methods. **(10)**

#### 4. Introduction to Genetic Algorithms

Biological background of GA, String Encoding of chromosomes, Selection methods, Single & multi-point crossover operation, Mutation, Adjustment of strategy parameters such as Population size, Mutation & Crossover probabilities. **(11)**

#### Suggested Books:

1. Jacek M. Zurada – Introduction to Artificial Neural Systems
2. S N Sivanandam, S N Deepa – Principles of Soft Computing, Wiley Publications
3. John Yen, Reza Langari – Fuzzy Logic Intelligence, Control, and Information.

## BTEC 935 Speech & Image Processing

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

**L T P**  
**3 1 0**

**Course Objective/s:** The course is designed to understand the concepts of Image Processing, Image Enhancement, Image Compression, Image Segmentation, Speech Processing and their applications. After the study of this course, a student is expected to learn the theoretical and mathematical concepts of Image Processing and Speech Processing.

### 1. Speech Processing

Review of Human Speech and Acoustic Theory, Nature of Sound, Harmonics, Resonance Measurement, Virtual Display. Music Theory, Pitch, Duration, Intervals, Rhythm. Human Speech Production, Vocal Tract, Larynx, Source Filter. Speech Signal Processing- Phasor Mode, Fourier Transfer, DFT, FFT. Hardware use of FIR & IIR Filters. Software, Elements of Speech Synthesis-Speech Recognition-Speech in Computer-Human Interface.

(8)

### 2. Introduction to Image Processing

Historical Background, Visual Perception, Image Formation, Elements of Storage, Sampling & Quantization, Relationships between Pixels-Neighbors of Pixel, Connectivity Labeling of Connected Components, Relations, Equivalence and Transitive Closure, Distance Measures, Arithmetic/ Logic Operation, Imaging Geometry Basic and Perspective Transformation Stereo Imaging, Application of Image Processing.

(10)

### 3. Image Enhancement

Spatial and Frequency Domain Methods, Point Processing, Intensity Transformation, Histogram Processing Image Substitution and Averaging Spatial Filtering, LP, HP and Homo-Morphic Filtering, Generation of Spatial Marks, Color Image Processing.

(8)

### 4. Image Compression

Redundancy Models, Error Free Compression, Lossy Compression, Image Compression Standards.

(6)

### 5. Image Segmentation

Detection of Discontinuity, Edge Detection, Boundary Detection, Thresholding, Regional Oriented Segmentation, Use of Motion In Segmentation.

(8)

### Suggested Books:

1. Rafael Gonzalez and Richard E. Woods- Digital Image Processing, Pearson Education Society.
2. Kenneth R Castleman- Digital Image Processing, Pearson Education Society.
3. A. K. Jain - Fundamental of Digital Image Processing, PHI.
4. Iain Murray - Speech and Audio Processing for multimedia PC's.

**BTEC-936 Human Resource Management**

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

**L T P**  
**3 1 0**

**Course Objective/s:** The aim of this course is to provide an overview to the students of Human Resource Management prevailing in industries and the regulations relevant to these industries.

**1. Introduction**

Introduction to Human Resource Management and its definition, Functions of Human Resource Management & its Relation to other Managerial Functions. Nature, Scope and Importance of Human Resource Management in Industry, Role & Position of Personnel Function in the Organization. (10)

**2. Procurement and Placement**

Need for Human Resource Planning; Process of Human Resource Planning; Methods of Recruitment; Psychological Tests and Interviewing, Meaning and Importance of Placement and Induction, Employment Exchanges (Compulsory Notification of vacancies) Act 1959, The Contract Labour (Regulation & Abolition) Act 1970. (8)

**3 Training & Development**

Difference between Training and Development, Principles of Training; Employee Development; Promotion-Merit v/s Seniority Performance Appraisal, Career Development & Planning. (5)

**4. Job analysis & Design**

Job Analysis, Job Description & Job Description, Job Specification. (5)

