Department of Electronics and Communication Engineering

SEMESTER 1

COURSE CODE	COURSE TITLE	C	L	T/SLr	P/R	Ty/Lb /ETL
BMA17007	PROBABILITY AND RANDOM PROCESS	4	3	1/0	0/0	Ty
BCS17I01	C++ AND DATA STRUCTURES	3	3	0/0	0/0	Ty
BEC17002	DIGITAL ELECTRONICS	4	3	1/0	0/0	Ty
BEC17ET1	ELECTRICAL MACHINES AND PCB DESIGN	3	1	0/2	1/1	ETL
BEC17L02	DIGITAL SYSTEM DESIGN LAB	1	0	0/0	3/0	Lb

Credits Sub Total: 15

SEMESTER 2

COURSE CODE	COURSE TITLE	C	L	T/SLr	P/R	Ty/Lb/ ETL
BMA17012	MATHEMATICS-IV FOR ELECTRONICS ENGINEERS	4	3	1/0	0/0	Ty
BEI17I01	MEASUREMENTS AND INSTRUMENTATION	3	3	0/0	0/0	Ty
BEC17003	SOLID STATE DEVICES	3	3	0/0	0/0	Ty
BEC17ET2	ANALYSIS OF ELECTROMAGNETIC FIELD THEORY	3	1	0/2	1/1	ETL
BEC17001	CIRCUIT THEORY	4	3	1/0	0/0	Ty

Credits Sub Total: 17

SEMESTER 3

COURSE CODE	COURSE TITLE	C	L	T/SLr	P/R	Ty/Lb/ ETL
BCS17I02	COMPUTER NETWORKS	3	3	0/0	0/0	Ty
BEC17005	SIGNALS AND SYSTEMS	4	3	1/0	0/0	Ty
BEC17006	ELECTRONIC CIRCUITS	3	3	0/0	0/0	Ty
BEC17ET3	DESIGN AND IMPLEMENTATION OF LINEAR INTEGRATED CIRCUITS	3	1	0/2	1/1	ETL
BEC17L16	ELECTRONIC CIRCUITS AND DEVICES LAB	1	0	0/0	3/0	Lb

Credits Sub Total: 14

SEMESTER 4

COURSE CODE	COURSE TITLE	C	L	T/SLr	P/R	Ty/Lb/ ETL
BEC17004	CONTROL SYSTEM FOR ELECTRONICS ENGINEERS	4	3	1/0	0/0	Ty
BEC17007	TRANSMISSION LINES AND WAVEGUIDES	4	3	1/0	0/0	Ty
BEC17010	COMMUNICATION SYSTEM	3	3	0/0	0/0	Ty
BEC17EXX	ELECTIVE-I	3	3	0/0	0/0	Ty
BEC17L17	COMMUNICATION ENGINEERING LAB	1	0	0/0	3/0	Lb

Credits Sub Total: 15

SEMESTER 5

COURSE CODE	COURSE TITLE	C	L	T/SLr	P/R	Ty/Lb/ ETL
BEC17013	INTRODUCTION TO VLSI AND EMBEDDED SYSTEM DESIGN	4	3	1/0	0/0	Ty
BEC17011	DIGITAL COMMUNICATION	4	3	1/0	0/0	Ty
BEC17009	MICROPROCESSOR AND MICROCONTROLLER	3	3	0/0	0/0	Ty
BEC17EXX	ELECTIVE-II	3	3	0/0	0/0	Ty
BEC17L12	VLSI AND EMBEDDED SYSTEM DESIGN LABI	1	0	0/0	3/0	Lb

Credits Sub Total: 15

SEMESTER 6

COURSE CODE	COURSE TITLE	C	L	T/SLr	P/R	Ty/Lb/ ETL
BEC17014	OPTICAL COMMUNICATION AND NETWORKS	4	3	1/0	0/0	Ty
BEC17008	DIGITAL SIGNAL PROCESSING	4	3	1/0	0/0	Ty
BEC17012	ANTENNA AND WAVE	3	3	0/0	0/0	Ty

	PROPAGATION					
BEC17EXX	ELECTIVE-III	3	3	0/0	0/0	Ty
BEC17L14	PROJECT PHASE-I	2	0	0/0	3/0	Lb

Credits Sub Total: 14

SEMESTER 7

COURSE CODE	COURSE TITLE	C	L	T/SLr	P/R	Ty/Lb/ ETL
BEC17EXX	ELECTIVE-IV	3	3	0/0	0/0	Ty
BEC17L15	PROJECT PHASE-II	10	3	1/0	0/0	Lb

Credits Sub Total: 13

C : Credits L : Lecture T : Tutorial S.Lr : Supervised Learning P : Problem / Practical R : Research

Ty/Lb/ETL: Theory/Lab/Embedded Theory and Lab

* Internal evaluation (Departmental level Refer Annexure for evaluation methodology)

4 Credit papers should compulsorily have either P/R component.

Credit Summary
Semester 1 : 15
Semester 2 : 17
Semester 3 : 14
Semester 4 : 15
Semester 5 : 15
Semester 6 : 14
Semester 7 : 13

Total Credits : 105

LIST OF ELECTIVES						
S.No	**Sub. Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1.	BEC17E01	Biomedical Instrumentation	3	0	0	3
2.	BEC17E02	Pattern Recognition	3	0	0	3
3.	BEC17E03	Device Modeling	3	0	0	3
4.	BEC17E04	Quantum computing	3	0	0	3
5.	BEC17E05	Microwave Engineering	3	0	0	3
6.	BEC17E06	Real Time Operating Systems	3	0	0	3
7.	BEC17E07	Power Electronics	3	0	0	3
8.	BEC17E08	Cryptography and -Network Security	3	0	0	3
9.	BEC17E10	Disaster Management	3	0	0	3
10.	BEC17E11	Television & Video Engineering	3	0	0	3
11.	BEC17E12	Operating Systems	3	0	0	3
12.	BEC17E13	Visual Programming	3	0	0	3
13.	BEC17E14	Bio-Signal Processing	3	0	0	3

14.	BEC17E15	Digital Image Processing	3	0	0	3
15.	BEC17E16	Neural networks and its Applications	3	0	0	3
16.	BEC17E17	Advanced Microprocessors	3	0	0	3
17.	BEC17E18	Database Management Systems	3	0	0	3

Subject Code: BMA17007	Subject Name: PROBABILITY AND RANDOM PROCESS	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Mathematics – I, Mathematics - II	Ty	3	1	0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand the basic concepts in probability and random process and its application in signal processing.

COURSE OUTCOMES (Cos) : (3- 5)

CO1	To understand the Basic concepts in Probability
CO2	To understand the Basic concepts in Distribution
CO3	To understand the Basic concepts in Random process
CO4	To understand the Basic concepts in Correlation
CO5	To understand the Basic concepts in Spectral Density

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H								M
CO2	H	H	M	H								M
CO3	H	H	M	H								M
CO4	H	H	M	H								M
CO5	H	H	M	H								M

COs / PSOs	PSO1	PSO2	PSO3
CO1	M	H	M
CO2	M	H	M
CO3	M	H	M
CO4	M	H	M
CO5	M	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
	✓											
Approval												

BMA17007 PROBABILITY AND RANDOM PROCESS 3 1 0 4

UNIT- I: RANDOM VARIABLES **12 Hrs**

Baye's Theorem – Applications - Random Variables – Distribution functions – Moments – Moment Generating functions –Chebychev's Inequality (statement and application only) – Function of Random Variables.

UNIT – II: STANDARD DISTRIBUTIONS **12 Hrs**

Marginal and Conditional Distributions – Applications of Discrete Distributions: Binomial – Poisson – Geometric – Applications of Continuous distributions: Uniform – Exponential– Normal distributions – Central Limit theorem (statement applications only).

UNIT- III: RANDOM PROCESS **12 Hrs**

Stationary Process – Ergodic Process – Poisson Process –Applications: Birth and Death Process – Markov Process – Markov Chains.

UNIT- IV: CORRELATION **12 Hrs**

Auto Correlation – Auto Covariance – Cross Correlation – Cross Covariance.

UNIT -V: SPECTRAL DENSITY **12 Hrs**

Spectral Density – Cross Spectral Density – Applications to Linear Systems with Random Inputs and Outputs.

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

TEXTBOOKS:

1. Veerarajan T., "*Probability, Statistics and, Random Processes*", Tata McGraw Hill Publishing Co., (2008).
2. Singaravelu, "*Probability and Random Processes*", Meenakshi Agency, (2008).
3. Kandasamy P., Thilagavathy K., Gunavathi K., "*Probability and Queuing theory*", S.Chand& Co., (2010).

REFERENCE BOOKS:

1. Gupta S.C., Kapoor V.K., "*Fundamentals of Mathematical Statistics*", S.Chand& Co., (2007).
2. Richard Johnson A., "*Miller & Freund's Probability and statistics for*

Subject Code: BCS17J01	Subject Name : C++ AND DATA STRUCTURES	T / L / ETL	L	T / S.Lr	P/ R	C

Engineers" (8th ed), Prentice Hall of India, (2009).

Department of Electronics and Communication Engineering

	Prerequisite: Programming and multimedia lab	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn different object oriented programming concepts
- To understand the different methods of organizing large amounts of data
- To efficiently implement the different data structures
- To learn the systematic way of solving problems
- To efficiently implement solutions for specific problems
- Get to know about the trending programming technologies.

COURSE OUTCOMES (COs) : (3- 5)

Students will be able to

CO1	Possess an insight into what is involved in the development of classes and how it can be implemented using C++
CO2	Attain the basic ability to analyze, test and organize huge data
CO3	Master a variety of data structures and their implementations.
CO4	Master different algorithm design techniques (brute-force, divide and conquer, greedy, etc.)
CO5	Apply and implement learned algorithm design techniques and data structures to solve problems.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	M	M	M	M	M	H	H
CO2	H	H	H	H	H	M	M	M	H	H	H	H
CO3	H	H	H	H	H	M	M	M	H	H	H	H
CO4	H	H	H	H	H	M	M	M	H	H	H	H
CO5	H	H	H	H	H	M	M	M	H	H	H	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	H	M	M					
CO2	M	H	M					

CO3	M	M	M					
CO4	M	M	M					
CO5	M	M	M					
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low								

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✓					✓					
Approval												

BCS17I01C++ AND DATA STRUCTURES3 0 0 3

UNIT- I: INTRODUCTION TO OOPS9 Hrs

Object Oriented Concepts – Basics of C++ Environment. Definition – Data Members – Function Members – Control Statements-Overloading Operators – Functions – Friends – Class derivation – Virtual Functions – Abstract Base Classes.

UNIT – II: CLASSES, INHERITANCE & TEMPLATES 10 Hrs

Constructor – Default constructors – Copy Constructors – Destructors – Static members –Constant Members – Free Store Operators-Multiple Inheritances- Exception Handling – Streams - Class Templates – Function Templates

UNIT - III: LINEAR DATA STRUCTURES 9 Hrs

Stacks, Queues & Lists Implementation and Application Singly linked list – Doubly linked lists

UNIT - IV: NON LINEAR DATA STRUCTURES **9 Hrs**

Trees – Binary Trees – Binary Search Tree – Tree Traversals – AVL Trees

UNIT V: SEARCHING AND SORTING **8 Hrs**

Searching – Linear search-Binary Search.Sorting- Insertion sort, Bucket sort, Heap sort, Merge sort, Quick sort.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

TEXTBOOKS :

1. Balagurusamy.E, "*Object oriented programming with C++*", Tata McGraw-Hill publishing company limited, Addison Wesley
2. E.Horowitz, S.Sahani&S.Rajasekharan, "Fundamentals of data structure in C++", Computer science press.
3. Stanley B.Lippman, "The C++ Primer", Addison Wesley Publishers, 4th Edition, 2005.

REFERENCE BOOKS:

1. Weiss Mark Allen. "Data Structures and Algorithms Analysis in C", Pearson Education, 2/e, 1997
2. E.Horowitz, S.Sahani&S.Rajasekharan, "Computer Algorithms", Galgotia 1999.
3. Gary J. Bronson, "Object Oriented Program Development using C++", Thomson Learning, 4th Edition 2005. Brett D. McLaughlin, Gary Pollice, David West" Head First Object-Oriented Analysis & Design" O'Reilly Media, 2007.
4. Gilberg&Forugan, "Data Structures: A Pseudo Code Approach using C++ ", Thomson Learning 1st Edition, 2002.
5. Gary J. Bronson, "*Object oriented program development using Java*, Thomson Learning , 2nd Revised Edition 2005.

Subject Code: BEC17002	Subject Name : DIGITAL ELECTRONICS	T / L / ETy	L	T / SLr	P/ R	C
	Prerequisite: Basic electronics and computer	Ty	3	1	0	4

Department of Electronics and Communication Engineering

	concepts					

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To give an conceptual understanding about Boolean algebra, demorgans theorem, simplification of Boolean expression, Karnaugh map and QuineMcklusky methodology.
- To Design and implement logic gates, combinational logic circuits, PAL, PLA and FPGA.
- To Design and implement sequential logic circuits like Flip flops, counters and shift registers.
- To analyzer state diagram, state tables and its reduction and design and implement synchronous and asynchronous sequential circuits.
- To study different logic families and classify different types of memories.

COURSE OUTCOMES (COs) : (3- 5)

CO1	The Student will be able to analyze and understand Boolean algebra and demorgans theorem concepts and apply Karnaugh map and Quinemckluskymethodogy to design combinational logic circuits.
CO2	The student shall demonstrate the ability to design and implement logic gates, PAL, PLA and FPGA in combinational logic circuits.
CO3	The Student will demonstrate the ability to design and implement sequential logic circuits like flip flops, counters and shift registers.
CO4	The student will be able to analyze state diagram , state tables and its reduction and design and implement synchronous and asynchronous sequential circuits
CO5	The student will be able to study different logic families and will able to differentiate and categorize memory devices.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H	H	H	M	H	H	M	H	M
CO2	H	H	M	H	H	H	M	H	H	M	H	M
CO3	H	H	M	H	H	H	M	H	H	M	H	H
CO4	H	H	M	H	H	H	M	M	H	M	H	H
CO5	H	M	M	M	H	H	M	M	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	M
CO3	H	H	M
CO4	H	H	M
CO5	M	M	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✓		✓			✓	✓				
Approval												

BEC17002 **DIGITAL ELECTRONICS** **3 1 0 4**

UNIT - I: BOOLEAN ALGEBRA **12 Hrs**

Boolean Algebra – De Morgan's Law - Simplifications of Boolean Expression – Sum of Products and Product of Sums – Karnaugh Map(up to 5 variables) – Quince McClusky Method of Simplification (Including Don't care conditions)

UNIT - II: COMBINATIONAL LOGIC **12 Hrs**

Logic gates – AND, OR, NOT, NOR, NAND and EX-OR – Combinational Logic- Arithmetic Circuits – Half adder – Full adder, Half Subtractor - Decimal Adder – Excess 3 Adder – Code Converters – Multiplexer – Demultiplexer- Encoder – Decoder – Design of General Combinational Logic Circuit. PAL, PLA and FPGA.

UNIT- III: SEQUENTIAL LOGIC DESIGN **12 Hrs**

Building Blocks Of Sequential Logic-Rs, JK, Master-Slave, D And T Flip-Flop, Design of Asynchronous and Synchronous Counters - Binary and BCD Counters - Shift Registers.

UNIT - IV: SEQUENTIAL MACHINES **12 Hrs**

Basic Models Of Sequential Machines – Concept of State Diagram - State Table – State Reduction - Design and Implementation of Synchronous Sequential Circuits .Design and Implementation of Asynchronous Sequential Circuits.

UNIT- V: LOGIC FAMILIES AND MEMORY DEVICE **12Hrs**

Characteristics of RTL, DTL, TTL, Families – Schottky, Clamped TTL, ECL, IIL –Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks:

1. Charles H. Roth, "*Fundamentals of Logic Design*", Thompson Learning, 5th Edition
2. FLOYD:" *Digital Fundamentals*", 10th Edition Universal Book Stall, New Delhi.1993
3. Morris Mano, "*Digital Electronics and Design*", Prentice Hall of India, 2000

Reference Books:

1. John F.Wakerly, "*Digital Design*", Fourth Edition, Pearson/PHI, 2008
2. John.M Yarbrough, "*Digital Logic Applications and Design*", Thomson Learning, 2006.
3. Charles H.Roth. "*Fundamentals of Logic Design*", 6th Edition, Thomson Learning, 2013.
4. Donald P.Leach and Albert Paul Malvino, "*Digital Principles and Applications*", 6th Edition, TMH, 2006.
5. Donald D.Givone, "*Digital Principles and Design*", TMH, 2003

Subject Code: BEC17ET1	Subject Name : ELECTRICAL MACHINES AND PCB DESIGN	T / L/ ETL	L	T / S.Lr	P/ R	C

Department of Electronics and Communication Engineering

	Prerequisite: Basic Electrical and Electronic Circuits	ETL	2	0/0	2/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study the working principles of different types of AC machines.
- To understand and analyze the working of various special machines.
- To give an introduction to different types of electronic components and instruments.
- To give an understanding of different stages in PCB design process.
- To analyze how components are assembled and tested in PCB.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Analyze the working principles of different types of AC machines.
CO2	Analyze the working of various special machines
CO3	Identify different types of electronic components and instruments.
CO4	Analyze and design PCB's
CO5	Assemble and test different components in PCB's

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	M	M	M	M	M	-	M
CO2	H	H	H	H	H	M	M	M	M	-	M	M
CO3	H	H	H	H	H	M	M	M	M	M	-	M
CO4	H	H	H	H	H	M	M	M	M	-	M	M
CO5	H	H	H	H	H	M	M	M	M	M	-	M

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	-
CO2	H	H	M
CO3	H	H	M
CO4	H	H	-
CO5	H	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								
Approval												

BEC17ET1 ELECTRICAL MACHINES AND PCB DESIGN 2 0/0 2/0 3

UNIT-I: AC MACHINES 9 Hrs

Transformers - Principle of Operation of single phase Transformer – EMF Equation- Auto Transformers – Three Phase Transformers – Constructional Details. Induction motors- Construction Details - Types – Principle of Operation – Torque Equation. Synchronous machines -Construction of Synchronous machines – Classification - Induced EMF Equation

UNIT-II: SPECIAL MACHINES 9 Hrs

Principle of operation-Universal Motor – Switched Reluctance Motor – Permanent magnet Stepper Motor and Variable Reluctance stepper motor – DC and AC Servo Motor – Tachogenerator - Linear Induction Motor.

UNIT III: INTRODUCTION TO BASICS OF ELECTRONIC COMPONENTS AND INSTRUMENTS 12 Hrs

Study of electronic components: passive: -R,L,C –Types of R,L,C-Analysis of Colour code in R,C :Active: –Diode, BJT, FET,MOSFET :Electronic Instruments: CRO : -Measurements of Voltage &Frequency, Function generator:- Frequency Measurements in Various Range and Wave Form : Power Supply: -Fixed and Variable :Multi-meter:-Measurement of Voltage ,Current, Frequency, R,L,C : IC tester:-Linear ICs and Non Linear ICs: Solder practice.