**5. Job Satisfaction**

Job Satisfaction and its Importance, Motivation, Factors affecting Motivation, Introduction to Motivation Theory; Workers ' Participation, Quality of work life. (4)

**6. The Compensation Function**

Basic Concepts in Wage Administration, Company's Wage Policy, Job Evaluation, Issues in Wage Administration, Bonus & Incentives, Payment of Wages Act-1936, Minimum Wages Act-1961. (8)

**Suggested Books:**

1. T.N.Chhabra- Human Resource Management (Dhanpat Rai & Co.)
2. Lowin B. Flippo - Principles of personnel Management (Mc Graw-Hill)
3. R.C. Saxena - Labour Problems and social welfare (K.Math & Co.)
4. A Minappa and M. S. Saiyada - Personnel Management (Tata Mc. Graw-Hill)
5. C.B. Mamoria - Personnel Management (Himalaya Publishing House, Bombay)
6. T.N. Bhagotiwai - Economics of Labour and Industrial Relations (Sahitya Bhawan Agra)

## BTEC-937 Computer Organization and Architecture

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

**L T P**  
**3 1 0**

**Course Objective/s :** The course is designed to understand the organization and architecture of a computer including CPU, internal and cache memory, i/o and storage, CPU architecture, parallel processing and multi-core computer. After the study of this course, a student is expected to elaborate advanced concepts of computer organization and architecture, parallel processing, inter processor communication and synchronization.

### 1. Introduction

Organization and Architecture, Structure and Function, Brief History of Computers, Designing for Performance, Performance Metrics; MIPS, MFLOPS, Computer Components and Their Functions, Interconnection Structures, Bus Interconnection, Point-To-Point Interconnect, PCI-Express, Flynn's Classification of Computers (SISD, SIMD, MISD, MIMD).

(10)

### 2. Internal and Cache Memory

Computer Memory System Overview, Cache Memory Principles, Elements of Cache Design, Pentium-4 Cache Organization, Semiconductor Main Memory, Advanced DRAM Organization.

(10)

### 3. Basic non-pipelined CPU Architecture and Operating System

CPU Architecture Types (Accumulator, Register, Stack, Memory/ Register), Detailed Data Path of a typical Register Based CPU, Fetch-Decode-Execute Cycle (Typically 3 To 5 Stage), Microinstruction Sequencing, Implementation of Control Unit, Enhancing Performance with Pipelining, Operating System Overview, Scheduling, Memory Management, Pentium Memory Management. (10)

### 4. Parallel Processing and Multi-core Computer

Multiple Processor Organizations, Symmetric Multiprocessors, Cache Coherence and the Mesi Protocol, Multithreading and Chip Multiprocessors, Clusters, Non-Uniform Memory Access, Vector Computation, Multi-Core Computers, Hardware and Software Performance Issues, Multi-Core Organization, Intel x86 Multi-Core Organization.

(10)

### Suggested Books:

1. William Stallings—Computer Organization and Architecture, Pearson, Delhi.
2. John P. Hayes —Computer Architecture and Organization, TMH.
3. Chaudhuri P. Pal —Computer Organisation & Design, PHI.
4. Mano, M.M.—Computer System Architecture, PHI.

### BTEC-941 Electromagnetic Interference & Compatibility

internal Marks: 40  
External Marks: 60  
Total Marks: 100

L T P  
3 1 0

**Course Objective/s:** The course is designed to understand EMI sources, its measurements and the various techniques for electromagnetic compatibility. After the study of this course, a student is expected to understand the problems related to Electromagnetic interference & Compatibility in design of electronic systems to diagnose and solve basic issues.

#### 1. Overview of EMI/EMC

Electromagnetic Environment, History, Concepts and Definitions, Overview of EMI/EMC, Natural and Nuclear Sources of EMI, Conducted and Radiated EMI, Transient EMI, Time Domain vs Frequency Domain EMI, Units of Measurement Parameters. (8)

#### 2. EMI Coupling Principles

Electromagnetic Emissions, Noise from Relays and Switches, Nonlinearities in Circuits, Passive intermodulation, Cross Talk in Transmission Lines, Transients in Power Supply Lines, Conducted, Radiated and Transient Coupling, Common Impedance Ground Coupling, Radiated Common Mode and Ground Loop Coupling, Radiated Differential Mode Coupling, Cable to Cable Coupling, Power Mains and Power Supply Coupling. (10)

#### 3. Radiated and Conducted interference Measurements

EMI Test instruments/Systems, Anechoic Chamber, TEM Cell, GH TEM Cell, Characterization of Conduction Currents/Voltages, Conducted EM Noise on Power Lines, Conducted EMI from Equipment, Immunity to Conducted EMI, Detectors and Measurements, EMI Shielded Chamber, Open Area Test Site, TEM Cell, Sensors/ injectors/ Couplers, Test Beds for ESD and EFT. (10)

#### 4. EMI Control Techniques

Principles and Types of Grounding, Shielding and Bonding, Characterization of Filters, Power Lines Filter Design Shielding, Isolation Transformer, Transient Suppressors, Cable Routing, Signal Control, Component Selection and Mounting, PCB Traces Cross Talk, Impedance Control, Power Distribution Decoupling, Zoning, Motherboard Designs and Propagation Delay Performance Models. (10)

#### Suggested Books:

1. V.P.Kodali, "Engineering EMC Principles, Measurements and Technologies", IEEE Press..
2. Henry W.Ott, "Noise Reduction Techniques in Electronic Systems", John Wiley and Sons, New York..
3. C.R.Paul, -introductionto Electromagnetic Compatibility|| , John Wiley and Sons, inc.
4. Bernhard Keiser, "Principles of Electromagnetic Compatibility", Artech house, 3rd Ed.



**BTEC-942 Neural Networks and Fuzzy Logic**

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

**L T P**  
**3 1 0**

**Course Objective/s:** The course is designed to understand the basic concepts of Neural Networks and associated training techniques. The course also intends to acquaint the students with Radial Basis Neural Networks Function, Fuzzy Logic System, Defuzzification techniques. After the study of this course, a student is expected to understand various neural and fuzzy systems. Student is also expected to design intelligent systems for domestic and industrial applications.

**1. Introduction to Neural Networks**

Human brain and Biological Neuron, Artificial Neural Network, ANN Terminology, Activation functions, Topology, Feed forward Neural Networks, ANN Learning: Supervised, Un-supervised, Competitive learning, Reinforcement learning, Knowledge representation. **(8)**

**2. Hopfield Neural Model Learning Laws**

Hopfield Model, Back-propagation Neural Networks, K-means clustering algorithm, Kohonen's feature maps, Associative Memories. **(11)**

**3. Radial Basis Neural Networks Function**

Neural Networks, Basic learning laws in RBF Nets, Recurrent Networks, Recurrent Backpropagation, Counter-Propagation Networks, ART Networks. **(11)**

**4. Fuzzy Logic Sets & System**

Introduction to Fuzzy Logic, Fuzzy Vs Crisp set, Linguistic variables, Membership functions, Fuzzy set operations, IF-THEN fuzzy rules, Mamdani & Sugeno inference techniques, Defuzzification techniques, Fuzzy Logic System: Block diagram, Implementation, Useful tools Fuzzy logic controller Vs PID controller, Antilock Braking System (ABS). **(10)**

**Suggested Books:**

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, Wiley publications.
2. Yagna Narayanan – Artificial Neural Networks
3. Bart Kosko – Neural Networks & Fuzzy logic
4. Simon Haykin – Neural Networks
5. G. A. Vijayalakshmi Pai and Sanguthevar Rajasekaran-Neural Networks, Fuzzy Logic and Genetic Algorithm.