UNIT IV: PCB DESIGN PROCESS12 Hrs

Conception Level Introduction: Specifying Parts, Packages and Pin Names, Libraries and Checking foot prints of the components, Partlist, Netlist, Making Netlist Files, Placing Parts, Routing Traces, Modifying Traces, Mounting Holes, Adding Text, PCB Layout, DRC, Pattern Transfer.

UNIT V: ASSEMBLING AND TESTING 12 Hrs

Subject Code: BEC17L02	Subject Name : DIGITAL SYSTEM DESIGN LAB	T / L/ ETL	L	T / S.LP	P/ R	C

Identifying the components and its location on the PCB, soldering of active and passive components, Testing the assembled circuit for correct functionality.

Total Number of Hours: 45 Hrs

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

TEXT BOOKS :

1. S. K. Bhattacharya, "*Electrical Machines"*, TMH Publications N. Delhi.
2.Kothari.D.P and Nagrath.I.J., "*Electrical Machines*", Tata McGraw Hill Publishing Co.Ltd, New Delhi, 5th edition 2002.

REFERENCES:

1. Orcad User manual.
2. Raghbir Singh Khandpur, "*Printed Circuit Boards: Design, Fabrication, and Assembly*", (McGraw-Hill Electronic Engineering-2006)
3. Dr. MurugeshKumar.K. "*DC Machines & Transformers*", Vikas Publishing House Pvt Ltd.,2nd edition 2003.
4. Deshpande M. V., "*Electrical Machines*" PHI Learning Pvt. Ltd., New Delhi, 2011.
5. Department Laboratory Manual.

Department of Electronics and Communication Engineering

	Prerequisite: Electronics	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To implement of various laws of Boolean algebra in SOP and POS forms.
- To implement various combinational logic and sequential logic circuits.
- To implement standard IC's in implementing digital circuits.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Practically implement of various laws of Boolean algebra in SOP and POS forms.
CO2	Implement various combinational logic circuits and code converters.
CO3	Design and implement different types of multiplexer and demultiplexers.
CO4	Design and implement various sequential circuits like flip-flops, counters and registers.
CO5	Use the standard IC's in implementing combinational and sequential logic circuits.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	M	M	M	M	M	-	M
CO2	H	H	H	H	H	M	M	M	M	-	M	M
CO3	H	H	H	H	H	M	M	M	M	M	-	M
CO4	H	H	H	H	H	M	M	M	M	-	M	M
CO5	H	H	H	H	H	M	M	M	M	M	-	M

COs / PSOs	PSO1	PSO2	PSO3
CO1	M	M	-
CO2	M	M	M
CO3	M	M	M
CO4	M	M	-
CO5	M	M	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					
Approval												

LIST OF EXPERIMENTS:

1. Implementation of BOOLEAN FUNCTIONS using logic gates –POS &SOP form.
2. Implementation of MULTIBIT ADDERS & SUBTRACTORS (2 & 3 BITS).
3. Design and implementation of code converters using logic gates

i) BCD to excess-3 code and vice versa

ii) Binary to gray and vice-versa

4. Design and implementation of Magnitude Comparator (2-Bit).
5. Multiplexer & De multiplexer logic circuit design
6. Design and implementation of FLIP FLOPS
7 .Implementation of STUDY OF REGISTERS
8. Construction and verification of COUNTERS.
9. Implementation of combinational logic functions using standard ICs
10. Implementation of sequential logic functions using standard ICs

References:

- Lab manual, Department of ECE, DR.MGR UNIVERSITY.
- Maheswari.L.K and Anand.M.M.S, "*Laboratory Manual for Introductory Electronic Experiments*", New Age,2010
- PoornachandraRao.S and Sasikala.B, "*Handbook of Experiments in Electronics and Communication*".

Subject Code: BMA17012	Subject Name: MATHEMATICS IV FOR ELECTRONICS ENGINEERS	T/ L/ ETL	L	T/ S.Lr	P/ R	C
	Prerequisite: MAT III	Ty	3	1	0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study the basic concepts in Analytic functions and its application in flow of current.
- To understand the basic concepts in Numerical methods and its applications.

COURSE OUTCOMES (COs) : (3- 5)

The student will be able to

CO1	Understand the Basic Concepts in solution of Algebraic and Transactional equations.
CO2	Understand the Basic Concepts in Interpolation
CO3	Understand the Basic Concepts in Numerical Differentiation and integration.
CO4	Understand the Basic Concepts in Analytical functions.
CO5	Understand the Basic Concepts in Complex integration.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M									M
CO2	H	H	M									M
CO3	H	H	M		M						M	M
CO4	H	H	M		M						M	M
CO5	H	H	M		M						M	M

Cos / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	M	H	M					
CO2	M	H	M					
CO3	M	H	M					
CO4	M	H	M					
CO5	M	H	M					

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
	✓											
Approval												

Subject Code: BEI17I01	Subject Name : MEASUREMENTS AND INSTRUMENTATION	T / L / ETL	L	T / S.Lr	P/ R	C

BMA17012 MATHEMATICS IV FOR ELECTRONICS ENGINEERS 3 1 0 4

UNIT- I : SOLUTION OF EQUATIONS **12 Hrs**

Solution of Algebraic and Transcendental Equations – Method of false position –Iteration method- Newton-Raphson method – Solution of linear system of equations – Gauss Elimination method – Gauss – Jordan method- Iterative methods – Gauss – jcobi method – Gauss – Sedial method - matrix Inversion by Gauss – Jordan method.

UNIT – II :INTERPOLATION **12 Hrs**

Newton forward and backward differences – Central differences – Stirling's and Bessel's formulae – Interpolation with Newton's divided differences – Lagrange's method.

UNIT- III :NUMERICAL DIFFERENTIATION AND INTEGRATION **12 Hrs**

Numerical differentiation with interpolation polynomials – Numerical integration by Trapezoidal and Simpson's (both 1/3 rd& 3/8 th) rules – Two and three point Gaussian Quadrature formulae – Double integrals using Trapezoidal and Simpson's rules.

UNIT- IV: ANALYTIC FUNCTIONS **12 Hrs**

Analytic functions – Cauchy Riemann equations in Cartesian and Polar form – Properties of analytic functions – Construction of analytic functions – Simple Transformations – Standard transformations : w = z2, w = ez, w = sin z, w = cosh z – Bilinear transformations.

UNIT- V: COMPLEX INTEGRATION **12 Hrs**

Cauchy's integral theorem (without proof) – Cauchy's integral formulae (without proof) – Taylor's and Laurent's series(without proof) – Singularities: Types – Residues – Cauchy's residue theorem (without proof) – Evaluation of real integrals by Contour Integration (excluding poles on real axi

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysi

Total no. of hrs. 60

Text Books :

1. Veerarajan, T. (2008) Engineering Mathematics (for first year).Tata McGraw Hill Publishing Co.
2. Veerarajan, T. (2007) Numerical Methods. Tata McGraw Hill Publishing Co.
3. Sastry, S.S. (2012) Introductory Methods of Numerical Analysis. Prentice Hall of India .
4. Kreyszig, E. (2011) Advanced Engineering Mathematics.9th Ed. John Wiley &Sons.
5.Kandasamy P., (2008)Thilagavathy, Gunavathy K., Numerical Methods (VOL.IV), S.Chand& Co .,
6. Grewal B.S., (2012)Higher Engineering Mathematics, Khanna publishers.

Department of Electronics and Communication Engineering

	Prerequisite: Electronic Circuit	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Introduce students to the use of various electrical/electronic instruments, their construction, applications, principles of operation, standards and units of measurements .Basic measurement and transducers concepts
- Importance of signal generators and signal analyzers in measurements
- Instrumentation standard protocols .
- Relevance of digital instruments in measurements.
- Provide students with opportunities to develop basic skills in the design of electronic equipments using PLC.

COURSE OUTCOMES (COs) : (3- 5)

Upon successful completion of this course, the student will be able to: (Knowledge based)

CO1	Well grounded in their knowledge about various types of transducers, Identify electronics/ electrical instruments, their use, peculiar errors associated with the instruments and how to minimize such errors.
CO2	Understand the basic design techniques of electronic equipment signal generators and signal analyzers.
CO3	Gain knowledge about Instrumentation standard protocolsHART and Foundation Fieldbus H1.
CO4	The students will use various laboratory instruments like cathode ray oscilloscope, function generators and analyze various patterns.
CO5	To develop basic skills in the design of electronic equipments using PLC

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	L	M	M	L	L	M	H	H	H	H
CO2	H	H	H	H	H	H	H	M	M	H	M	M
CO3	H	L	L	M	H	H	M	L	H	H	H	H
CO4	H	H	H	M	M	M	H	L	M	H	H	H
CO5	H	H	H	M	M	M	H	L	M	H	H	H

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	L	H
CO2	H	H	H
CO3	H	M	H
CO4	H	H	M
CO5	H	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							
Approval												

BEI17I01 MEASUREMENTS AND INSRUMENTATION 3 0 0 3

UNIT I: TRANSDUCERS 9 Hrs

Transducer definition, classification, and performance characteristics.Potentiometer and its types, loading effect, sensitivity, piezo-resistive, equivalent circuits, charge and voltage sensitivity.Measurements, Instrumentation, Errors in Measurements, Calibration and Standard.

UNIT II:SIGNAL GENERATOR AND SIGNAL ANALYZERS 9 Hrs

A.F. Generator, Pulse Generator, AM / FM Signal Generator, Function Generator, Sweep Frequency Generator, Wave Analyzers, Spectrum Analyzers, Logic Analyzer, Distortion Analyzers, Network Analyzer.

UNIT III: INSTRUMENTATION STANDARD PROTOSCOLS 9 Hrs

Definition of protocol, HART Protocol: Introduction, frame structure, programming, implementation examples, benefits, advantages and limitation. Foundation Fieldbus H1: Introduction, frame structure, programming, implementation examples, benefits, advantages and limitation. Comparison of HART, Foundation Fieldbus, Devicenet, Profibus, Controlnet, Industrial Ethernet.

UNIT IV: DATA DISPLAY AND RECORDING SYSTEM 9 Hrs

CRO, Single Beam, Dual Trace, Double Beam CRO, Digital Storage and Analog Storage Oscilloscope, Sampling Oscilloscope, Power Scope, Curve Tracer, Analog, Digital Recorders and Printers – Case Study on LissajousPattern .

UNIT V: COMPUTER CONTROLLED TEST SYSTEM 9 Hrs

Programmable logic controllers (PLC) Introduction, architecture, definition of discrete state process control, PLC Vs PC, PLC Vs DCS, relay diagram, ladder diagram, ladder diagram examples, relay sequencers, timers/counters, high speed counter, PLC design, study of at least one industrial PLC

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks:

1. Rangan C.S. "*Instrumentation Devices and Systems*", Tata McGraw Hill, 1998.
2. SandeepRedkar, "Foundation Fieldbus control system" , Rockwell Automation,2010,
3. A. K. Shawney "*Electronics and Electrical Instrumentation"* Tata McGraw Hill, 1975.

Reference Books:

1. Bouwels A.J., "*Digital Instrumentation*", McGraw Hill, 1986.
2. Barney .C, "*Intelligent Instrumentation* ", Prentice Hall of India, 1985.
3. Oliver and Cage, "*Electronic Measurements and Instruments and Instrumentation*", McGraw Hill, 1975.
4. Deobelin, "*Measurements Systems*", McGraw Hill, 1990.
5. Cooper, "*Electronic Instrumentation and Measurement Techniques*", Prentice Hall of India, 1988.

Subject Code: BEC17003	Subject Name : SOLID STATE DEVICES	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Basics of electrical and electronics.	Ty	3	0	0	3

Department of Electronics and Communication Engineering

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn crystal structures of elements used for fabrication of semiconductor devices.
- To study energy band structure of semiconductor devices.
- To understand Fermi levels, movement of charge carriers, Diffusion current and Drift current.
- To study behavior of semiconductor junction under different biasing conditions and Power devices. Varactor diode, Zener diode, Schottky diode, etc.
- To study VI Characteristics of devices and limitations in factors like current, power frequency.

COURSE OUTCOMES (COs) : (3- 5)

The students will be

CO1	Understand crystal structures of elements used for fabrication of semiconductor devices.
CO2	Familiar with energy band structure of semiconductor devices.
CO3	Understand Fermi levels, movement of charge carriers, Diffusion current and Drift current.
CO4	Know about Power devices. Varactor diode, Zener diode, Schottky diode, etc.
CO5	Understand VI Characteristics of devices and limitations in factors like current, power frequency

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H		M	L	M	M	L	H	H	M	M	M
CO2	H			M		H	M	M	M	M		
CO3	H	H				M	M	H	M		H	M
CO4	H	M				H	H	H	M	M	M	L
CO5	H	H	M	M	M	M			M	M	M	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	H	M						
CO2	H	M	M					
CO3	H	M						
CO4	H	M	M					
C05	H	H	M					

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✓		✓								
Approval												

BEC17003 SOLID STATE DEVICES 3 0 0 3

UNIT- I : SEMICONDUCTOR DIODES 9 Hrs

Theory of PN Junction Diode – VI characteristics – Static and Dynamic Resistance – Effect of Temperature on Diodes – Space Charge and Diffusion Capacitance - Zener Diode – Avalanche and Zener Break Down Mechanisms – Zener Diode as a Voltage Regulator.

UNIT- II : BJT & BIASING 9 Hrs

Principles of Transistor Action – Current Components – Cut Off, Active & Saturation Region – I/P & O/P characteristics CE, CB and CC. Small Signal Large Signal 'β', Break Down & Switching Characteristics – Transistor Biasing – Bias Stabilization – Bias Compensation – Thermal Runaway – Design with Heat Sink.

UNIT- III: FET & MOSFET 9 Hrs

Construction Feature & Working Principles of JFET, MOSFET Depletion and Enhancement Mode, Biasing of FET, and MOSFETS, Transmission Gate using CMOS.

UNIT- IV: POWER DEVICES 9 Hrs

Charge Transfer Device, UJT, SCR, Diac, Triac, GTO, MCT and Introduction to Gallium Arsenide Devices, FinFET, LDR, Photo Voltaic cell, Varactor diode.

UNIT- V: SMALL SIGNAL MODEL 9 Hrs

Small Signal Model of Transistor- Analysis of Amplifiers using Small Signal Model. Common Emitter, Common Base, Common Collector, Common Source, Common Drain, Common Gate, Multistage Amplifiers.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks:

1. Nandita Das Gupta, Amitava Das Gupta, "*Semiconductor Devices*", Prentice Hall of India, 2005
2. Sedra and Smith, "*Microelectronic Circuits*" Oxford University Press, 2004
3. Mohammed Gausi and Spencer, "*Introduction to Electronics Circuit Design*", Pearson Education, 2004

Reference Books:

1. Boylestad, Robert. L and Nashelsky Louis ," *Electronic Devices and Circuit theory*" Prentice Hall of India,6th Edition, 2001
2. William & Harris, "*Electronic Devices and Circuits*", Tata McGraw Hill International Editions, 2000
3. MillmanHalkias, "*Electron Devices*", Tata McGraw Hill, 2000.
4. Donald neamam, " Micro electronics" , Tata McGraw Hill, 2007.
5. Sedra smith, " *Micro Electronic Circuits*" Fifth edition,2013.

Subject Code: BEC17ET2	Subject Name : ANALYSIS OF ELECTRO MAGNETIC FIELD THEORY	T / L/ ETL	L	T / S.L r	P / R	C

Department of Electronics and Communication Engineering

	Prerequisite: Engineering Physics, Vector Calculus	ETL	0	1	2	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study the basic concepts in vector calculus and fundamental ideas in electrostatics and magneto statics.
- To understand the concepts of current density and to learn how to solve the electrostatic problems
- To learn the behavior of time varying fields and flow of electromagnetic power.

COURSE OUTCOMES (COs) :

CO1	The students will be able to apply the vector calculus in the field of electrostatics and electrodynamics.
CO2	The students will show their ability to analyze the behavior of electric field continuous across an interface.
CO3	The students will hone their inferences to solve complex electrostatic problems.
CO4	The students will demonstrate their skills in analyzing the effects of magnetic fields.
CO5	The students will apply their understanding of wave equations to design an antenna.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	M	M	H				M	M	
CO2	H	H	H	H	M	H				M	M	
CO3	H	M	M	H	H	H	M	H	M	M	H	H
CO4	H	H	H	H	H	M	M	H		M		H
CO5	H	M		M	M	M	H		H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	
CO3	H	H	M
CO4	H	H	
CO5			M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
	✓			✓								
Approval												

BEC17ET2 ANALYSIS OF ELECTRO MAGNETIC FIELD THEORY 0 1 2 3

UNIT I: VECTOR ANALYSIS **9Hrs**

Scalars and Vectors, Cartesian, Cylindrical and Spherical Coordinate System, Integrals containing vectors, Gradient, Divergence and Curl, Divergence theorem and Stoke's theorem

Lab Experiments

- Vector Representation and Coordinate Systems using Software Package: 'CAEME'
- Coordinate Systems and Conversion using 'CAEME' Software

UNIT II: ELECTROSTATICS **9Hrs**

Fundamental Postulates of Electrostatics in free space, Coulomb's law, Determination of Electric field, Gauss's law and its applications, Electric potential, Electric Flux Density and Dielectric constant, Boundary Conditions for Electrostatic fields, Determination of Capacitance and Electrostatic Energy,

Lab Experiments

- Electrical Field and Potential inside the Parallel Plate Capacitor
- Capacitance and Inductance of Transmission Lines
- Simulation of Electric Field and Potential Inside Capacitors

UNIT III: ELECTROSTATIC SOLUTIONS AND STEADY ELECTRIC CURRENTS **9Hrs**

Laplace's Equations and Poisson's Equations, Uniqueness theorem, Boundary Value Problems in Cartesian, Cylindrical and Spherical Coordinate System, Current Density, Electromotive Force, Continuity Equation, Boundary Conditions for Current Density.

Lab Experiments

- Simulation of Electric Field and Potential Inside Capacitors

UNIT IV: MAGNETOSTATICS **9 Hrs**

Fundamental Postulates of Magneto statics in free space, Vector Magnetic Potential, Biot-Savart's law and its applications, Scalar Magnetic Potential, Magnetic Field Intensity and Relative Permeability, Boundary Conditions for Magneto static fields, Determination of Inductance and Magneto static Energy, Determination of magnetic Force and Torque.

Lab Experiments

- Magnetic Field outside a Straight Conductor
- Magnetic Field of Coils
- Magnetic Force on a Current Carrying Conductor
- Inductance of Transmission Lines

UNIT V: TIME-VARYING FIELDS AND ELECTROMAGNETIC POWER **9 Hrs**

Faraday's Law of Electromagnetic Induction, Maxwell's Equations (Integral and Differential Form), Wave Equations for a source-free region, Poynting vector and Poynting theorem.

Lab Experiments

- Electromagnetic Induction
- E.M Wave Radiation and Propagation

Total Number of Hours: 45 Hrs

Textbooks

1. David K.Cheng, "*Field and Wave Electromagnetics*", McGraw Hill Inc., Third Edition, Malaysia, 1995
2. William H. Hayt& John A.Buck, "*Engineering Electromagnetics*",TataMc-Graw-Hill 7th Edition 2005. .
3. Y.Mallikarjunareddy, "Eletromagnetic fields", Universities press, Edition 2013.

Reference Books:

1. John D Kraus, "*Electromagnetics*", Tata McGraw Hill Book Co., New York, Third Edition, 1989.
2. Joseph A Edminister, "*Theory and Problems of Electro Magnetics*", Schaum's Outline Series Tata McGraw Hill, New York, 1986
3. Mathew N. O. Sadiku, "*Elements of Electromagnetics*", Oxford International Student Edition, Fourth Edition
4. David J.Griffiths, "*Introduction to Electrodynamics*", Pearson Education Limited 2014.
5. S.P.Seth, "*Elements of Electromagnetic Fields*", DhanpatRai& Co.

Subject Code: BEC17001	Subject Name : CIRCUIT THEORY	T / L / T	L	T / Sg Lr	P/ R	C

Department of Electronics and Communication Engineering

	Prerequisite: Mathematical knowledge, basic electrical concepts	Ty	3	1	0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand the concept of circuit elements lumped circuits, waveforms, circuit laws and network reduction
- To solve the electrical network using mesh and nodal analysis by applying network theorems
- To learn methods of circuits analysis in time domain and frequency domain
- To understand the concept of resonance in Series and parallel circuits and to know the concepts of coupled circuits.
- Obtaining equations to solve circuits in steady state and transient state

COURSE OUTCOMES (COs) : (3- 5)

CO1	The student will be able to understand the concept of circuits, network theorems and various circuit laws
CO2	The student will be able to analyse and solve a given electrical networks using mesh and nodal analysis
CO3	The students will hone their inferences to analyze circuits analysis in time domain and frequency domain
CO4	The students will demonstrate their skills in understanding the concept of various resonance and coupled circuits
CO5	The students will apply their understanding to derive the analyze the equations with respect to solving circuit transients.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H	H	H	H	H	H		H	
CO2	H	H		H	H	H	M	H	H		H	
CO3	H	H	M	H	H	H	M	H	H		H	H
CO4	H	M		H	H	H		H	H	M	H	H
CO5	H	M			H	H		M	H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	
CO3	H	H	M
CO4	H	H	
CO5			M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✓		✓			✓	✓				
Approval												

BEC17001 CIRCUIT THEORY 3 1 0 4

UNIT-I: BASIC CIRCUIT CONCEPTS 12 Hrs

V-I Relationships Of R, L And C – Independent Sources – Dependent Sources – Kirchhoff's Laws - Simple Resistive Circuits – Network Reduction – Voltage Division – Current Division – Source Transformation. Formation of Matrix Equations and Analysis Using Mesh-Current and Node-Voltage Methods.

UNIT-II: AC FUNDAMENTALS 12 Hrs

AC Quantity, Phasor Representation – Analysis Of Simple Series And Parallel Circuits – Power And Power Factor – Analysis Mesh Current And Node Voltage Methods – Series Resonance And Parallel Resonance

UNIT-III: NETWORK THEOREM AND DUALITY 12Hrs

Useful Circuit Analysis techniques - Linearity and superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Super position theorem - Delta-Wye Conversion. Duals, Dual circuits.

UNIT- IV:TRANSIENT ANALYSIS 12 Hrs

Transient Concepts-Behavior Of Circuit Elements Under Switching Conditions and Their Representation-Forced and Free Response of RL, RC And RLC Circuits with D.C. And Sinusoidal Excitations Using Laplace Transform Method – Natural Frequency and Damping Factor

UNIT-V: COUPLED CIRCUITS 12 Hrs

Mutual Inductance – Coefficient Of Coupling – Ideal Transformer – Analysis Of Multi Winding Couple Circuits – Single & Double Tuned Circuits – Critical Coupling.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks :

1. A.Sudhakar&ShyanmugamS.Palli*" Circuits & Network Analysis & Synthesis*", 4th Edition, Tata McGraw Hill, 2010
2. Bruce Carlson, "*Circuits: Engineering Concepts and Analysis of Linear Electric Circuits*", Thomson Learning, 1st Edition, 2002
3. M.L Soni& J.C. Gupta, " *Electric Circuit Analysis"*, DhanpatRai& Sons , New Delhi, 1999.

Reference Books:

1. Hyatt, W.H. Jr and Kimmerly, J.E., "*Engineering Circuits Analysis*", McGraw Hill International Editions,1993.
2. Edminister, J.A., "*Theory and Problems of Electric Circuits*", Schaum's Outline Series McGraw Hill Book Company, 2nd Edition, 1983.
3. Paranjothi S.R., "*Electric Circuit Analysis*", New Age International Ltd., Delhi, 2nd Edition, 2000.
4. Artice.M. Davis, "*Linear Circuits Analysis*", Thomson Learning 2002
5. Roy Choudhury, "*Networks and Systems*", New Age International Ltd, 1992

Subject Code: BCS17102	Subject Name : COMPUTER NETWORKS	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Communication System	Ty	3	0	0	3

Department of Electronics and Communication Engineering

Department of Electronics and Communication Engineering

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand different storage media and OSI layers
- To introduce the features of different I/O peripheral devices and their interfaces.
- To introduce the students the functions of different layers.
- To introduce IEEE standard employed in computer networking.
- To make students to get familiarized with different protocols and network components.

COURSE OUTCOMES (COs) : (3- 5)

The Students will able to

CO1	Describe the basic concepts of data communication and OSI layers.
CO2	Analyze data link control protocol.
CO3	Explain different standards and protocols used in LAN
CO4	Express the duties of network support layer and WAN protocols
CO5	Define the functions of upper OSI layer

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H							H	H	M		
CO2	H	H			M							
CO3	M	M	M		H		M	M				H
CO4	H		M	M		M	M		M			H
CO5	H	M				H			M	M	M	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	H	H						
CO2	H	M	H					
CO3		H	M					
CO4								
CO5	M	M	H					

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
										✓		
Approval												

BCS17I02 COMPUTER NETWORKS 3 0 0 3

UNIT- I DATA COMMUNICATION 9 Hrs

Introduction, Basic Transmission concepts of OSI Reference Model, Transmission of Digital Data –Electrical Interface, Modems- rate-modem standards-Guided Media-Twisted –pair Cable-Coaxial cable-Performance-Error Detection and Correction (CRC) - Time and Frequency domains Signals

UNIT -II DATA LINK CONTROL AND PROTOCOLS 9 Hrs

Flow Control and Error Control, Stop And Wait, Sliding Windows, Automatic Repeat (ARQ), Asynchronous Protocols, - X Modem, Y Modem, Synchronous Protocols – Character Oriented and Bit Oriented Protocols (HDLC).

UNIT- IIILOCAL AREA NETWORKS 9 Hrs

IEEE 802 Standards, LLC, MAC Layer Protocols –CSMA/CD Ethernet, Token Bus, Token Ring, FDDI, Distributed Queue Dual Bus, Switched Multimegabit Data Service

UNIT- IVWIDE AREA NETWORKS 9 Hrs

Switching, Duties of the Transport Layer, ATM Protocol –Architecture Header Structure, Function of AAL Layer,Internetworking Devices, Repeater,Bridge, Routers and Gateways, Routing Algorithms.LinkStateand Distance Vector routing.

UNIT- VUPPER OSI LAYERS 9 Hrs

Session Layer Protocols, Presentation Layer – CryptographyData Security, Brief Introduction to Encryption / Decryption, Authentication -Data Compression, Application Layer Protocols, MHS, File Transfer .

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks :

1. Behrous A. ForouzanEtal, "*Data Communication and Networking*", Tata McGraw Hill, 2nd Edition, 2000.
2. William A, Shay, "*Understanding Data Communications and Networks*", Thomson Learning, 3rd Edition 2003.
3. Miller, "*Data and Network Communications*", Thomson Learning
4. Gallo, "*Computer Communications and Networking Technologies*", Thomson Learning, 1st edition 2001.

Reference Books:

1. William Stallings, "*Data and Computer Communication*", Prentice Hall of India, Fifth Edition 1997.
2. Andrew S. Tanenbaum, "*Computer Networks*", prentice hall of India, Third Edition 1996.
3. Fred Hallsall, "*Data Communication Computer Networks and Open System*", Addison – Wesley, 1992

Subject Code: BEC17005	Subject Name: SIGNALS AND SYSTEMS	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Mathematics	IV	3	1	0	4

Department of Electronics and Communication Engineering

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study the representation of discrete and continuous signals and systems.
- To study the analysis of continuous time systems using Laplace and Fourier transforms.
- To study the analysis of discrete time systems using DFT and Z transforms.

COURSE OUTCOMES (COs) : (3- 5)

The student

CO1	Will be able to classify continuous and discrete time signals and systems.
CO2	Will analyze continuous signals and its spectrum with transforms.
CO3	Will be able to determine the response of continuous time systems with transforms and state variable approach.
CO4	Will analyze discrete signals and its spectrum with transforms.
CO5	Will analyze discrete signals and its spectrum with transforms.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H		M			M	M	M
CO2	H	H	H	H	H		M			M	M	M
CO3	H	H	H	H	H		M			M	M	M
CO4	H	H	H	H	H		M			M	M	M
CO5	H	H	H	H	H		M			M	M	M

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	M	
CO2	H	M	
CO3	H	M	
CO4	H	M	
CO5	H	M	

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								
Approval												

BEC17005 SIGNALS AND SYSTEMS 3 1 0 4

UNIT- I: CLASSIFICATION OF SIGNALS AND SYSTEMS 12 Hrs

Continuous Time Signals (CT signals), Discrete Time Signals (DT Signals) – Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals – Periodic and aperiodic, Random Signals, CT Systems and DT Systems, Classification of Systems – Linear Time Invariant Systems(LTI).

UNIT - II: ANALYSIS OF C.T SIGNALS 12Hrs

Fourier series Analysis, Spectrum of C.T. Signals, Fourier Transform and Laplace Transform –Properties of Fourier Transform - Applications in Signal Analysis.

UNIT- III: LTI – CT SYSTEMS 12 Hrs

Differential Equation, Block Diagram Representation, Impulse Response, Step Response, Convolution Integral, Frequency Response, Fourier and Laplace Transforms in Signal Analysis, State Equations and Matrix.

UNIT - IV: ANALYSIS OF D.T. SIGNALS 12 Hrs

Spectrum of D.T. Signals, Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT), Properties of DFT, Properties of Z – Transform in Signal Analysis, Inverse Z-Transform.

UNIT - V: LTI – DT SYSTEMS 12 Hrs

Difference Equations, Block Diagram Representation, Impulse Response, Convolution, Frequency Response, Z – Transform Analysis, Realization of Digital Filters – Direct Form-I, Direct Form-II, Transposed, Parallel, Cascade Structure, State Variable Equation and Matrix.

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks:

1. Alan V Oppenheim, "*Signals and Systems*", Prentice Hall of India Pvt. Ltd, 2nd Edition, 1997.

Subject Code: BEC17006	Subject Name: ELECTRONIC CIRCUITS	T / L / ETL	L	T / S.Lr	P/ R	C

2. Roger E. Zeimer et al, "*Signals and Systems*": Continuous and Discrete, McMillan, 2nd Edition, 1990

3. Hwei P. Hsu, Schaum's Outline Series, "*Signals and Systems*", McGraw Hill Companies, 2nd Edition.

Reference Books:

1. Douglas K Lindner, "*Signals and Systems*", McGraw Hill International, 1999.
2. Simon Haykin and Barry Van Veen ," *Signals and Systems*", John Wiley and Sons, Inc., 1999.
3. Robert A. Gabel and Richard A. Roberts,"*Signals and Linear Systems*", John Wiley, 3rd Edition, 1987.

Department of Electronics and Communication Engineering

	Prerequisite: Solid State devices	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- On completion of this course the student will understand
- The methods of biasing transistors and Design of simple amplifier circuits
- Method of calculating cutoff frequencies and to determine bandwidth
- Design of power amplifiers and heat sinks

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Model various types of rectifiers.
CO2	Use the different amplifier independently
CO3	Construct the feedback amplifiers and oscillators.
CO4	Calculate the delay and switching time multivibrator.
CO5	Detect the efficiency of power amplifier.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	M	M		M	H	M	H	H
CO2	H	H	H	H	H	M		H	M	M	H	H
CO3	H	H	H	H	H			M	H	H	H	M
CO4	H	H	H	H	H				H	H	M	M
CO5	H	H	M	H	H				H	M		H

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	M	M
CO2	H		H
CO3	H		H
CO4	H	M	H
CO5	H	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								
Approval												

Department of Electronics and Communication Engineering

BEC17006 ELECTRONIC CIRCUITS 3 0 0 3

UNIT I: RECTIFIER & POWER SUPPLY9 Hrs

Half & Full Wave Rectifies – Filters – Shunt, Inductor, LC Section & Ripple Factor, πfilters Calculation for C, L and LC Filters – Voltage Regulators – Zener – Series Voltage Regulator – Shunt Voltage Regulator – SMPS-IC Voltage Regulators.

UNIT II: AMPLIFIERS 9 Hrs

Amplifiers – Frequency Response of RC Coupled Amplifiers – Frequency Response ofEmitter follower, Gain BandWidth Product – FET - Amplifier at Low and High Frequency Cascaded Amplifiers

UNIT III: FEED BACK AMPLIFIER & OSCILLATORS 9 Hrs

Four Basic Type of Feedback – Effect of Feedback on Amplifier Performance-Examples of Different types of Feedback Amplifiers-Voltage Series & Shunt Feedback, Current Series & Shunt Feedback – Condition for Oscillation Barkhaushen Criteria – LC Oscillators – Hartley &Colpitts – RC Oscillators – Wein Bridge, RC Phase Shift CrystalOscillator.

UNIT IV: MULTIVIBRATORS 9 Hrs

Collector Coupled & Emitter Coupled AstableMultivibrator, – Mono Stable, BistableMultivibrator– TriggeringMethods – Storage Delay and Calculation of Switching Time - Schmitt Trigger Circuits, Speed up Capacitor in Switching – UJT based Relaxation Oscillator.

UNIT V: POWER AMPLIFIER 9 Hrs

Classification – Class A, B, C & AB, Class B-push pull – Class B Complementary Symmetry, Class S, and Power sections Classifications, Efficiency, Distortion in Amplifiers-Tuned Amplifiers.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks :

1. Mohammed. H. Rashid, "*Micro Electronic Circuits, Analysis and Design*", Thomson Learning
2. David. A. Bell, "*Solid state Pulse Circuits*", Prentice Hall India, 4th Edition, 2000.
3. Angsumansarkar, “Solid State Microelectroni and Optoelectronic Devices” University press,2012.

4. Mohammed. H. Rashid, "*Micro Electronic Circuits, Analysis and Design*", Thomson Learning
5. David. A. Bell, "*Solid state Pulse Circuits*", Prentice Hall India, 4th Edition, 2000.
6. Angsumansarkar, “Solid State Microelectroni and Optoelectronic Devices” University press,2012.

Reference Books:

1. MillmanTaub ,"*H Pulse Digital & Switching waveform* ", Tata McGraw Hill International, 2001
2. Jacob Millman, Cristas C. Halkias," *Integrated Electronics*", Tata McGraw Hill., Edition 199
3. MillmanTaub ,"*H Pulse Digital & Switching waveform* ", Tata McGraw Hill International, 2001

4. Jacob Millman, Cristas C. Halkias," *Integrated Electronics*", Tata McGraw Hill., Edition 1991.

Subject Code: BEC17ET3	Subject Name : DESIGN AND IMPLEMENTATION OF LINEAR INTEGRATED CIRCUITS	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Electronic Circuits	ETL	1	0/0	2/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To introduce the basics of linear integrated circuits.
- To understand the applications of operational amplifiers.
- To learn the design of comparators, signal generators and timers.
- To design active filters and PLL.
- To learn the concepts of IC regulators and Data converters.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Understand the basics of linear IC's.
CO2	Apply op-amp for various applications.
CO3	Design comparators and signal generators using op-amp.
CO4	Design active filters and PLL.
CO5	Understand and apply data converters for real time application.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	-	H	M	M	M	M		M	M	M	M
CO2	H	H	H	M	M	H	H		M	M	M	-
CO3	H	H	H	H	H	M	M				M	M
CO4	H	H	H	H	H	H	M	M			M	-
CO5	H	M	M	M	M	M				M	M	M

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	
CO2	H	H	
CO3	H	H	
CO4	H	H	
CO5	H	H	

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								
Approval												

BEC17ET3 **1 0/0 2/03**

DESIGN AND IMPLEMENTATION OF LINEAR INTEGRATED CIRCUITS

UNIT-I: INTRODUCTION TO INTEGRATED CIRCUITS **9Hrs**

Integrated circuit and its classification, Introduction to Operational amplifier, Ideal Op-Amp , DC & AC Characteristics, Slew rate and methods of improving slew rate, CMRR, PSRR, Frequency Response and Compensation techniques.

Lab Experiments:

- Measure input bias current, input offset current, input offset voltage of the given op-amp
- Design voltage follower to measure slew rate.
- Measure CMRR for a given circuit and Compare measured value with calculated value

UNIT-II:APPLICATIONS OF OPAMP IC741 **9Hrs**

Inverter and Non-Inverter - Summer and Subtractor – Multiplier and Divider – Differentiator and Integrator – Instrumentation Amplifier – AC Amplifier – Op- Amp Circuits using Diodes, Precision Rectifier – Clipper and Clamper – Sample and Hold Circuit – Log and Antilog Amplifiers.

Lab Experiments:

- Design an Inverting and Non Inverting amplifier for required gain using IC741
- Design and realize adder and subtractor using IC741.
- Design Integrator and Differentiator using IC741.

- Design Clipper and Clamper Circuit using IC741.

UNIT-III: COMPARATORS AND SIGNAL GENERATORS 9Hrs

Applications of Comparators – Regenerative Comparators (Schmitt Trigger) – Square Wave Generator (AstableMultivibrator) – MonostableMultivibrator –Triangular Wave Generator – Saw Tooth Wave Generator – Sine Wave Generators.

Lab Experiments:

- Design Schmitt trigger using IC741 for given values of UTP & LTP
- Design Monostablemultivibrator for required pulse width using IC741.
- Design Astablemultivibrator for required frequency and duty cycle using IC741

UNIT-IV: ACTIVE FILTERSAND PLL 9Hrs

RC Active Filters: Low pass – High pass – Band pass – Band reject – Notch – First order , Second order Filters– Switched Capacitor Filters – Counter Timers.

PLL Basic Principles – Phase Detector and Comparator: Analog and Digital Voltage Controlled Oscillator – Low pass Filter - PLL – Applications of PLL

Lab Experiments: (PSPICE)

- Design & Obtain frequency response of First order HPF & LPF filters
- Design & Obtain frequency response of Notch, BPF & BRF filters

UNIT V: IC REGULATORS AND DATA CONVERTERS: 9Hrs

IC voltage regulators: Introduction, Fixed voltage regulators, SMPS, current limiting and current foldback techniques using IC723.

DAC/ADC Techniques – Integrating DAC /ADC Specifications, High Speed A/D Converters

Lab Experiments: (PSPICE)

- Design a voltage regulator for a given voltage.
- Calculate line, load regulation for a voltage regulator using IC723
- Construct a 4-bit R-2R ladder type DAC
- Set up a 4-bit successive approximation type ADC and study its performance

TEXT BOOKS:

1. James. M. Fiore, "Operational Amplifiers and Linear Integrated Circuits", First Edition , Thomson Learning.
2. Roy Choudhury and Shail Jain, “Linear Integrated Circuits” , Wiley Eastern Ltd., 1991.