## BTEC-943 Robotics

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

**L T P**  
**3 1 0**

**Course Objective/s:** The course is designed to introduce the basic concepts of the field of robotics. It covers the fundamentals of sensing, control and dynamics of robot, machine vision, kinematics and programming. Understanding of principles on force and optical sensing; selection of motors and grippers; processing and analysis of image; degree of freedom and programming languages for robots. After the study of this course, a student is expected to have good knowledge to design a robot in accordance with requirements.

### 1. Introduction

Definition and need for robots, robot anatomy, co-ordinate systems, work envelope, types and classification, specifications, pitch, yaw, roll, joint notations, speed of motion, pay load, robot parts and their functions, different applications. (6)

### 2. Sensors

Principles and applications and need of a sensor, principles, position of sensors, piezoelectric sensor, LVDT, resolvers, optical encoders, pneumatic position sensors, range sensors, triangulation principle, structured, lighting approach, time of flight range finders, laser range meters, proximity sensors, inductive, hall effect, capacitive, ultrasonic and optical proximity sensors, touch sensors, (binary sensors, analog sensors), wrist sensors, compliance sensors, slip sensors. (7)

### 3. Drive Systems & Grippers for Robot

Drives systems (Mechanical, Electrical, Pneumatic Drives, Hydraulic), D.C. servo motors, stepper motor, A.C. servo motors, comparison of all drives, end effectors, grippers (Mechanical, Pneumatic, Hydraulic, Magnetic, Vacuum Grippers), two fingered and three fingered grippers, internal grippers and external grippers, selection and design considerations. (8)

### 4. Machine Vision

Camera, frame grabber, sensing and digitizing image data, signal conversion, image storage, lighting techniques, image processing and analysis, data reduction, edge detection, segmentation feature extraction, object recognition, other algorithms, applications, inspection, identification, visual serving and navigation. (7)

### 5. Robot Kinematics & Programming

Forward kinematics, inverse kinematics and differences; forward kinematics and reverse kinematics of manipulators with two, three, four degrees of freedom, deviations and problems teach pendant programming, lead through programming, robot programming languages, val programming, motion commands, sensor commands, end effector commands. (8)

### Suggested Books:

1. M.P. Groover - Industrial Robotics : Technology, Programming and Applications, McGraw-Hill.
2. Ashitava Ghosal - Robotics Fundamental Concepts and Analysis, Oxford University Press.
3. Yoram Koren - Robotics for Engineers, McGraw-Hill.
4. K.S. Fu - Robotics: Control, Sensing, Vision and Intelligence, Tata McGraw-Hill.

### BTEC-944 Operation Research

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

L T P  
3 1 0

**Course Objective/s:** The course is designed to understand the concepts of operational research, solving the transportation problem, use of sequencing models, dynamic programming and game theory. The students will be able to identify and develop operational research models from the verbal description of the real systems. They will understand the need of mathematical tools that are needed to describe the model to solve the optimization problems, that will help to analyze the results and to propose recommendations in the decision-making processes.

#### 1. Introduction to Operations Research

Definition, Scope, Objectives, Phases, Models and Limitations of Operations Research, Linear Programming Problem, Formulation of LPP, Graphical Solution of LPP, Simplex Method, Slack, Surplus and Artificial Variables, Concept of Duality, Big-M Method two Phase Method, Dual Simplex Method, degeneracy And Unbound Solutions, Procedure for Resolving Degenerate Cases. (8)

#### 2. Transportation Problem

Formulation of Transportation Model, Optimality Methods, Unbalanced Transportation Problem, Basic Feasible Solution, Northwest Corner Rule, Least Cost Method, Vogel's Approximation Method, Applications of Transportation Problems, Assignment Problem, Formulation, Unbalanced Assignment Problem, Traveling Salesman Problem, Optimality Test, The Stepping Stone Method, MODI Method. (8)