Subject Code: BEC17L16	Subject Name: ELECTRONIC CIRCUITS AND DEVICES LAB	T / L/ ETL	L	T / S.Lr	P/ R	C

3. Coughlin and Dirscol, "Operational Amplifiers and Linear Integrated Circuits", Prentice Hall of India Pvt., Ltd., 1992

REFERENCE BOOKS:

1. Millman and Halkias, “Integrated Electronics", McGraw Hill, 1992.
2. Sergio Franco, “ Design with Operational Amplifiers and Analog Integrated Circuits”, Third Edition, T MH, 2002 .
3. Ramakant A. Gayakwad, “ Op – amp and Linear Integrated Circuits”, Fourth edition, PHI.

Department of Electronics and Communication Engineering

	Prerequisite: Electronic Circuits	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To be able to design, implement different types of rectifier circuits.
- To be able to design different types of voltage regulators.
- To be able to design different amplifiers and oscillatory circuits.
- To be able to design power amplifier and study its characteristics.
- To be able to design tuned amplifier and analyze its behavior.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Design and implement different types of rectifier circuits.
CO2	Testing and Verification of circuit theorems
CO3	Perform hands on design on different amplifier circuits.
CO4	Testing and verification of Resonant Circuits
CO5	Perform hands on designing oscillator circuits and analyze its behavior.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	M	M	M	M	M	M	-
CO2	H	H	H	H	H	M	M	M	M	M	-	M
CO3	H	H	H	H	H	M	M	M	M	-	M	-
CO4	H	H	H	H	H	M	M	M	M	-	-	M
CO5	H	H	H	H	H	M	M	M	-	M	M	-

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	M
CO3	H	H	M
CO4	H	H	M
CO5	H	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					
Approval												

BEC17L16 ELECTRONICCIRCUITS & DEVICES LAB 0 0 3 1

1. VERIFICATION OF SUPERPOSITION THEOREM, MPT, THEVENIN & NORTON THEOREM
2. CHARACTERISTICS OF P-N JUNCTION & ZENER DIODE
3. I/P & O/P OF CHARACTERISTICS OF BJT & FINDING β OF THE TRANSISTOR
4. CHARACTERISTICS OF JFET
5. Half Wave and Full Wave Rectifiers
6. MOSFET CHARACTERISTICS
7. STUDY OF RESONANT CIRCUITS
8. FREQUENCY RESPONSE OF CE AMPLIFIER
9. HARTLEY AND COLPITTS OSCILLATOR
10. WIEN BRIDGE AND RC PHASE SHIFT OSCILLATOR

Subject Code: BEC17004	Subject Name : CONTROL SYSTEMS FOR ELECTRONICS ENGINEERS	T / L/ ETL	L	T / S Lr	P/ R	C
	Prerequisite: Network system	Ty	3	1	0	4

Department of Electronics and Communication Engineering

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn the basic elements of control system with mathematical model.
- To understand the time response of first and second order system feedback.
- To learn the frequency response of systems using bode plot and polar plot.
- To check the stability of Control system using various techniques.
- To study different compensators and advance control system concepts using state variables.

COURSE OUTCOMES (COs) : (3- 5)

The student will be able to

CO1	Model physical systems using block diagram and signal grew.
CO2	Analyze the system using time response.
CO3	The open loop and closed loop analysis of systems in frequency domain.
CO4	Check the stability of the given system using root locus and Nyquist Plot.
CO5	Choose the compensator for the given system and do the analysis using state variables.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H		M		M	M	M	
CO2	H	H	H	H	H		M		M	M	M	
CO3	H	H	H	H	H		M		M	M	M	
CO4	H	H	H	H	H		H		M	M	M	
CO5	H	H	H	H	H		H		H	M	M	

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	
CO2	H	H	
CO3	H	H	
CO4	H	H	
CO5	H	H	

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✓		✓								
Approval												

BEC17004 CONTROL SYSTEMS FOR ELESTRONICS ENGINEERS 3 1 0 4

UNIT- I: SYSTEM REPRESENTATION 12 Hrs

Control Systems – Basic elements in control systems –Open and Closed loop systems – Mathematical models of physical systems – Transfer function – Block diagram reduction techniques – Signal flow graph.

UNIT- II: TIME RESPONSE 12 Hrs

Standard Test Signals-Time Domain study of first order and second order feedback control systems -Time domain Specifications - I and II order System Response - Error Coefficients - Generalized Error Series - Steady State Error - P, PI, PID Controllers.

UNIT - III: FREQUENCY RESPONSE 12 Hrs

Frequency Response - Bode plot - Polar plot - Constant M and N circles - Determination of Closed Loop Response from Open Loop Response - Correlation between Frequency Domain and Time Domain Specifications.

UNIT- IV: STABILITY OF CONTROL SYSTEM 12Hrs

Characteristics Equation - Location of Roots in S plane for stability - Routh Hurwitz Criterion - Root Locus Construction - Effect of Pole, Zero Addition - Gain Margin and Phase Margin - Nyquist Stability Criterion.

UNIT - V: COMPENSATORS AND STATE SPACE ANALYSIS 12 Hrs

Lag, Lead, Lag Lead Compensators- State Space Analysis - State Space Formulation -State Variables - Phase variables and Canonical Variables –Concept of Controllability &Observabliity

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks:

1. K. Ogata, '*Modern Control Engineering*', 4th edition, Pearson Education, New Delhi, 2003 / PHI.

Subject Code:	Subject Name : TRANSMISSION LINES & WAVE GUIDES	T / L/ ETL	L	T / S.Lr	P/ R	C

2. I.J. Nagrath& M. Gopal, '*Control Systems Engineering'*, New Age International Publishers, 2003.
3. B.C. Kuo, '*Automatic Control Systems*', Prentice Hall of India Ltd., New Delhi,7th edition, 1995.

Reference Books:

1. M. Gopal, '*Control Systems, Principles & De*sign', Tata McGraw Hill, New Delhi, 2002.
2. M.N. Bandyopadhyay, '*Control Engineering Theory and Practice'*, Prentice Hall of India, 2003.
3. A.Nagoorkani , "*Control System Engineering*" RBA Publications.
4. Stefani ,Shanian, Savant, Hostetter, " *Design of Feedback Control Systems*"4th edition, Oxford university press 2002.

Department of Electronics and Communication Engineering

	Prerequisite: Electro Magnetic Field	0	3	1	0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To become familiar with transmission lines and losses associated with it.
- To understand signal propagation in transmission lines at Radio frequencies and analyze them under loss-less conditions.
- To give a thorough understanding about impedance transformation and matching in high frequencies.
- To understand different characteristics of TE and TM waves.
- To analyze circular and rectangular wave guides and behavior of TE & TM guides in these waveguides.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Will be familiar with transmission lines and various losses associated with it.
CO2	Will able to analyze and understand signal propagation in loss-less conditions at radio frequencies
CO3	Will be able to understand different impedance transmission techniques and matching in high frequencies and able to solve case studies using Smith Chart.
CO4	Will able to appreciate the behavior of TE&TM waves in different type of mediums.
CO5	Will be able to analyze and understand different types of waveguides and the behavior of TE & TM waves and will gain the ability to derive the field equations in rectangular and cylindrical wave-guides.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H	M			M	H	M	M	M
CO2	H	H	M	H	M			M	H	M	M	M
CO3	H	H	H	H	M			M	H	M	M	M
CO4	H	H	M	H	M			M	H	M	M	M
CO5	H	H	M	H	M			M	H	M	M	M

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	
CO2	H	H	
CO3	H	H	
CO4	H	H	
CO5	H	H	

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓				✓				
Approval												

BEC17007 TRANSMISSION LINES AND WAVEGUIDES 3 1 0 4

UNIT: I TRANSMISSION LINE THEORY 14 Hrs

General Theory of Transmission Lines –The transmission line, A General Solution – The Infinite Line – Wavelength, Velocity of propagation – Waveform Distortion – The Distortion-less line – Loading and Different methods of loading – Line not terminated in Z0 – Reflection Co-efficient – Calculation of Current, Voltage, Power Delivered and Efficiency of transmission – Input and transfer Impedance – Open and short circuited lines – Reflection loss .

UNIT: II HIGH FREQUENCY TRANSMISSION LINES 10 Hrs

Transmission lines equations at radio frequencies – Line of Zero dissipation – Voltage and Current on the dissipation-less line – Standing waves, Nodes, Standing wave ratio – Input impedance of the dissipation-less line – Power and impedance measurement on lines.

UNIT: III IMPEDANCE MATCHING IN HIGH FRENCY LINES 12 Hrs

Impedance matching: Quarter wave transformer – Impedance matching by Single and double stubs – Smith chart, Problems and Solutions.

UNIT: IV GUIDED WAVES 12 Hrs

Waves between parallel planes of perfect conductors – Transverse electric and transverse magnetic waves – Characteristics of TE and TM Waves – Transverse Electromagnetic waves – Velocities of propagation – Component uniform plane waves between parallel planes – Attenuation of TE and TM waves in parallel plane guides

UNIT: V RECTANGULAR AND CIRCULAR WAVEGUIDES 12 Hrs

Transverse Magnetic Waves in Rectangular Wave guides – Transverse Electric Waves in Rectangular Waveguides-Impossibility of TEM waves in waveguides - Solution of field equations in cylindrical co-ordinates – TM and TE waves in circular guides

Practical component P : Include case studies / application scenarios

Department of Electronics and Communication Engineering

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks :

1. J.D. Ryder "*Networks, Lines and Fields*", PHI, New Delhi, 2003.
2. E.C. Jordan and K.G. Balmain "*Electro Magnetic Waves and Radiating System*," PHI, New Delhi, 2003.
3. UmeshSinha " *Transmission lines and networks*" , Sathyaprakashan ,2010

Reference Books:

1. David K. Cheng,"*Field and Waves in Electromagnetism*", Pearson Education, 1989.
2. Ramo, Whineery and Van Duzer: "*Fields and Waves in Communication Electronics*" John Wiley, 2003.
3. David M. Pozar: "*Microwave Engineering*" – 2nd Edition – John Wiley
4. G.S.N Raju: *"Electromagnetic Field Theory and Transmission Lines"* , Pearson Education, First edition 2005.
5. John D Kraus and Daniel A Fleisch: *"Electromagnetics with Applications",*McGraw Hill Book Co, 2005

Subject Code: BEC17010	Subject Name: COMMUNICATION SYSTEMS	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Probability and random process	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Tovarious Amplitude modulation and demodulation systems.
- To provide some depth analysis in noise performance of various receiver.
- To study some basic information theory with some channel coding theorem.

COURSE OUTCOMES (COs) : (3- 5)

Students will be able to

CO1	Explain about different types of Noise
CO2	Interpret about continuous wave modulation systems
CO3	Express the generation & demodulation of FM systems.
CO4	Define different types of pulse modulation
CO5	Describe the basics of information coding

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO1 1	PO1 2
CO1	H					M	H	M	M	H		M
CO2	H	M	H	M		M	M				H	H
CO3	H	M	M	M	M	M	M				H	H
CO4	H		M								M	H
CO5	M	M	H	M	M	M	M	M	M	M	M	H

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	M	M
CO2	H	H	H
CO3	H	H	H
CO4	H	M	H
CO5	H	M	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✓		✓								
Approval												

BEC17010 COMMUNICATION SYSTEMS 3 0 0 3

UNIT - I: NOISE 9 Hrs

Basic Communication Systems – Need for Modulation in Communication Systems - Noise - Sources of Noise – Types of Noise - External Noise – Thermal Agitation – Shot Noise – Noise Figure – Signal to Noise Ratio – Equivalent Noise Resistance.

UNIT- II: CONTINUOUS – WAVE MODULATION 9 Hrs

Bandpass Signal Transmission - Amplitude Modulation – AM modulators – Single- Sideband Amplitude Modulation – SSB Generation – AM Transmitter – SSB Transmitter - Vestigial Sideband Modulation – Demodulation - Double Side Band Amplitude Modulation – Single Side Band and VSB Modulation – Modulators.

UNIT- III: EXPONENTIAL CONTINUOUS – WAVE MODULATION 9 Hrs

Angle Modulation : Phase Frequency – Frequency modulation – Bandwidth of FM signal: Frequency Analysis – Narrowband FM and PM Signal: Phase Representation – FM Generation – FM Demodulators – Stereophonic FM Broadcast: Transmission and Reception – Non-linear Distortion and Interference in FM Signals - Detectors, AM Transmitter. FM Transmitter – Broadband Transmitter and Receiver FM Receivers, Communication Receivers.

UNIT- IV: MODULATION TECHNIQUES AND PULSE MODULATION 9 Hrs

Phase Modulation – Noise Triangle – Pre-Emphasis and De-Emphasis – Stereophonic FM Multiplex System – Comparison of Wideband and Narrow Band FM – AFC, Introduction – Sampling Theorem –Quantization, Quantization Error, PAM, PTM, PM, PCM – Telegraph.

UNIT -V: INFORMATION THEORY 9 Hrs

Introduction – Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon – Fano coding, Huffman coding, Extended Huffman coding – Joint and conditional entropies, Mutual information – Discrete memory less channels – BSC,BEC– Channel capacity, Shannon limit.

Practical component P : Include case studies / application scenarios Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks :

1. Roy Blake, "*Electronic Communication Systems*", Thomson Learning 2nd Edition, , 2002.
2. George Kennedy: "*Electronic Communication Systems*", Tata McGraw Hill publications, 1992.
3. R Bose , " Information theory, Coding and Cryptography" , TMH 2007.

Reference Books:

1. Taub& Schilling," *Principles of Communication*", Tata McGraw Hill,1986
2. Simon Haykins, "*Principles of Communications*", Prentice Hall of India. 2001

Subject Code: BEC17L17	Subject Name : COMMUNICATION ENGINEERING LAB	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Digital Communication, Communication Systems	Lb	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

Department of Electronics and Communication Engineering

OBJECTIVE :

- To learn the concepts of analog pulse modulation techniques.
- To study the working of digital modulation system.
- To study the different types of information coding.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Understand and apply the concept of analog pulse modulation.
CO2	Generate codes for transmission of data.
CO3	Apply digital modulation techniques.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	M	M	M	-	M	M		M
CO2	H	H	H	H	-	M	M	M	M	M		M
CO3	H	H	H	H	M	M	M	M	M	M		M

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	M
CO3	H	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					

Approval	

Subject Code:	Subject Name : INTRODUCTION TO VLSI DESIGN AND EMBEDDED SYSTEMS	T / L/	L	T / S Lr	P/ R	C

BEC17L17 COMMUNICATION ENGINEERING LABORATORY 0 0 3 1

1. DESIGN AND TESTING OF AMPLITUDE MODULATION AND DEMODULATION.
2. DESIGN AND TESTING OF FREQUENCY MODULATION AND DEMODULATION.
3. DESIGN AND TESTING OF PULSE AMPLITUDE MODULATION & DEMODULATION.
4. DESIGN AND TESTING OF PULSE WIDTH MODULATION & PULSE POSITION MODULATION.
5. DESIGN AND TESTING OF PRE-EMPHASIS AND DE-EMPHASIS.
6. DESIGN AND TESTING OF NARROW FREQUENCY MODULATION.
7. DESIGN AND TESTING OF ASK, FSK AND PSK
8. STUDY OF LINE CODING AND DECODING TECHNIQUES
9. STUDY OF SAMPLING
10. STUDY OF PULSE CODE MODULATION

Department of Electronics and Communication Engineering

BEC17013		**ETL**				
	Prerequisite: Digital Electronics and Data structures	Ty	3	1	0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn the basics of MOS Transistors.
- To study the design of combinational logic circuit using CMOS.
- To learn CMOS sequential logic circuits design.
- To learn the concepts of modeling a digital system using HDL.
- To study the basics of PIC microcontroller.

COURSE OUTCOMES (COs) : (3- 5)

The students will be able to

CO1	Understand the basics of MOS Transistor.
CO2	Design combinational circuits using CMOS logic.
CO3	Design sequential circuits using CMOS.
CO4	Write program to model a digital system using VHDL & Verilog.
CO5	Understand the basics of 16F877 PIC Microcontroller.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	M	M	M	M		M	H	M	
CO2	H	H	H	H	H	M	M		M	M	H	
CO3	H	H	H	H	H	M			M	M	H	
CO4	H	M	M	M	H	M			M	M	M	
CO5	H	L	M	M	H	M			M	M	M	

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	M
CO3	H	H	M
CO4	H	H	M
CO5	H	H	

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								
Approval												

Department of Electronics and Communication Engineering

BEC17013 INTRODUCTION TO VLSI DESIGN AND EMBEDDED SYSTEMS 3 1 0 4

UNIT I MOS TRANSISTOR THEORY 12Hrs

Introduction – NMOS and PMOS transistor, Threshold voltage, Body effect, MOS device – Basic DC equations ,Second order effects, MOS models, Small signal AC characteristics, Complementary CMOS Inverter, Power dissipation and scaling of MOS transistors.

UNIT II DESIGNING COMBINATIONAL LOGIC CIRCUITS 12Hrs

Static CMOS design – Complementary CMOS, Propagation Delay and Power Consumption in static CMOS, Pseudo NMOS Logic, Pass Transistor Logic, Transmission gates, Dynamic CMOS Design – Basic principle, Speed and Power dissipation of Dynamic logic, Signal integrity issues in dynamic design,CMOS Domino logic, np CMOS logic.

UNIT III DESIGNING SEQUENTIAL LOGIC CIRCUITS 12Hrs

Introduction – Timing metrics for sequential circuits, Classification of memory elements, Static latches and registers – The bi-stability principle, Multiplexer based latch, Master slave edge triggered register, Static SR flip flop, Dynamic latches and registers – Dynamic transmission gate edge triggered registers, clocked CMOS register.

UNIT IV : VHDL & VERILOG PROGRAMMING 12Hrs

VHDL background – VHDL requirement, Elements of VHDL, operators, Basic concepts in VHDL, Structural modeling, Behavioral modeling and Dataflow modeling in VHDL and Simple programs, Verilog HDL – Basic concepts – Gate Level modeling, Dataflow modeling and Behavioral modeling – Simple programs.

UNIT V PIC MICROCONTROLLER 12Hrs

Introduction - PIC16F877 Micro controller overview, Special Function Registers, I/O Ports, Timers, Oscillators, Capture/ Compare and PWM module, Serial communication module, Analog module and Instruction set.

Practical component P : Include case studies / application scenarios
Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks :

1. Neil H.E. Weste, Kamran Eshraghian, "*Principles of CMOS VLSI Design – A system perspective*", second edition,Addison Wesley,1997.
2. Jan M.Rabaey, AnanthChandrakasan, BorivojeNikolic, " *Digital Integrated Circuits : A Design perspective*", second edition, Prentice Hall of India, 2003.
3. ZainalabedinNavabi, " *VHDL – Analysis and modeling of Digital Systems*" , Second edition, Mcgraw – Hill International Editions, 1998.

Reference Books:

1. A. Pucknell, Kamran Eshraghian, " *Basic VLSI Design*", Third Edition, Prentice Hall of India,2007.

Subject Code: BEC17011	Subject Name : DIGITAL COMMUNICATION	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Communication System, Probability and Random Process, Mathematics-I	0	3	1	0	4

2. R.Jacob Baker, Harry W.Li, David E. Boyce, "*CMOS circuit design, Layout and Simulation*", Prentice Hall of india, 2005
3. J.Baskar, "*A VHDL Primer*", Third edition, Pearson Education,2004.
4. Samir Palnitkar, "*Verilog HDL, A Guide to Digital Design and Synthesis*", second edition, Pearson Education,2003.
5. pic-microcontroller.com / free- ebook- pic-microcontrollers.

Department of Electronics and Communication Engineering

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study detection, estimation and discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals.
- To understand the concepts of different digital modulation techniques and their applications in our day to day life
- To learn error control coding which encompasses techniques for the encoding and decoding of digital data streams for their reliable transmission over noisy channels.

COURSE OUTCOMES (COs) : (3- 5)

CO1	The students will be able to apply the sampling process in real-time systems and to detect and estimate the likely output of a communication system
CO2	The students will show their ability to design a system without distortion and interference
CO3	The students will hone their inferences to develop various modulation technologies for the state of the art communication.
CO4	The students will demonstrate their skills in generating a unique code for the information to be transmitted across a channel.
CO5	The students will apply their understanding to improve the system efficiency in a multipath environment.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	M	M	H				M	M	
CO2	H	H	H	H	M	H				M	M	
CO3	H	M	M	H	H	H	M	H	M	M	H	H
CO4	H	H	H	H	H	M	M	H		M		H
CO5	H	M		M	M	M	H		H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	
CO3	H	H	M
CO4	H	H	
CO5	H	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								
Approval												

BEC17011 DIGITAL COMMUNICATION 3 1 0 4

UNIT- I: DETECTION, ESTIMATION AND SAMPLING PROCESS 12 hrs

Model of Digital Communication System,Gram Schmidt OrthogonalizationProcedure,Matched Filters, Correlation Receivers, Error Probability,Maximum Likelihood Estimation, Linear Prediction and Prediction Filters, Sampling Theorem, Quadrature Sampling of Band-Pass Signals, Reconstruction of a message from its samples

UNIT - II: WAVEFORM CODING TECHNIQUES AND BASEBAND SHAPING 12 hrs

PCM and TDMA Principles, Channel Noise and Error Probability, Quantization Noise and SNR, Differential Pulse Code Modulation and Delta ModulationSpeech Coding at Low Bit Rates, Power Spectra of PAM Signals, Inter Symbol Interference, Nyquist Criterion for distortionless baseband transmission, Correlative Coding and Precoding, Eye Patterns and Equalization Techniques.

UNIT - III: DIGITAL MODULATION TECHNIQUES 12 hrs

Coherent Binary Modulation Techniques, Coherent Quadrature Modulation Techniques, NonCoherent Binary Modulation Techniques, Power Spectra,BandwidthEfficiency,Bit versus Symbol Error Probabilities

UNIT - IV: ERROR CONTROL CODING 12 hrs

Need for Coding, Types of Codes, Linear Block Codes, Cyclic Codes, Convolution Codes, Maximum Likelihood Decoding of convolutional Codes, Distance Properties and Sequential Decoding of convolutional Codes, Trellis coding, Viterbi coding.

UNIT - V: SPREAD SPECTRUM SYSTEMS 12 hrs

Pseudo Noise Sequences, Generation and Correlation Properties, Direct Sequence Spread Spectrum Systems, Frequency Hop System, Signal Space Dimension and Processing Gain , Probability of Error, Antijam and Multipath Performance.

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks

1. Simon Haykin, "Digital *communications*", John Wiley & Sons, 1988
2. John. G. Proakis, "*Digital Communication*", McGraw Hill Inc., Third Edition, Malaysia, 1995
3. B.P. Lathi," *Modern Digital and Analog communication system*", Oxford publications, Third edition.

Reference Books:

1. Roy Blake, "*Electronic Communication systems*", , Thomson Learning, 2nd edition 2002
2. M.K. Simen, "*Digital Communication Techniques Signal Design & Detection*", Prentice Hall of India, 1999.
3. Bernard Sklar, "*Digital Communication: Fundamentals and Applications*",Prentice Hall, 2011 Edition
4. UpamanyuMadhow, "*Fundamentals of Digital Communication*",Cambridge University Press, 2008
5. Robert G. Gallager, "*Principles of Digital Communication*",Cambridge University Press 2008.

Subject Code: BEC17009	Subject Name: MICROPROCESSORS AND MICROCONTROLLER	T / L/ ETL	L	T / SLr	P/ R	C
	Prerequisite: Digital Electronics	0	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study the architecture, addressing modes, and assembly language program of 8085 and 8086 microprocessor.
- To understand the concepts of different peripherals and their applications
- To learn the functions of 8051 microcontroller and ARM processor and their applications.

COURSE OUTCOMES (COs) :

CO1	The students will be able to write assembly language program in 8085 and 8086 to perform arithmetic and logical operations
CO2	The students will show their ability to interface peripherals with microprocessors
CO3	The students will hone their inferences to develop a hardware using 8051 microcontroller
CO4	The students will demonstrate their skills in writing an ALP in 8051 to do real time applications
CO5	The students will apply their understanding to do a project to develop an application using ARM processor.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	M	M	H				M	M	
CO2	H	H	H	H	H	H		M		M	M	M
CO3	M	M	M	M	H	H	M	H		M	H	M
CO4	H	H	H	H	H		M	H		M		H
CO5	H	M		M	M	M	H		H	M	H	H

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M

CO2	H	H						
CO3	M	H						
CO4	H	M						
CO5			M					
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low								

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓	✓							
Approval												

BEC17009 MICROPROCESSOR AND MICROCONTROLLER 3 0 0 3

UNIT-I: CPU 8085 & 8086 9 Hrs

8085 Architecture -Instruction set –Addressing modes —Assembly language-Simple Programming – Counters –Time delays-Interrupts –Intel 8086 internal architecture–8086 Addressing modes – instruction set -8086 Assembly language-Interrupts

UNIT-II: PERIPHERALS INTERFACING 9 Hrs

Interfacing serial I/O(8251)-Parallel I/O(8255) –Keyboard and display controller (8279)-ADC/DAC Interfacing-Timer (8253).Programmable Interrupt Controller (8259), DMA controller, Applications of 8085

UNIT-III: 8051 MICROCONTROLLER 9 Hrs

8051 Microcontroller hardware I/O pins, Ports and circuits-External memory –Counters and Timers-Serial Data I/O –Interrupts.

UNIT – IV 8051 PROGRAMMING AND APPLICATIONS 9 Hrs

8051 Instruction set –Addressing Modes –Assembly Language Programming -8051 interfacing LCD, ADC, Sensors, Stepper motors, Motors, Keyboard and DAC

UNIT-V INTRODUCTION TO ARM PROCESSOR **9 Hrs**

ARM Architecture –ARM programmer's model- ARM development tools-memory hierarchy-ARM assembly language programming-Simple Examples-Architectural support for operating system- ARM instruction Set-Embedded ARM Applications

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks:

1. Krishna Kant, "*Microprocessor and Microcontrollers*", Eastern Company Edition, Prentice Hall of India, New Delhi , 2007.
2. R.S. Gaonkar, '*Microprocessor Architecture Programming and Application*', with 8085, Wiley Eastern Ltd., New Delhi, 2013.
3. Soumitra Kumar Mandal, " *Microprocessor& Microcontroller Architecture, Programming & Interfacing using 8085,8086,8051*",McGraw Hill Edu,2013..

References:

1. Furber,S.,"*ARMSystemon Chip Architecture*" Addison Wesley trade Computer Publication,2000.
2. Peatman,J.B, *" Design with PIC Microcontrollers*" Pearson Education, 3rd Edition, 2004
3. Mazidi,M.A, "*PIC Microcontroller*" Rollin McKinley, Danny Causey, Prentice Hall of India,2007
4. A. Pal, "*Microprocessors: Principles and Applications*"
5. Crisp John Crisp ,"*Introduction to Microprocessors and Microcontrollers*"

Subject Code: BEC17L13	Subject Name : VLSI & EMBEDDED SYSTEM DESIGN LAB	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Introduction ofVLSI& embedded system design	Lb	0	0/0	3/0	1

Department of Electronics and Communication Engineering

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To design and simulate combinational logic circuits using Xilinx.
- To design and simulate sequential logic circuits.
- To interface ADC, DAC, DC motor, stepper motor with PIC microcontroller.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Write programs to implement combinational circuits like adder, multiplexer, de multiplexer etc.,
CO2	Simulate sequential circuits like FFs, counters, shift registers.
CO3	Interface I/O devices, ADC, DAC, motors with microcontroller.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	M	M	M	M	M	M	-
CO2	H	H	H	H	H	M	M	M	M	M	-	M
CO3	H	H	H	H	H	M	M	M	M	M	M	-

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	M
CO3	H	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					

Subject Code: BEC17014	Subject Name: OPTICAL COMMUNICATION AND NETWORKS	T / L/ ETL	L	T / S Lr	P/ R	C
Approval						

BEC17L13 VLSI & EMBEDDED SYSTEM DESIGN LAB0031

LIST OF EXPERIMENTS

SIMULATION OF DIGITAL CIRCUITS USING XILINX

1. DESIGN AND TESTING OF ADDER AND SUBTRACTOR
2. DESIGN AND TESTING OF MULTIPLEXER, DEMULTIPLEXER, ENCODER ,DECODER .
3. DESIGN AND TESTING OF MAGNITUDE COMPARATOR WITH 4/8 BITS.
4. DESIGN AND TESTING OF JK, D, T AND SR FLIP FLOPS, AND REGISTERS
5. DESIGN AND TESTING OF SYNCHRONOUS & ASYNCHRONOUS COUNTERS.
6. DESIGN AND TESTING OF SHIFT REGISTERS (RIGHT / LEFT).

INTERFACING WITH PIC MICROCONTROLLER

7. ADC INTERFACE WITH LM35.
8. STEPPER MOTOR INTERFACE
9. TRAFFIC LIGHT CONTROLLER INTERFACE
10. DC MOTOR INTERFACE
11. LCD DISPLAY INTERFACE.
12. LED INTERFACE

Department of Electronics and Communication Engineering

	Prerequisite: Digital communication	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn the basic elements of optical fiber transmission link, types of fibers, Slicing and connectors.
- To understand the different kind of loss and system design consideration.
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
- To learn the fiber optical receivers such as PIN, APD diodes, noise performance in photo detector, receiver operation and configuration.
- To learn different types of optical networks.

COURSE OUTCOMES (COs) : (3- 5)

The students will be able to

CO1	Design any types of fibers.
CO2	Design lossless fibers.
CO3	Include newer technique for designing optical sources.
CO4	Design efficient optical detectors using innovative idea.
CO5	Implement modern technology for designing optical networks.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	M		H	M		H	M	H
CO2	H	H	H	M	M		M	H		H	H	H
CO3	H	H	H	H	M		M			H	M	M
CO4	H	H	H	H	M		M			H	M	M
CO5	H	H	H	H	H		M	H	H	H	H	H

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	H
CO3	H	H	
CO4	H	H	
CO5	H	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
	✓	✓		✓			✓	✓				
Approval												

BEC17014 OPTICAL COMMUNICATION AND NETWORKS 3 0 0 3

UNIT I: INTRODUCTION TO OPTICAL FIBERS 12Hrs

The General System – Evolution of Fiber Optical System – Elements of an Optical Fiber Transmission Link – Cylindrical Fiber – Single Mode Fibers and Multimode Fibers -Fiber Splicing and Connectors.

UNIT II: OPTICAL LOSSES AND DESIGN 12Hrs

Absorption Losses, Scattering Losses – Bending Losses – Core and Cladding Losses – Signal Distortion in SM Fibers - Point to Point Links – System Design Consideration — Line Power Budget – Rise Time Budget.

UNIT III: OPTICAL SOURCES 12Hrs

Direct and Indirect Band Gap Material – LED Structures - LED Power and Efficiency – Modulation – Laser Diodes Structures and Radiation Pattern – Single Mode Lasers – Modulation of Laser Diodes.

UNIT IV: OPTICAL DETECTORS 12Hrs

PIN and APD Diodes – Photo Detector Noise, SNR, Detector Response Time, Avalanche Multiplication Noise – Comparison of Photo Detectors – Fundamentals Receiver Operation – FET Pre-amplifiers

UNIT V: OPTICAL NETWORKS 12Hrs

Operational Principles of WDM – Introduction to Optical Networks - Principles of SONET/SDH, OFDM, OTDM – Multiplexing and De multiplexing techniques - Synchronization.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60Hrs

Textbooks :

1. Gerd Keiser, "*Optical Fiber Communication System*", McGraw Hill, International, Singapore 3rd ed., 2000.
2. John M. Senior, "*Optical Fiber Communication principles and practice*" – Prentice Hall of India private limited, 1996.
3. Rajiv Ramaswami and Kumar N. Sivarajan, "*A Practical Perspective*‖ ," Harcourt Asia Ptv Ltd., Second Edition, 2004.

Reference Books:

1. J. Gower, "*Optical communication system*", Prentice Hall of India, 2001.
2. Govind P. Agrawal "*Fiber-Optic Communication Systems*", Wiley India 3rd Edition
3. C. Siva Ram Moorthy and Mohan Gurusamy, "*WDM Optical Networks: Concept, Design and Algorithms"*, Prentice Hall of India, Ist Edition, 2002. 54
4. P.E. Green, Jr., "*Fiber Optic Networks*", Prentice Hall, NJ, 1993.
5. Biswanath Mukherjee, "*Optical WDM Networks*", Springer Series, 2006.

Subject Code: BEC17012	Subject Name : DIGITAL SIGNAL PROCESSING	T/L/ ETL	L	T/ S.Lr	P/ R	C
	Prerequisite: Signals and System	Ty	3	1	0	4

Department of Electronics and Communication Engineering

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn the concepts of Fourier transform and its Applications.
- To understand the design techniques of digital IIR filters
- To learn the concepts and design techniques of digital FIR filters.
- To understand the concepts and applications of Multi – rate sampling.
- To introduce the architecture of Digital Signal Processors.

COURSE OUTCOMES (COs) : (3- 5)

The students will

CO1	Be able to apply Fourier transform concepts.
CO2	Have the ability to design IIR filters.
CO3	Have the ability to design FIR filters.
CO4	Apply Multi rate samplings techniques for system design.
CO5	Describe the modules in the architecture of digital signal processor.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	M						M
CO2	H	H	H	H	H	M	M	L	M	M		M
CO3	H	H	H	H	H						M	
CO4	H	H	H	H	H	H			M			
CO5	H	H	M	M	M	M	M	M	M	M	M	M

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	
CO2	H	H	
CO3	H	H	
CO4	H	H	
CO5	M	M	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✓		✓			✓					
Approval												

BEC17012 DIGITAL SIGNAL PROCESSING 3 1 0 4

UNIT I DFT AND FFT 12 Hrs

Discrete Fourier Transform (DFT) - Properties-Convolution of Sequences - Linear Convolution - Circular Convolution - Introduction to Radix-2 FFT- Properties - DIT (FFT)-DIF (FFT) - Algorithms of Radix-2FFT- Computing Inverse DFT by doing a direct DFT.

UNIT II DESIGN OF IIR FILTER 12 Hrs

IIR Filters- Properties of IIR Filters -Analog Low pass Filter Design - Butterworth Filter - Chebyshev Filter - Design of IIR Filters from Analog filters - Approximation of Derivatives – Impulse Invariance - Bilinear Transformation – The Matched z- Transformation - Frequency Transformation.

UNIT III DESIGN OF FIR FILTER 12 Hrs

FIR Filters - Characteristics of FIR Filters with Linear Phase-Properties of FIR Filters-Design of FIR Filters using Windows-Fourier Series Method-Frequency sampling Method – Limit cycle oscillations- Zero- Input Limit cycle oscillations- Overflow Limit cycle oscillations- Signal Scaling.

UNIT IVMULTIRATE SIGNAL PROCESSING 12 Hrs

Multirate Signal Processing- Interpolation - Decimation - Single and Multistage Realization - Filter Bank Implementation - Applications-Sub Band Coding.

UNIT V OVERVIEW OF DIGITAL SIGNAL PROCESSOR 12Hrs

Overview of Digital Signal Processors – Application of Digital Signal Processor – Memory Architecture of DSP Processor – Von Neumann Architecture – Harvard Architecture - Architecture of TMS32C5X Processor – Addressing modes – Pipelining .

Practical component P : Include case studies / application scenarios

Department of Electronics and Communication Engineering

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks :

1. John . G. Proakis and DimitrisC.Manolakis, " *Digital Signal Processing Principles, Algorithms and Applications*, " Pearson Education, Third edition 2006.
2. Sanjitk.Mitra "*Digital signal processing*",A Computer Based Approach,Tata McGraw Hill,New delhi,2001.
3. A.V.Oppenheim, R.W. Schafer and J.R. Buck, "*Discrete – Time Signal Processing*", 8th Indian reprint, Pearson 2004.

Reference Books:

1. Ashok Ambardar,"*Analog and Digital Signal Processing*",2ndEdition,Thomson Learning 2000.
2. Ashok Ambardar,"*Analog and Digital Signal Processing A Modern Introduction*",Ist edition Thomson Learning 2006
3. Johnny R.Johnson,"*Introduction to Digital Signal Processing*",Minthprinting,September 2001.
4. M.D.Srinath,P.K.Rajasekaran,R.Vishwanathan "*Introduction to Statistical Signal ProcessingWithApplication*",Prentice-Hall of India Pvt.Ltd.,New Delhi,1999.
5. B.Venkataramani, M.Bhaskar, "Digital Signal Processors, Architecture, Programming and Application", Tata McGraw Hill, New Delhi, 2003.

Subject Code: BEC17012	Subject Name : ANTENNAS AND WAVE PROPAGATION	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: EMF, TLWG	Th	3	0	0	3

Department of Electronics and Communication Engineering

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study Antenna Parameters.
- To study Radiation Resistance, Antenna Efficiency Measurement.
- To study Antenna Arrays.
- To study different types Antennas
- To study Radio wave propagation.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Ability to understand the knowledge about antenna basics.
CO2	Ability to write about the radiation from a current element.
CO3	Ability to analyze the antenna arrays.
CO4	Ability to explain various types of antenna.
CO5	Ability to explain the various types of radio wave propagation.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	M	M	M	L	M	M
CO2	H	H	H	H	H	H	M	M	M	L	M	M
CO3	H	H	H	H	H	M	M	M	M	L	M	M
CO4	H	H	H	H	H	M	M	M	M	L	M	M
CO5	H	H	H	H	H	M	M	M	M	L	M	M

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	M
CO3	H	H	M
CO4	H	H	M
CO5	H	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			

		✓		✓								
Approval												

BEC17012 ANTENNAS AND WAVE PROPAGATION 3 0 0 3

UNIT - I ANTENNA BASICS 12 Hrs

Antenna Parameters – Gain, Directivity, Effective Aperture Polarization, Beam width, Balun, Ground System, Top loading, monopole and Half wave dipole antenna, Short linear antenna, Beam solid angle, Antenna Temperature.