#### 3. Sequencing Models

Johnsons Algorithm, Processing n Jobs through 2 Machines, Processing n Jobs through 3 Machines, Processing 2 Jobs through m Machines, Processing n Jobs through m Machines, Graphical Solutions Priority Rules. (8)

#### 4. Dynamic Programming

Characteristics of Dynamic Programming, Dynamic Programming approach for Priority Management Employment Smoothing, Capital Budgeting, Stage Coach/Shortest Path, Cargo Loading and Reliability Problems. (8)

#### 5. Games Theory

Competitive Games, Rectangular Game, Saddle Point, Minimax (Maximin) Method of Optimal Strategies, Value of the Game. Solution of Games with Saddle Points, Dominance Principle, Rectangular Games without Saddle Point – Mixed Strategy for 2 X 2 Games. (8)

#### Suggested Books:

1. Taha H. A.- Operations Research and Introduction, Pearson Education edition.
2. P. Sankara Iyer- Operations Research, Tata McGraw-Hill.
3. A.M. Natarajan, P. Balasubramani, A. Tamilarasi - Operations Research, Pearson Education.
4. S. D. Sharma- Operations Research, –Kedarnath Ramnath & Co.

### BTEC-945 Mobile Computing

<b>Internal Marks: 40</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>External Marks: 60</b>	<b>3</b>	<b>1</b>	<b>0</b>
<b>Total Marks: 100</b>			

**Course Objective/s:** This course is designed to examine the area of wireless networking and mobile computing, looking at the unique network protocol challenges and opportunities presented by wireless communications. To study about various types of wireless data networks and wireless voice networks and identify the GSM, Bluetooth, Zigbee software model for mobile computing. Outline knowledge on mobile IP, ad-hoc network, sensor networks. Analyze and characterize location management in wireless mobile networks. To realize the role of wireless protocols in shaping the future internet.

After the completion of this course, students should be able to learn about the concept and principles of mobile computing, Understand and identify the GSM, Bluetooth software model for mobile computing, Understanding the characteristic and limitations of mobile hardware devices including their user interface modilitites, Analyze QoS over wire and wireless channels.

#### 1. Introduction

Introduction, Issues In Mobile Computing, Overview Of Wireless Telephony: Cellular Concept, Gsm: Air-Interface, Channel Structure, Location Management: HLR-VLR, Hierarchical, Handoffs, Channel Allocation In Cellular Systems.  
(7)

#### 2. Mobile Network & Transport Layer

Mobile IP Goals, assumptions, Entities and Terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunneling and Encapsulation, Dynamic Host Configuration Protocol (DHCP), Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission / time-out freezing, Selective retransmission, Transaction oriented TCP.  
(12)

#### 3. Wireless Networking

Wireless LAN Overview MAC issues, IEEE 802.11, Blue Tooth, Wireless Multiple Access Protocols, TCP over Wireless, Wireless applications, Data Broadcasting, Mobile IP, WAP Architecture, Protocol Stack, Application environment, Applications. (10)

#### 4. Mobile Ad hoc Networks

Mobile Agents Computing, Security and Fault Tolerance, Transaction Processing in Mobile Computing Environment, Mobile Ad hoc Networks (MANETs), Overview, Properties of a MANET, Spectrum of MANET applications, Routing and various Routing Algorithms, Security in MANETs. (9)

#### Suggested Books:

1. J. Schiller, Mobile Communications, Addison-Wesley, second edition.
2. Raj Pandya, Mobile & Personal Communication Systems and Service, PHI.
3. Asoke k Talukder , Roopa R Yavagal, Mobile Computing , Technology, Application & Service Creation. Tata Mc Graw Hill
4. Stojmenovic and Cacute, —Handbook of Wireless Networks and Mobile Computingll, Wiley.

## BTEC-946 Wireless Sensor Network

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

**L T P**  
**3 1 0**

**Course Objective/s:** The course is designed to understand the basic WSN technology and supporting protocols, with emphasis placed on standardization basic sensor systems and provide a survey of sensor technology. After the study of this course, a student is expected to learn the various hardware, software platforms that exist for sensor network and understand what research problem sensor networks pose in disciplines such as signal processing, wireless communications and even control systems.