UNIT - II RADIATION PRINCIPLE AND ANTENNA TERMINOLOGIES 12 Hrs

Principle of Radiation, pattern, Antenna Terminologies – Reciprocity Theorem, Friss Formula, Slot Antennas, SWR.(Standing Wave Radiators)

UNIT - III ANTENNA ARRAYS 12 Hrs

Arrays – Two Element Arrays – Uniform Linear Array – Broadside Array – End fire array – Principle of Pattern Multiplication – Binomial Arrays.

UNIT - IV SPECIAL ANTENNA 12 Hrs

Dish Antenna – Helical Antenna, Biconical Antenna, Microstip Patch Antenna, Turnstile Antenna, Yagi – uda antenna, Loop Antenna, Antenna Low and Medium Frequencies.

UNIT - V WAVE PROPAGATION 12 Hrs

Wave Propagation - Surface Wave Propagation , Structure of the Ionosphere,Space Wave Propagation- Determination of Critical Frequencies - Maximum Usable Frequency - Effect of Earth's Magnetic Field - Fading - Super Refraction - Scatter Propagation.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60Hrs

Textbooks :

1. Constantine A.Balanis, "*Antenna theory analysis and design*" JohnWiley , 2nd Edition 2007.
2. G.S.V. Raju, "*Antenna wave propagation*", pearson education, 2004.
3. R.E. Collins, "*Antenna and Radio wave propagation*".

Reference Books:

1. John D. Kraus, Ronald J Marhefka. "*Antenna for all Appplications*" Tata McGraw Hill 3nd Edition,2007.

Subject Code: BEC17E01	Subject Name : BIOMEDICAL INSTRUMENTATION	T / L/ ETL	L	T / SLr	P/ R	C

2. A.R.Harish, M. Sachidanada, "*Antenna and wave propagation*", Oxford university press,2007.

3. W.L.Stutzman and G.A. Thiele, "*Antenna analysis and design*", John willey,2000.

Department of Electronics and Communication Engineering

	Prerequisite: Measurement and Instrumentation, control Systems	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study the methods of recording various bio potentials
- To study how to measure biochemical and various physiological information
- To understand the working of units which will help to restore normal functioning
- To understand the use of radiation for diagnostic and therapy
- To understand the need and technique of electrical safety in Hospitals

COURSE OUTCOMES (COs) :

The students will able to

CO1	Enable the students to develop knowledge of how instruments work in the various department and laboratories of a hospital and thereby recognize their limitations.
CO2	Interpret technical aspects of medicine.
CO3	Familiarize students with various medical equipment's and their technical aspects. Understand medical diagnosis and therapy.
CO4	Introduce students to the measurements involved in some medical equipment's.
CO5	Understanding the problem and ability to identify the necessity of equipment's to a specific problem.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M					H	H	H	H		H	H
CO2				M		H	H	M	H		M	M
CO3		M		M		H	H	H	H	M	H	M
CO4					M	H	H	H	H	M	M	M
CO5		M	M		M	H	H	H	H	M	M	M

COs / PSOs	PSO1	PSO2	PSO3
CO1			H
CO2		M	H
CO3		M	H
CO4	H	M	H
CO5	H	M	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							
Approval												

BEC17E01 BIOMEDICAL INSTRUMENTATION 30 0 3

UNIT I: BASIC PHYSIOLOGY 9 Hrs

Cells and their Structures – Transport of Ions Through Cell Membrane – Resting and Excited State – Transmembrane Potential – Action Potential – Bio-Electric Potential – Nervous System – Physiology of Muscles – Heart and Blood Circulation – Respiratory System – Urinary System.

UNIT II: BASIC TRANSDUCER PRINCIPLES AND ELECTRODES 9 Hrs

The Transducer Principles – Active Transducers – Passive Transducers – Transducer for Bio-Medical Application – Electrode Theory- Bio-Potential Electrode – Bio-Chemical Transducer.

UNIT III: CARDIOVASCULAR SYSTEM 9 Hrs

The Heart and Cardiovascular System – Blood Pressure – Characteristics of Blood Flow – Heart Sounds - Electro Cardiograph – Measurements of Blood Pressure – Measurement of Blood Flow and Cardiac O/P Plethysmography – Measurements of Heart Sounds

UNIT IV: X-RAY AND RADIOISOTOPE INSTRUMENTATION: 9 Hrs

X-ray Imaging Radiography – Fluoroscopy – Image Intensifiers – Angiography - Medical use of Radioisotopes – Beta Radiations – Detectors – Radiation Therapy.

UNIT V:BIO-TELEMETRY 9 Hrs

Introduction to Bio-Telemetry – Physiological Parameters Adaptable to Bio-Telemetry – The Components of Bio-Telemetry Systems – Implantable Units – Applications of Telemetry in Patient Care – Application of Computer in Bio-Medical Instrumentation, Anatomy of Nervous System – Measurement from the Nervous System – EEG – EMG.

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Text books:

1. M. Arumugam, "*Bio-medical Instrumentation*" – Anuradha Agencies Publishers, 1992.
2. Khandpur," *Handbook on Biomedical Instrumentation*" – Tata McGraw Hill Co Ltd., 1989.

References:

1. Leusis Cromwell Fred, J. Werbell and Erich A.pfraffer, "*Biomedical instrumentation and Measurements*" – Prentice Hall of India, 1990.
2. Joseph J. Carr and John M. Brown, "*Introduction to Biomedical equipment Technology*", John Wiley and Sons, New York, 1997

Subject Code: BEC17E02	Subject Name : PATTERN RECOGNITION	T / L / Th	L	T / Sl	P/ R	C

Department of Electronics and Communication Engineering

	Prerequisite: Probability Random Process	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn the different techniques of pattern recognition and training.
- To learn various rules available in decision making.
- Study the different approaches of pattern classification and application in clinical diagnosis

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Identify areas where pattern recognition can offer a solution
CO2	Describe algorithms, validation methods and sampling techniques.
CO3	Describe the advances in algorithms for classification and recognition.
CO4	Interpret the basics of neural, feature and data engineering.
CO5	Recall the applications of neural processing.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H		M		M	H	M		H
CO2	H	H	M						M	H		M
CO3	H	M	M						M	H		M
CO4	H	H	H	M		M			H	H	M	H
CO5	H			M	M				H	M		H

COs / PSOs	PSO1	PSO2	PSO3
CO1			
CO2		M	
CO3		M	
CO4	M	M	M
CO5			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							
Approval												

BEC17E02 PATTERN RECOGNITION 3 0 0 3

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UNIT-I FUNDAMENTALS OF PATTERN RECOGNITION 9 Hrs

Basic Concepts of Pattern Recognition - Decision Theoretic Algorithms - Structural Pattern Recognition.

UNIT-II INTRODUCTORY NEURAL NETWORKS 9Hrs

Artificial Neural Network Structures - Supervised Training via Error back Propagation: Derivations.

UNIT-III ADVANCED FUNDAMENTALS OF NEURAL NETWORKS 9 Hrs

Acceleration and Stabilization of Supervised Gradient Training of MLPs - Advances in Network Algorithms for Classification and Recongnition - Recurrent Neural Networks.

UNIT-IV NEURAL, FEATURE AND DATA ENGINEERING 9 Hrs

Neural Engineering and Testing of FANNs - Feature and Data Engineering

UNIT- V TESTING AND APPLICATIONS 9 Hrs

Some Comparative Studies of forward Artificial Neural Networks-Pattern recognition Applications in TextureClassifications& recognition- Speech recognition- Neural processing of Digital images-character recognition.

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Subject Code:	Subject Name : DEVICE MODELING	T / L/	L	T /	P/	C

Text Books:

1. Caral g. Looney," *Pattern Recognition Using Neural Networks–Theory and Algorithms for Engineering andScientists*"–New York Oxford University Press 1997.
2. Earl Gose, Richard Johnsonbaugh, Steve Jost, "*Pattern Recognition and Image Analysis*", Prentice Hall of India Pvt. Ltd., New Delhi, 1999.

REFERENCES:

1. P. A. Devijver and J. Kittler, "*Pattern Recognition",* Prentice-Hall International, Englewood Cliffs, NJ, 1980.
2. William Gibson, *Pattern Recognition*, Science fiction,2003

Department of Electronics and Communication Engineering

BEC17E03		ETL		S.Lr	R	
	Prerequisite: Solid State Device	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand passive devices and structures
- To understand the integrated BJT and MOS devices

COURSE OUTCOMES (COs) :

The Student will be able to

CO1	Describe in brief about integrated passive devices.
CO2	Present a review on monolithic technologies.
CO3	Analyze different models of integrated bipolar transistor.
CO4	Solve the basic equations of integrated MOS transistor.
CO5	Recall the concepts of spice modeling.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H			M	M	H	H		
CO2	H	M					H	H	H	H		M
CO3	H	H	M	H	M			M	H	M	M	M
CO4	H	H	H	H	M				H		M	M
CO5	H	M					M		H	H		H

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	M	M
CO2	H		H
CO3	H	H	H
CO4	H	H	
CO5	H	M	

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			

					✓							
Approval												

BEC17E03 DEVICE MODELING 3 0 0 3

UNIT I: INTEGRATED PASSIVE DEVICES: 9 Hrs

Types and Structures of Resistors and Capacitors in Monolithic Technology – Dependence of Model Parameters on Structure.

UNIT II: INTEGRATED DIODES: 9 Hrs

Junction and Schottky Diodes in Monolithic Technologies – Static and Dynamic Behavior – Small and Large Signal Models– SPICE Models.

UNIT III: INTEGRATED BIPOLAR TRANSISTOR: 9 Hrs

Types and Structures in Monolithic Technologies – Basic Model (Eber Moll_-Cunmel – Poon Model – Dynamic Model, Parasitic Effects – SPICE Model –Parameter Extraction.

UNIT IV: INTEGRATED MOS TRANSISTOR: 9 Hrs

n-MOS and p-MOS Transistor – Threshold Voltage -Threshold Voltage Equations – MOS Device Equations – Basic DC Equations Second Order Effects – MOS Models Small Signal AC Characteristics – MOSFET SPICE Model Level 1,2,3,4

UNIT V: SPICE MODELLING 9 Hrs

Advanced Concepts of Large Signal & Low Signal Modeling

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Text books:

1. Daniel Foty, "MOSFET *Modeling with Spice"* prentice hall, 1997.
2. Neil Weste and Kamran Eshranghian "*Principlesof CMOS VLSI Design, A System Perspective*", "Addition – Wesley, 1993.

References:

Subject Code: BEC17E04	Subject Name :QUANTUM COMPUTING	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Physics	Ty	3	0	0	3

1. Jacob Millman& Arvin Millman, "*Micro Electronics*", McGraw Hill (Second Edi) 1987.
2. M. Satyagi, John Wiley" *Introduction to Semi-conductor materials and devices"*, New Edition

Department of Electronics and Communication Engineering

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand the building blocks of a quantum computer.
- To understand the principles, quantum information and limitation of quantum operations formalizing.
- To understand the various quantum algorithms.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Demonstrate the importance of quantum computing and superposition states.
CO2	Possess a deep insight on Quantum operator and its Applications.
CO3	Attain the knowledge about variety of quantum gates and build quantum circuits.
CO4	Apply the concept of different quantum algorithms and have the insight of QKD.
CO5	Recognize, test and correct various Quantum errors through Quantum error correcting codes.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H				H				M		M	H
CO2	H	H	M		M				M		M	H
CO3	H		H		H						H	
CO4	M			H	H						M	M
CO5	H	H	H	M	M	M	M	M				M

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	M	M
CO2	H	H	
CO3	H	M	H
CO4		M	
CO5	H	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							
Approval												

BEC17E04 **QUANTUM COMPUTING** **3 0 0 3**

UNIT I: INTRODUCTION **9 Hrs**

Introduction to Quantum Computing- Power of Quantum Computing- Quantum Information-Quantum Computers. The Wave and the Corpuscular Nature of Light Photon Behavior, State Description, Measurement in Multiple Bases, Superposition States – The Superposition probability Rule.

UNIT II: QUANTUM MECHANICS **9 Hrs**

Quantum Postulates – State space, Evolution, Quantum Measurement, Distinguishing Quantum states, Projective measurements, POVM measurements -Quantum Mechanics-Hilbert Space-Linear Operators Tensor and Outer Products-Quantum Operators- Application Quantum mechanism: Super dense Coding -Double Silt Experiments.

UNIT III: QUBITS AND QUANTUM GATES **9 Hrs**

Qubits, Bloch Sphere Representation-Rotation Operation-The Measurement of a Single Qubits-A Pair of Qubits- Bell States- Qubits as Spin Half- Integer Particles- Qubits as Polarized Photon-Entanglement, Exchange of Information / Teleportation – Quantum Coping Circuit - The Non-Cloning Theorem-Quantum Gates – Universal Quantum Gate Gates – Matrix Representation – Quantum Circuits- Single and Multiple Qubit Controlled Operations.

UNIT IV: QUANTUM ALGORITHM **9 Hrs**

Turing Machine - Quantum Parallelism-Deutsch's Problem, Deutsch – Jozsa Algorithm - QFT(Quantum Fourier Transform)-Short's Factoring Algorithm-Simon's Algorithm-Quantum Search Algorithm- Quantum key distribution - Mathematical Models of Quantum Computers - Introduction Different implementations of quantum computer.

UNIT V: QUANTUM ERROR CORRECTION **9 Hrs**

Quantum error correction and simple examples – The Three Qubit flip code, Three Qubit Phase flip code, The Shor Code - Brief Introduction to Quantum Computing Software - Quantum error-correcting codes:Error models, Criteria for a good code: reversible operations.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks :

1. Dan C. Marinescu, Gabriela M. Marinescu, "*Approaching Quantum Computing*", Pearson Education 2008-09.
2. M.A. Neilson and I.L .Chuang "*Quantum computing and Quantum information"*, Cambridge University Press,2009.
3. Vishal Sahani "*Introduction to Quantum Computing*", TATA McGraw-Hill Publishing Company Limited.

Reference Books:

1. A.Yu.Kitaev, A.H.Shen, M.N.Vyalyi, "*Classical and Quantum Computation*", American Mathematical Society.
2. Mark.M.Wilde, "*Quantum information theory*" Cambridge university press.
3. J.A.Jones, "*Quantum information, computation and communication*" Cambridge University Press.
4. Scott Aaronson, "*Quantum computing since Democritus*", Cambridge University Press 2013.

Subject Code: BEC17E05	Subject Name : MICROWAVE ENGINEERING	T / L/ ETL	L	T / S.Lr	P/ R	C

Department of Electronics and Communication Engineering

	Prerequisite: Transmission Lines and Waveguides, Antenna and Wave Propagation	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study Microwave sources and amplifiers.
- To study passive microwave components and their S- Parameter analysis.
- To study Microwave semiconductor devices & applications.

COURSE OUTCOMES (COs) : (3- 5)

The students will be able to

CO1	Understand the characteristics of microwave passive devices and their scattering parameter analysis.
CO2	Understand the concept of microwave generators and amplifiers.
CO3	Understand the concepts of microwave solid state devices and their characteristics.
CO4	Understand the concepts of microwave transistors in RF circuits.
CO5	Measure different parameters like frequency, wavelength, power, VSWR in RF circuits.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	M			M		M	
CO2	H	H	H	H	H	M			M		M	
CO3	H	H	H	H	H	M			M		M	
CO4	H	H	H	H	H	M			M		M	
CO5	H	H	H	H	H	M			M		M	

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	M	
CO2	H	M	
CO3	H	M	
CO4	H	M	
CO5	H	M	

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			

					✓							
Approval												

BEC17E05 MICROWAVE ENGINEERING 3003

UNIT I:MICROWAVE PASSIVE DEVICES 9 Hrs

Transmission Lines for use at Microwave Frequencies – Attenuators, Directional Couplers, Terminators, Phase Shifters, Faraday Rotation Isolators and Circulators, Field Displacement Isolators, Microwave Filters, Frequency Meters, Hybrid Junctions – Scattering Analysis.

UNIT II: MICROWAVE GENERATORS 10Hrs

Limitations of Conventional Tubes at Very High Frequencies – Velocity – Modulated Tubes, Two – Cavity Klystron Amplifiers, Reflex Klystron Oscillators – Periodic Slow Wave Structures and their Use in Travelling Wave Tube Amplifiers, Focusing Techniques, TWTA Performance Characteristics – Electron Motion in Crossed Electric and Magnetic Fields - Magnetron Oscillators, Hartree Equation Rieke Diagram and Performance Charts .

UNIT III: MICROWAVE SOLID-STATE DEVICES 9 Hrs

Varactor Diodes, Manley – Rowe Relations, Low Noise Parametric Amplifiers – Transferred – Electron Devices and Their Operation, Cavity – Controlled Modes, LSA Mode-Avalanche – Transit Time Devices and Their Operation, TRAPATT Mode, BARITT mode, PIN Diodes and Their use as Attenuators and Switches.

UNIT IV: MICROWAVE CIRCUITS 8 Hrs

Small – Signal Equivalent Circuits, High-Frequency Applications, Performance Criteria and Limitations of BJTs and FETs – HEMTs – Fabrication Techniques.

UNIT V: MICROWAVE MEASUREMENTS 9 Hrs

Slotted - Line Techniques – Measurements of Wavelength – Measurement of Low and High VSWR – Measurement of Frequency and Frequency Meters – Measurement of Insertion Loss and Attenuation by Substitution Methods – Measurement of Low and High Powers at Microwave Frequencies – Modern Measurement Techniques using Automatic Network Analyzer and Spectrum Analyzer.

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks:

1. Annapurna Das, Sisir. K. Das, "*Microwave Engineering*", Tata McGraw Hill Co., Ltd., 1999. Reprint 2001.
2. Samuel Y. Liao: "*Microwave Devices and Circuits*" , Prentice Hall of India – 3rd Edition (2003)
3. SubalKar , "*Microwave Engineering*" , Universities press(India) private limited – 1st Edition (2016)

Reference Books:

1. D.M. Pozer, "*Microwave Engineering*", Addison – Wesley, 1998.

Subject Code: BEC17E06	Subject Name : REAL TIME OPERATING SYSTEMS	T / L/	L	T / S.Lr	P/ R	C

2. R.E. Collins: "*Foundations for Microwave Engineering*", IEEE Press Second Edition (2002)
3. David K. Cheng," *Field and Waves in Electromagnetism*", Pearson Education, 1989.

Department of Electronics and Communication Engineering

		ETL				
	Prerequisite: Operating Systems Concepts	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Review of elements and fundamentals of Systems.
- To understand the embedded tools.
- To understand the queues and scheduling

COURSE OUTCOMES (COs) :

The Student will be able to

CO1	Describe the different between the general computing system and the embedded system.
CO2	Identify different software architecture.
CO3	Become aware of the elements of RTOS.
CO4	Implement the design concepts of RTOS.
CO5	Use the embedded software development tools.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H		M			H	H	M	M
CO2	H	H	H	H	M	M			H	H	M	
CO3	M	M						M		H	M	H
CO4	H	H	H	H	H	H			H	H	H	
CO5	H	H	H	H	H	H	H	M	H	H	H	H

COs / PSOs	PSO1	PSO2	PSO3
CO1	M	M	
CO2	M	H	
CO3	M		M
CO4			
CO5	H	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							
Approval												

BEC17E06 REAL TIME OPERATING SYSTEMS 3003

UNIT- I EMBEDDED SYSTEM FUNDAMENTALS 9 Hrs

Introduction, Characteristics of embedded systems and challenges in system Design –design issues in embedded real-time systems, critical performance issues in embedded real-time systems.

UNIT - II SURVEY OF SOFTWARE ARCHITECTURES 9 Hrs

Round –robin, Round-Robin with interrupts, queues. Function- scheduling architecture, Real time operating system architecture, Scheduling architecture.

UNIT- III ELEMENTS OF REAL TIME OPERATING SYSTEMS 9 Hrs

Tasks & Task States, Tasks & data, Semaphores & shares data, Message queues, Mailboxes and Pipes, Timer functions, events, Memory management and Interrupt Routines in an RTOS environment.

UNIT –IVBASIC DESIGN USING REAL-TIME OPERATING SYSTEMS 9 Hrs

Principles, encapsulating semaphores & queues, hard real-time scheduling considerations, saving memory space, savingpower.

UNIT- VEMBEDDED TOOLS 9 Hrs

Embedded software development tools- host and target machines, linker/locators for embedded software, getting embedded software into the target system. Debugging techniques- testing on host system, instruction set simulators, the assert, macro using laboratory tools.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Wayne Wolf, "*Computers as Components- Principles of Embedded Computing Systems Design*", Academic press,2001.
2. David E. Simon, "*An Embedded Software Primer*", Pearson education, 1999.

References:

1. Arnold S. Berger, "*Embedded Systems Design- an Introduction to Processes, Tools & Techniques"*, CMP books, 2002.
2. Jean J. Labrosse, "*Embedded Systems Building Blocks*", CMP books, 2002.
3. Michael Barr, "*Programming Embedded Systems in C andC++",* O'Reilly, 1999.

Subject Code: BEC17E07	Subject Name : POWER ELECTRONICS	T / L/ ETL	L	T / SLr	P/ R	C
	Prerequisite: Electronic Circuits, Electronic Devices	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study about power electronic circuits for voltage and current control and protection.
- To learn the switching characteristics of transistors and SCRs. Series and parallel functions of SCRs, Programmable triggering methods of SCR.
- To learn controlled rectification of AC supplies.
- To study of converters and inverters.
- To learn about motor control, charges, SMPS and UPS.

COURSE OUTCOMES (COs)

The Students will be able to

CO1	Analyze power electronic circuits for voltage and current control and protection
CO2	Analyze switching characteristics of transistors and SCRs.
CO3	Apply the function phase controlled converters.
CO4	Demonstrate the applications of inverters and choppers.
CO5	Develop the applications specific to power electronics in industries.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	M	M	M		M	M	M
CO2	H	H	H	H	H	M	M	M			M	M
CO3	H	H	H	H	H	M	M	M		M	M	
CO4	H	H	H	H	H	M	M	M				M
CO5	H	H	H	H	H	M	M	M		M	M	M

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	
CO2	H	H	
CO3	H	H	
CO4	H	H	
CO5	H	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							
Approval												

BEC17E07 POWER ELECTRONICS 3 0 0 3

UNIT-I: POWER ELECTRONIC DEVICES 9 Hrs

Characteristics of Power Devices – Characteristics of SCR – Two Transistor Model of SCR,Characteristics of TRIAC, BJT, MOSFET, IGBT, GTO both Static and Switching Characteristics – Protection of Thyristors against Over Voltage – Over Current, dv/dt and di/dt.

UNIT-II:TRIGGERING& COMMUTATION TECHNIQUES 9 Hrs

Turn on Circuits for SCR – Triggering with Single Pulse & Train of Pulses – Triggering with Microprocessor – Different Techniques of Commutation – Natural and Forced Commutation – Series & Parallel Operations.

UNIT-III:PHASE CONTROLLED CONVERTERS 9 Hrs

Converters – Single Phase – Three Phase – Half Controlled and Fully Controlled Rectifiers with R, RL and RLE Loads – Waveforms of Load Voltage and Line Current – Harmonic Factor, Power Factor, Ripple Factor, Distortion Factor – Operation with Freewheeling Diode – Effect of Source Inductance – Dual Converter**.**

UNIT-IV: INVERTERS & CHOPPERS 9Hrs

Voltage and Current Source Inverters, Resonant, Series Inverter – Basic Series Inverter, Modified, Improved – PWM Techniques – Single Phase AC Choppers with R and RL Load – Half Wave and Full Wave – DC Choppers – Various Classes of Operation – Buck, Boost and Buck – Boost Type Choppers – Merits and Applications.

UNIT-V: AC VOLTAGE CONTROLLERS & INDUSTRIAL APPLICATIONS 9 Hrs

Single-Phase and Three-Phase AC Voltage Controllers - Sequence Control of AC Voltage Regulators.Cycloconverters – Single-Phase and Three-Phase Cycloconverters, SMPS & UPS – Static Compensators – HVDC Transmission System.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Rashid, M.H., "*Power Electronics - Circuits Devices and Applications*", Prentice Hall of India, 3rd Edition, 2004.
2. Singh.M.D and Kanchandani, "*Power Electronics*", Tata McGraw Hill & Hill publication Company Ltd, New Delhi, 2002.

References:

1. Dubey, G.K., Doradia, S.R., Joshi, A. and Sinha, R.M., "*Thyristorised Power Controllers*", Wiley Eastern Limited,
1986.
2. Lander,W., "*Power Electronics*", McGraw Hill and Company, Third Edition, 1993.
3. P.S. Bimbhra, "*Power Electronics*", Khanna Publishers, 3rd Edition, 1999.

Subject Code: BEC17E08	Subject Name: CRYPTOGRAPHY AND NETWORK SECURITY	T / L/ ETy	L	T / S.Lr	P/ R	C
	Prerequisite: Computer Networks	Ty	3	0	0	3

Department of Electronics and Communication Engineering

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study the various cryptographic algorithms, firewall.
- To study Integrity, Authentication.
- To study about wireless network security concepts.

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Identify different types of attacks and techniques used for transmission of information.
CO2	Encrypt and decrypt messages using different types of ciphers.
CO3	Verify message using well know signature generation and verification algorithms.
CO4	To have a clear knowledge on network security, web security and firewalls.
CO5	To test and identify the various security attack issues in wireless systems.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	-	M			H	H	M	H
CO2	H	H	H	H	H	H		M	M	H	H	H
CO3	H	H	H	H	M	H		M	H	H	M	H
CO4	H	M	H	H	H	H	M	M		H	M	H
CO5	H	H	H	H	H	H		H	H	H	H	M

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	M	M
CO2	H	H	M
CO3	H	H	M
CO4	H		
CO5	H	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							

Approval	

BEC17E08 CRYPTOGRAPHY AND NETWORK SECURITY 3003

UNIT –I: INTRODUCTION ON SECURITY 9 Hrs

Security Goals, Types of Attacks: Passive attack, active attack, attacks on confidentiality, attacks on Integrity and availability. Security services and mechanisms, Techniques: Cryptography, Steganography, Revision on Mathematics for Cryptography.

UNIT- II: SYMMETRIC & ASYMMETRIC KEY ALGORITHMS 9 Hrs

Substitution Ciphers, Transposition Ciphers, Stream and Block Ciphers, Data Encryption Standards (DES), Advanced Encryption Standard (AES), RC4, Principle of asymmetric key algorithms, RSA Key distribution.

UNIT –III: INTEGRITY, AUTHENTICATION AND KEY MANAGEMENT 9 Hrs

Message Integrity, Hash functions: SHA, Digital signatures: Digital signature standards. Authentication Entity Authentication: Biometrics, Key management Techniques, Introduction to Quantum Cryptography.

UNIT- IV: NETWORK SECURITY, FIREWALLS AND WEB SECURITY 9 Hrs

Introduction on Firewalls, Types of Firewalls, Firewall Configuration and Limitation of Firewall. IP Security Overview, IP security Architecture, authentication Header, Security payload, security associations, Key Management. Web security requirement, secure sockets layer, transport layer security, secure electronic transaction, dual signature

UNIT- V: WIRELESS NETWORK SECURITY 9 Hrs

Security Attack issues specific to Wireless systems: Worm hole, Tunneling, DoS WEP for Wi-Fi network, Security for 4G networks: Secure Ad hoc Network, Secure Sensor Network

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

References:

1. Behrouz A. Fourouzan , "*Cryptography and Network security*" Tata McGraw- Hill, 2008
2. William Stallings, *"Cryptographyand Network security: principles and practice*", 2nd Edition, Prentice Hall of India, New Delhi, 2002
3. AtulKahate , "*Cryptography and Network security*", 2nd Edition, Tata McGraw- Hill, 2008
4. R.K.Nichols and P.C. Lekkas ,"*Wireless Security*", McGraw-Hill Professional, New York, NY, USA, 2001

Subject Code: BEC17E10	Subject Name: DISASTER MANAGEMENT	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BPE 13001, BPE 13002 Environment and health sciences	Ty	3	0	0	3

5. H. Yang et al., "*Security in Mobile Ad Hoc Networks: Challenges and Solution*", IEEE Wireless Communications, Feb. 2004.
6. Securing Ad Hoc Networks, *IEEE Network Magazine*, vol. 13, no. 6, pp. 24-30, December 1999.

Department of Electronics and Communication Engineering

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Disaster management refers to the policies, programs, administrative actions and operations undertaken to address a Natural or man-made disaster through preparedness, mitigation, response and recovery.

COURSE OUTCOMES (COs) :

The Students will be able to

CO1	Describe the basic types of hazard and disasters.
CO2	Demonstrate knowledge of risk management.
CO3	Implement the risk reduction techniques during emergency.
CO4	Aware of the relationship between disaster and development.
CO5	Aware of the various risk management in India.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		M	M	M	M	H	H		H		H
CO2	M		H	H	H	H	H	H	H	M	H	H
CO3	H		H	H	H	H	H	H	H	H	H	H
CO4	M			M	H	H	H	H	M	M	M	M
CO5	M			M	M	H	H	H	M	M		

COs / PSOs	PSO1	PSO2	PSO3
CO1			M
CO2		M	M
CO3			M
CO4			H
CO5			H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			

					✓							
Approval												

BEC17E10DISASTER MANAGEMENT 3 0 0 3

UNIT-I INTRODUCTION TO DISASTERS: **9 Hrs**

Concepts, and definitions-Disaster, Hazard, Vulnerability, Resilience, Risks Disasters: Classification, Causes, Impacts - including social, economic, political, environmental, health, psychosocial, etc.)

UNIT-II RISK MANAGEMENT 9 Hrs

Goals and objectives of ISDR Programme- Risk identification – Risk sharing – Disaster and development: Development plans and disaster management –Alternative to dominant approach – disaster-development linkages -Principle of risk partnership.

UNIT-III RISK REDUCTION 9 Hrs

Trigger mechanism – constitution of trigger mechanism - risk reduction by education -disaster information network - risk reduction by public awareness Application of various technologies: Data bases - RDBMS - Management Information systems - Decision support system and other systems - Geographic information systems Remote sensing-an insight - contribution of remote sensing and GIS - Case study.

UNIT-IV INTER-RELATIONSHIPS BETWEEN DISASTERS AND DEVELOPMENT:**9 Hrs**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc., Climate Change Adaptation, Relevance of indigenous knowledge, appropriate technology and local resources financial arrangements – areas of improvement –disaster preparedness — emergency response.

UNIT-V DISASTER RISK MANAGEMENT IN INDIA 9 Hrs

Hazard and Vulnerability profile of India Components of Disaster Relief: Water, Food, Sanitation, Shelter, and Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation)

Practical component P : Include case studies / application scenarios

Subject Code: BEC17E11	Subject Name : TELEVISION & VIDEO ENGINEERING	T / L	L	T / SLr	P/ R	C

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. PardeepSahni, MadhaviMalalgoda and Ariyabandu, "*Disaster risk reduction in Southasia*", PHI

2. AmitaSinvhal, "*Understanding earthquake disasters*" TMH, 2010.

References:

1. PardeepSahni, AlkaDhameja and Uma Medury, "*Disaster mitigation: Experiences and reflections*".

Department of Electronics and Communication Engineering

		ETL				
	Prerequisite: Communication systems, Microwave Engineering	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver Picture Tubes and Television Camera Tubes
- To study the principles of Monochrome Television Transmitter and Receiver systems.
- To study the various Color Television systems with a greater emphasis on PAL system.
- To study the advanced topics in Television systems and Video Engineering.

COURSE OUTCOMES (COs) :

The Students will able to

CO1	Incorporate and recall the fundamentals of television.
CO2	Describe the various components of monochrome TV receiver.
CO3	Distinguish between various colour TV systems.
CO4	Identify the character of colour TV receiver.
CO5	Beware of recent trends and technologies of TV.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	M		M		M		H	M	
CO2	H	M	H	M		M			M	H		
CO3	H	M	M				M		M	M		
CO4	H	H		H						M	M	H
CO5	H									M		M

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	
CO3	M	M	
CO4	H	M	M
CO5			M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							
Approval												

BEC17E11 TELEVISION AND VIDEO ENGINEERING 3 003

UNIT- I: FUNDAMENTALS OF TELEVISION 9 Hrs

Characteristics of Eye and Television Pictures – Resolution and Brightness Gradation- Theory of Scanning, Camera Tubes – Videocon and Silicon Diode Array Videocon- Monochrome Picture Tube, Composite.

UNIT-II:MONOCHROME TELEVISION RECEIVER 9 Hrs

Transmission and Propagation of TV signal- TV Antenna, Receiver VHF Tuners - Vision IF Subsystem, Inter Carrier Sound System, and Video Amplifiers - Synchronous Separation AFC and Deflection Oscillators - Frame and Line Deflection Circuits.

UNIT-III:COLOUR TELEVISION SYSTEMS 9 Hrs

Color Characteristics – Color Cameras Color Picture Tubes, Color signal Generation and Encoding, NTSC, PAL and SECAM Systems.

UNIT- IV:COLOUR TELEVISION RECEIVERS 9 Hrs

Block Diagram of PAL-D Receivers, Luminance Channel, Chrominance amplifier, Color Burst Separation and Burst phase Discriminators, R, G, B Matrix and Drives.

UNIT-V:SPECIAL TOPICS IN TELEVISION 9 Hrs

Digital Tuning Techniques, Remote Control, Introduction to Cable and Satellite Television, Video Tape Recorders, Videodisc system, Fundamental of Digital TV and High Definition Television.

Practical component P : Include case studies / application scenarios
Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Gulati. R.R "*Modern Television Practice, Principle of Technology and Servicing"*, New Age International Pvt. Ltd., 2002.
2. R.R. Gulati "*Monochrome and colour television"*, New age International Publisher, 2003

Subject Code: BEC17E12	Subject Name : OPERATING SYSTEMS	T / L/ ETL	L	T / S.Lr	P/ R	C

References:

1. Dhake A, M., "*Television and Video Engineering*", Tata McGraw Hill, 1995.
2. Grob. B. Herndon. C.E., "*Basic Television and Video Systems*", McGraw Hill 1999.

Department of Electronics and Communication Engineering

	Prerequisite: Data structures, OOPS	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To have an overview of different types of operating systems
- To know the components of an operating system
- To have a thorough knowledge of process management
- To have a thorough knowledge of storage management
- To know the concepts of I/O and file system

COURSE OUTCOMES (COs) :

The Students will be able to

CO1	Review functions, structures and history of operating systems.
CO2	Process management concepts including scheduling
CO3	Be familiar with multithreading
CO4	Present and document concepts of memory management schemes.
CO5	Appreciate secondary storage management

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	M		M		M	M	H		
CO2	H	H	H	H					M	H	M	
CO3	H	M	M						M	M		
CO4	H	M	M							H	M	M
CO5	H	M					M			M	M	

COs / PSOs	PSO1	PSO2	PSO3
CO1			
CO2		M	H
CO3		M	M
CO4			H
CO5			M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							
Approval												

BEC17E12 OPERATING SYSTEMS 3 0 0 3

UNIT- I: INTRODUCTION 9 Hrs

Mainframe Systems – Desktop Systems – Multi Processor Systems - Distributed Systems – Cluster Systems – Real Time Systems-Hardware Protection-System Components-Handheld Systems-Operating System Services-System Calls-System Programs-System Structure-Visual Machines-System Design and Implementation.

UNIT- II: PROCESS MANAGEMENT 9 Hrs

Process Concept-Process Scheduling-Operation on Process-Co-operating Processes- Inter Process Communication-Threads-Overview-Multithreading Models. CPU Scheduling-Basic Concepts-Scheduling Criteria-Scheduling Algorithms-Multiple-Processor Scheduling-Real Time Scheduling-Algorithm Evaluation

UNIT -1II: SYNCHRONIZATION ANDDEADLOCKS 9 Hrs

Process Synchronization-The Critical Section Problem-Synchronization Hardware-Semaphores-Classical Problems Of Synchronization-Deadlocks-System Model-Deadlock Characterization-Methods Of Handling Deadlocks-Deadlock Prevention-Deadlock Avoidance-Deadlock Detection-Recovery form Deadlock.

UNIT- 1V: MEMORY MANAGEMENT 9 Hrs

Background-Swapping-Contiguous Memory Allocations - Virtual Memory – Address Translation – Paging – Segmentation – Segmentation with Paging - Static Paging Algorithm – Dynamic Paging Algorithm

UNIT –V: FILES AND SECONDARY STORAGE MANAGEMENT 9 Hrs

File Systems – File Concepts – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection –File System Structure – File System Implementation – Recovery – Disk Structure – Disk Scheduling – Disk Management

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Silberschatz, Galvin, GAGNE "*Operating System Concepts*" John Wiley & Sons INC, 6th Edition, 2002
2. William Stallings, "*Operating Systems*", Prentice Hall of India, 1997.

References:

1. D.M. Dhamdhere, "*Operating Systems*", Tata McGraw Hill, 2002
2. Charles Crowley, "*Operating Systems: A Design Oriented Approach*", Tata McGraw Hill 1999.
3. Andrew S. Tanenbaum, "*Modern Operating Systems*", Prentice Hall of India, 1995.
4. Harvey M. Deitel, "*Operating Systems*", Second Edition, Pearson Education Pvt. Ltd, 2002.

Subject Code: BEC17E13	Subject Name : VISUAL PROGRAMMING	T / L/ ETL	L	T / S.L	P/ R	C

Department of Electronics and Communication Engineering

	Prerequisite: Oops, Data structures	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To introduce the concepts of windows programming
- To introduce GUI programming using Microsoft Foundation Classes
- To enable the students to develop programs and simple applications using Visual C++
- To make the students to understand the simple application using visual C+++
- To develop a deep knowledge about advanced concept for windows applications.