### 1. Introduction to Wireless Sensor Networks

Constraints and Challenges of sensor networks, Emerging technologies for wireless sensor networks, Node architecture, Hardware components overview, Energy consumption of Sensor nodes, Dynamic energy and power management on System level, some examples of Sensor nodes, Optimization goals and figures of merit, QOS, Energy Efficiency, scalability, robustness Advantages of sensor networks, Sensor network applications. (11)

### 2. Topology Control

Location driven, Geographic Adaptive Fidelity (GAF), Geographic Random Forwarding (GeRaF), GEAR, Connectivity driven, SPAN, ASCENT. (7)

### 3. WSN Sensors

Physical Layer Design, Transceiver Design, MAC Protocols for WSN, Low Duty Cycle Protocols & Wakeup Concepts, S-MAC, Mediation Device Protocol, Wakeup Radio Concepts, Address & Name Management, Assignment of MAC Addresses, Routing Protocols, Energy Efficient Routing, Geographic Routing. (10)

### 4. WSN Platforms & Tools

Sensor Node Hardware, Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric Programming. (10)

### Suggested Books:

1. Holger Karl & Andreas Willig, "Protocols & Architectures for Wireless Sensor Networks", John Wiley.
2. Feng Zhao & Leonidas J. Guibas, —Wireless Sensor Networks- An Information Processing Approach", Elsevier.
3. Walteneus Dargie and Christian Poellabauer, —Fundamentals of Wireless Sensor Networks – Theory and Practice, John Wiley and Sons.
4. Holger Karl and Andreas Willig, —Protocols and Architectures for Wireless Sensor Networks, John Wiley and Sons.

### BTEC-947 Numerical Methods

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

**L T P**  
**3 1 0**

#### **Course Objective/s :**

Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to mathematical problems. Derive numerical methods for various mathematical operations and tasks, which helps to deal with scientific and Engineering problem involving mathematical Models. Also to explore complex systems, physicists, engineers, financiers and mathematicians require computational methods since mathematical models arise from real situations rarely solvable analytically.

#### **1. Absolute and Approximation Values, Errors**

Truncation error, Round-off error, Absolute and Relative errors. Solution of Algebraic and Transcendental Equations: Introduction ,Bisection method, Iteration method, Newton-Raphson method, Regula Falsi method and Secant method. Rate of convergence of Newton-Raphson method . (9)

#### **2. Solution of system of non-homogeneous linear equations**

Introduction ,Matrix operations ,transpose of Matrix .Inverse of Matrix ,Direct Methods for linear Systems : Gauss Elimination method, Partial and Complete Pivoting, Gauss Jordan Elimination method, Triangularization method .Iterative Methods : Jacobi's method and Gauss-Seidal's method. Eigen values and Eigen vectors of a matrix: Power Method to find the largest Eigen Value and Corresponding Eigen Values. Curve fitting: Method of Least Squares-fitting a straight line, a second degree parabola and exponential curves. (12)

#### **3. Numerical Differentiation and Integration**

Numerical Differentiation using finite differences, Numerical Integration, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule. (7)

#### **4. Numerical Solution of Differential Equations**

Numerical solution of first order ordinary differential equations using Taylor's series method, Picard's method, Euler's method, Improved Euler's method , Modified Euler's method, Runge-Kutta method of Second and Fourth order. (8)

#### **Recommended Books :**

1. Numerical Methods for Mathematics, Science and Engineering by Mathews, Prentice-Hall of India. Ed. Second.
2. Numerical Methods for Scientist and Engineering Computation by M. K. Jain, S. R. K. Iyengar and R. K. Jain, New Age International Publisher, Ed. Fourth.
3. Introductory Methods of Numerical Analysis by S. S. Sastry