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Demonstrate fundamental skills in utilizing the tools of visual environment in terms of the set of command menus and tool bars.
CO2	Implement specialized new GUI components.
CO3	Apply visual programming to software development by designing projects.
CO4	Use visual programming environment to create simple visual applications.
CO5	Motivate to understand concepts and tools for windows applications.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	M	H	M	M	H	H	H	H	H
CO2	H	H	H	M	M	H	H	M	H	H	H	H
CO3	H	H	H	H	M	H	H	H	H	M	H	H
CO4	H	H	H	H	M	H	H	H	H	M	H	H
CO5	H	M	H	M	H	H	H	H	H	H	H	H

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	H
CO3	H	M	H
CO4	H	M	H
CO5	H	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Department of Electronics and Communication Engineering

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							
Approval												

BEC17E13 VISUAL PROGRAMMING 3 00 3

UNIT I: FORMS AND CONTROL 9Hrs

Customizing a Form-Writing Simple Programs-Toolbox-Creating Controls-Name Property-Command Button-Access Keys-
Image Controls-Text Boxes-Labels-Message Boxes-Grid-Editing Tools-Variables-Data Types-String –Numbers.

UNIT II: FUNCTIONS AND EVENTS 9 Hrs

Displaying Information-Determinate Loops-Indeterminate Loops-Conditionals-Built-In Functions-Functions and Procedures- Lists-Arrays-Sorting and Searching-Records-Control Arrays-Combo Boxes-Grid Control-Projects with Multiple forms-Do Events and Sub Main-Error Trapping.

UNIT III: MENUS AND MOUSE ACTIVITY 9 Hrs

VB Objects-Dialogue Boxes-Common Controls-Menus-MDI Forms-Testing, Debugging and Optimization-Working with Graphics- Monitoring Mouse Activity-File Handling-File System Controls-File System Objects-COM/OLE-Automation-DLL Services-OLE Drag and Drop.

UNIT IV: VISUAL C++ PROGRAMMING 9 Hrs

Visual C++ Components – Developing Simple Applications – Microsoft Foundation Classes – Controls – Message Handling
– Document View Architecture – Dialog Based Applications – Mouse and Keyboard Events –Reading and Writing Documents – SDI and MDI Environments – Splitter Windows and Multiple Views.

UNIT V: ADVANCED CONCEPTS 9 Hrs

Concepts and Tools for Windows Application – Procedure Oriented Windows Applications – Windows Applications using the MFC – Application and Class Wizards – Getting Started with OLE – Getting Started with Active X Controls – COM and DHTML

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Gary Cornell-"*Visual Basic 6 from the Ground Up*"-Tata McGraw Hill, New Delhi,1999
2. David Kruglirski J, "*Inside Visual C++*", Microsoft Press 1993.
3. CHRIS H.PAPPAS & WILLIAM H.MURRAY –"*The Complete reference–Visual C++*", Tata McGraw Hill, edition 1999, Chapter 1, 2,3,4,16-27 (IV & V unit)

References:

1. Deitel&Deitel, T.R.Nieto, "*Visual Basic 6, How to program*", Prentice Hall of India, 1999.
2. Lars Klander, "*Core visual C++ 6*", Pearson Education Asia, 2000.
3. Gray J.Bronson,"*A first book of Visual C++",*Vikas Publishing House Thomson Learning) 2000.
4. Steven Holzner –"*Visual Basic 6–Programming Black Book*" by Dream tech Press ,edition 2000
5. Noel Jerke-"*Visual Basic 6(The Complete Reference)"*-Tata McGraw Hill, New Delhi1999.

Subject Code: BEC17E14	Subject Name : BIO-SIGNAL PROCESSING	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Signals and Systems	T	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To introduce the concepts of spectrum in biosignal
- To introduce adaptive filtering and wavelet detection in biosignal.
- To understand the biosignal classification and recognition

Department of Electronics and Communication Engineering

COURSE OUTCOMES (COs) :
The students will be able to

CO1	Identify various types of signals.
CO2	Solve problems in time series analysis.
CO3	Implement various adaptive filters.
CO4	Classify and recognize the bio signals
CO5	Be aware of applications of bio signal processing

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	M		M				H		H
CO2	H	H	H	H		M			H	H	H	H
CO3	H	H	H	H	H				H	H	M	M
CO4	H	H	H	M	M				M	M	M	H
CO5	H	M	M			M		M				

COs / PSOs	PSO1	PSO2	PSO3
CO1	H		H
CO2	H		H
CO3	H	H	H
CO4	H		H
CO5			M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							

Approval	

Subject Code:	Subject Name : DIGITAL IMAGE PROCESSING	T / L/ ETL	L	T / S Lr	P/ R	C
BEC17E14	BIO-SIGNAL PROCESSING				3003	

UNIT I: SIGNAL, SYSTEM AND SPECTRUM **10 Hrs**

Characteristics of Some Dynamic Signals – Bio-Electric Signals, Impedance,. Acoustic Signals, Mechanical Signals, Bio-Magnetic Signals, Bio-Chemical Signals, Signal Conversion – Simple Signal Conversion Systems, Conversion Requirements for Bio-Medical Signals. Basics of Digital Filtering – FIR and IIR filters. Spectral Analysis – Power Spectral Densities Function, Cross Spectral Density and Co-Herence Function, Cepstral Analysis and Homomorphic Filtering, Estimation of Mean with Finite Time Signal

UNIT II:TIME SERIES ANALYSIS AND SPECTRAL ESTIMATION **9 Hrs**

Time Series Analysis – Linear Prediction Models, Process Order Estimation, Attic Representation, Non-Stationary Process, Adaptive Segmentation, Model Based ECG Simulator, Spectral Estimation – Blackman Turkey Method, Periodogram and Model Based Estimation.

UNIT III:ADAPTIVE FILTERING AND WAVELET DETECTION **9 Hrs**

Filtering – LMS adaptive filter, adaptive noise canceling in ECG, improved adaptive filtering in FECG. Wavelet detection in ECG – Structural, features, matched filtering, adaptive wavelet detection, detection of overlapping wavelets.

UNIT IV:BIOSIGNAL CLASSIFICATION AND RECOGITION **9Hrs**

Signal classification and recognition – statistical signal classification, linear discriminate function, direct feature selection and ordering, Back propagation neural network based classification.

UNIT V:SELECTED TOPICS IN BIO-SIGNAL PROCESSING **8 Hrs**

Application of wavelet transform on Bio-signal – TFR representation, ECG data compression, ECG characterization, Application of Chaos theory on Biomedical signals, Software implementation of signal processing algorithms on biomedical signals.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. VallaruRao and HayagivaRao, "*C++ Neural Networks and Fuzzy Logic*", BPS Publication, New Delhi, 1996
2. Special topics on" *The Applications of Chaos Theory on Bio-Signal*", Journal of IEEE Engg. In Medicine and Biology Magazine, October, 1996.

References:

1. Willies J Tompkins, "*Bio-medical Digital Signal Processing*" Prentice Hall, New Jersey, 1993.
2. Samuel D. Stearns Ruth A. David, "*Signal Processing Algorithms using FORTRAN and C*", Prentice Hall, New Jersey, 1993.

Department of Electronics and Communication Engineering

	Prerequisite: Transforms, Signals and Systems	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedure
- To study the image segmentation and representation techniques

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Solve the mathematical transforms of image processing.
CO2	Derive the various image transform techniques.
CO3	Discuss the image enhancement techniques.
CO4	Model and restore image using filters.
CO5	Process an image through various image processing techniques.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	M	H		H	M	H	M	H	H
CO2	H	H	M	M	H	H	M	M	H	M	H	
CO3	H	M	H	M	M	H	M	M	M	H	H	H
CO4	M	H	H	H	H	M	M		M		M	H
CO5		M	H	H	H	M	M		M	M	H	H

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	M	H	
CO3	M	H	H
CO4	M	H	H
CO5	H	M	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			

					✓							
Approval												

BEC17E15 DIGITAL IMAGE PROCESSING 3 0 0 3

UNIT I: CONTINUOUS AND DISCRETE IMAGES AND SYSTEMS 9 Hrs

Light, Luminance, Brightness and Contrast, Eye, The Monochrome Vision Model, Processing Problems and Applications, Vision Camera, Digital Processing System, 2-D Sampling Theory, Aliasing, Image Quantization, Lloyd Max Quantizer, Dither, Color Images, Linear Systems And Shift Invariance, Fourier Transform, Z-Transform, Matrix theory Results, Block Matrices and Kronecker Products.

UNIT II:IMAGE TRANSFORMS 9 Hrs

2-D Orthogonal and Unitary Transforms, 1-D and 2-D DFT, Cosine, Sine, Walsh, Hadamard, Haar, Slant, Karhunen-Loeve, Singular Value Decomposition Transforms.

UNIT III: IMAGE ENHANCEMENT 9Hrs

Point Operations- Contrast Stretching, Clipping and Thresholding Density Slicing, Histogram Equalization, Modificationand Specification, Spatial Operations – Spatial Averaging, Low Pass, High Pass, Band Pass Filtering, DirectionSmoothing,Medium Filtering, Generalized Cepstrum and Homomorphic Filtering, Edge Enhancement using 2-D IIR and FIR filters, Color Image Enhancement

UNIT IV: IMAGE RESTORATION 9 Hrs

Image Observation Models, Sources of Degradation, Inverse and Wiener Filtering, Geometric Mean Filter, Non-Linear Filters, Smoothing Splines and Interpolation, Constrained Least Squares Restoration.

UNIT V: IMAGEDATA COMPRESSION AND IMAGE RECONSTRUCTION FROM PROJECTION 9 Hrs

Image Data Rates, Pixel Coding, Predictive Techniques, Transform Coding and Vector DPCM, Block Truncation Coding, Wavelet Transform Coding of Images, Color Image Coding, Random Transform - Introduction to Python Programming- Introduction to OpenCV-Python

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Anil K. Jain, "*Fundamentals of Digital Image Processing*", PHI 1995.
2. Milan Sonka,*" Image Processing–Analysis and Machine vision*", Thomson Learning. 2nd Edition.
3. AlasdarMcAndrew, "*Introduction to Digital Image Processing*", Thomson Learning 2004.

References:

1. M.A. Sid Ahmed, "*Image Processing*", McGraw Hill, Inc, 1995.

Subject Code: BEC17E16	Subject Name: NEURAL NETWORKS AND ITS APPLICATIONS	T / L / ETL	L	T / S Lr	P/ R	C
	Prerequisite:None	Ty	3	0	0	3

2. R. Gonzalaz and P. Wintz, "*Digital Image Processing*", Addition Wesley 2nd Ed, 1987.
3. William. K. Pratt, "*Digital Image Processing*", Wiley Inter Science, 2nd Ed, 1991.
4. John V Guttag. "*Introduction to Computation and Programming Using Python*", Prentice Hall of India
5. https://opencv-python-tutroals.readthedocs.io/en/latest/

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L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study the various neural network algorithms and its application in pattern recognition.

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Describe the basic concepts of art neural networks.
CO2	Explain about BPN and BAM
CO3	Implement the concept of simulated annealing and CPN
CO4	Interpret the concepts of SOM and ART.
CO5	Implement BPN algorithm.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	M						H	M	H
CO2	H	H	M	M						H		M
CO3	H	H	H	H	H	M	M	M	H	M	H	M
CO4	H	M	H	H	M					H		M
CO5	H	H	H	H	M		M					

COs / PSOs	PSO1	PSO2	PSO3
CO1		M	M
CO2		M	H
CO3	M		H
CO4			H
CO5		M	

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							

Approval	

BEC17E16 NEURAL NETWORKS AND ITS APPLICATIONS 3 003

UNIT I: INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS 9 Hrs

Neuro – Physiology – General Processing Element – ADALINE – LMS Learning Rule – MADALINE – Perception Networks

UNIT II: BPN AND BAM 9 Hrs

Back Propagation Network – Updating of Output and Hidden Layer Weights – Application of BPN – Associative Memory – Bi-Directional Associative Memory - Hopfield Memory – Traveling Sales Man Problem

UNIT III: SIMULATED ANNEALING AND CPN 9 Hrs

Annealing, Boltzmann Machine – Learning – Application – Counter Propagation Network – Architecture – Training – Application.

UNIT IV: SOM AND ART 9 Hrs

Self-Organizing Map – Learning Algorithm – Feature Map Classifier – Applications – Architecture of Adaptive Resonance Theory – Pattern Matching in ART Network.Neocognitron: Architecture of Neocognitron – Data Processing and Performance of Architecture of Spacio – Temporal Networks for Speech Recognition

UNIT V CASE STUDY 9 Hrs

Implementation of BPN Algorithm in a Computer Language - Application of Neural Networks for Pattern Recognition - Data Comparison - Hopfield Networks for an n-bit A/D Converter

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Hagan, "*Neural Networks Design",* Thomson Learning.
2. J.A. Freeman and B.M. Skapura, "*Neural Networks, Algorithms Applications and Programming Techniques*", Addison-Wesley, 1990.

References:

1. Laurence Fausett, "*Fundamentals of Neural Networks: Architecture, Algorithms and Applications*", Prentice Hall,
1994.

Subject Code: BEC17E17	Subject Name : ADVANCED MICROPROCESSORS	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Microprocessor and Microcontroller	T/L/ETL	2	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

2. Simon Haykin, "*Neural Networks and Learning Machines*" -3/E - Pearson/ Prentice Hall 2009

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OBJECTIVE :

- To introduce the concepts in internal programming model of Intel family of microprocessors.
- To introduce the programming techniques using MASM, DOS and BIOS function calls.
- To introduce the architecture programming and interfacing of 16 bit microcontrollers.
- To introduce the concepts and architecture of RISC processor

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Explain the generalized architecture of advanced microprocessor
CO2	Develop algorithm/ program of advanced microprocessor or a particular task
CO3	Appreciate the microprocessor based system design
CO4	Analyze the MOTOROLA MC 68000 family
CO5	Describe about the various RISC processors

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	M	M		M		H	H		H
CO2	H	H	H	H	M	M		M	H	H	H	H
CO3	H	H	M	M			M	M		H	M	H
CO4	H	H	H	H			H		M	M	H	M
CO5	H	H	H	H					H	H		

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	M	
CO2	H	H	
CO3	H	M	M
CO4	H		M
CO5	H		H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							

Approval	

BEC17E17 ADVANCED MICROPROCESSORS 3003

UNIT I: THE INTEL X86 FAMILY 9 Hrs

The Intel X86 Family Architecture, 32 bit Processor Evolution Systems Connections and Timing, Instruction and Data Formats, Instruction set of X86 Processors, Addressing Modes.

UNIT II: INTEL X86 ASSEMBLY LANGUAGE PROGRAM 9 Hrs

Implementation of Strings, Procedures, Macros, BIOS and DOS Services using X86 Assembly Language Programming, Memory and I/O Interfacing, Analog Interfacing and Industrial Control.

UNIT III: SYSTEM DEVELOPMENT 9 Hrs

Microprocessors Based System Design, TMS 320 Series DSP Based Signal Processing, Microcontroller 8096 Architecture, Addressing mode and system design.

UNIT IV: THE MOTOROLA MC 68000 FAMILY 9 Hrs

The MC 68000 Architecture, CPU Registers, Data Formats, Addressing Modes, Instruction Set and Assembler Directors, Memory Management Instruction and Data, Caches, Exception Processing.

UNIT V: RISC PROCESSORS 9 Hrs

RISC vs CISC, RISC Properties and Evaluation, Advanced RISC Microprocessors, DEC ALPHA, The Power PC family.The SUN SPARC Family, the MIPS RX 100 Family, the Intel 860 Family. The Motorola M88000 Family, HP Precision Architecture.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. B.B. Bery, "*The Intel Microprocessors 8086 / 8088, 80186 / 80188, 80286, 80386, 80486, PENTIUM, andPENTIUM Processors*", Prentice Hall, 1997.
2. K Udayakumar, B.S. Uma Shankar, "*Advanced Microprocessors and IBM PC Assembly Language Programming*",
Tata McGraw Hill, 1996.

References:

Subject Code: BEC17E18	Subject Name : DATABASE MANAGEMENT SYSTEMS	T / L/ ETL	L	T/ S.Lr	P/ R	C

1. Daniel Tabak, "*Advanced Microprocessors*", McGraw Hill, 1995.
2. Douglas V. Hall, "Microprocessors *and Interfacing–Programming Hardware*", McGraw Hill, 1992.
3. W.A. Tribel& A. Singh, "*The 68000 and 68020 Microprocessors–Architecture, Software and InterfacingTechniques*", Prentice hall of India, 1991
4. Rifiquzzaman, "*Microprocessors–Theory and Applications: Intel and Motorola*", Prentice Hall, 1992.
5. Kenneth J. Ayala, "*The 8051 Microcontroller, Architecture, Programming and Application*", Penram International
   Publishing (India), 1996.
6. John Peatman, "*Design with Microcontrollers*", McGraw Hill International, 1988.

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	Prerequisite: C++ and Data structures	Ty	3	0	0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram
- To make a study of SQL and relational database design
- To understand the internal storage structures using different file and indexing techniques
- To know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Master the basic concepts of database systems.
CO2	Identify and construct queries using SQL
CO3	Be familiar with relational database theory
CO4	Write SQL program for queries
CO5	Work successfully on a team by design and developing database management systems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		M		M		H	H	H
CO2	H	H	H	M	H	M			M	H	M	H
CO3	H	M	M	H				M		H	M	M
CO4	H	H	M	M	H				H		H	M
CO5	H	H	M	H	H	M	H		H	M	H	M

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	M	H
CO2	H	M	H
CO3	H	H	M
CO4	H	H	M
CO5	H	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							
Approval												

BEC17E17 DATABASE MANAGEMENT SYSTEMS 3 0 0 3

UNIT-I :INTRODUCTION 9 Hrs

Definition -Need for a DBMS-Uses of DBMS- Advantages and Disadvantages of DBMS

Database and Database users- View of Data –Architecture-Data Models-Data Dictionary –Database Languages

UNIT II:RELATIONAL APPROACH 9 Hrs

Relational Model-Structure of a Relational Database-Relational Algebra- Tuple Relational Calculus-Domain Relational Calculus-SQL-Embedded SQL-Query Languages

UNIT III:RELATIONAL DATABASE DESIGN 9 Hrs

Relational Database Design-Integrity Constraint-Pitfalls and Design –Functional Dependency-Normalization-Entity Relationship Model-Storage and File Structure-Indexing and Hashing-Basic Concepts-B+ tree Index File-B+ tree Index File-Static Hashing –Dynamic Hashing.

UNIT IV:OBJECT ORIENTED RELATIONAL DATABASE TECHNOLOGY 9 Hrs

Concepts for Object Oriented Data Model – Object Oriented Database Languages -Persistent Programming Language-Object Relational Databases. System Implementation techniques: Query Processing-Transaction Processing-Concurrency Control-Recovery System.

UNIT V :ENHANCED DATA MODELS FOR ADVANCED APPLICATIONS 9 Hrs

Database System Architecture- Client Server System-Centralized Systems-Parallel Systems-Distributed System-DistributedDatabases

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Abraham Silberschatz, Henry F.korth, S.Sudharshan, "*Database system concepts*" 4th Edition, Tata McGraw-Hill, 1997
2. RamezElmasri, ShamkantB.Navathe, "*Fundamentals of database systems*", 4th edition Pearson Education-2002

References:

1. C.J.Date, "*An Introduction to Database systems*",7th Edition, Pearson Education,1997.
2. Raghu Ramakrishnan, "*Database Management Systems*", WCB McGraw Hill, 1998.
3. BipinC.Desai, "*An Introduction to Database Systems*", Galgotia publications, 2001