

REGULATIONS 2015
B.E. ELECTRONICS AND TELECOMMUNICATION ENGINEERING
CURRICULUM - SYLLABUS
SEMESTER I

Code No.	Course Title	L	T	P	C
Theory					
BEN101	English – I	3	0	0	3
BMA101	Mathematics -I	3	0	0	3
BPH101	Engineering Physics -I	3	0	0	3
BCH101	Engineering Chemistry - I	3	0	0	3
BCS101	Fundamentals of Computing & Programming	3	0	0	3
BME102	Engineering Graphics - C	3	0	0	3
BFI101	Foreign/Indian Language	3	0	0	3
BEE101	Basic Electrical & Electronics Engineering	2	0	0	2
Practical					
BCS1L1	Computer Practice Lab	0	0	3	1
BEE1L1	Basic Electrical and Electronics Engg.. Practices Lab	0	0	3	1

Total Credits: 25

SEMESTER II

Code No.	Course Title	L	T	P	C
Theory					
BEN201	English-II	3	0	0	3
BMA201	Engineering Mathematics -II	3	0	0	3
BPH201	Engineering Physics -II	3	0	0	3
BCH201	Engineering Chemistry - II	3	0	0	3
BBA201	Personality Development	2	0	0	2
BBT202	Biology for Engineers	2	0	0	2
BCS202	Internet programming	2	0	0	2
BCE201	Basic Civil Engineering	2	0	0	2
BME201	Basic Mechanical Engineering	2	0	0	2
Practical					
BCS2L1	Internet Practices lab	0	0	3	1
BCM2L1	Basic Civil & Mechanical Engg. Practices Lab	0	0	3	1
BPC2L1	Physics and Chemistry Lab	0	0	3	1

	NCC/NSS/Yoga (optional) to be conducted during weekends)				
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Total Credits: 25

SEMESTER III

Code No.	Course Title	L	T	P	C
Theory					
BMA301	Mathematics -III	3	1	0	4
BEC 301	Signals and Systems	3	0	0	3
BET301	Principles of Analog and Digital System	3	1	0	4
BET302	Electronic Devices	3	1	0	4
BEC306	Environmental Studies	3	1	0	4
BEE305	Electrical Engineering	3	0	0	3
Practical					
BET3L1	Analog and Digital System laboratory	0	0	3	1
BET3L3	Electrical Engineering Lab Laboratory	0	0	3	1
BET3S1	Technical Seminar - I	0	0	3	1
BET3P1	Mini Project - I	0	0	3	1

Total Credits: 26

SEMESTER IV

Code No.	Course Title	L	T	P	C
Theory					
BMA402	Numerical Methods	3	1	0	4
BET403	Electromagnetic Fields and Waves	3	1	0	4
BEC405	Linear Integrated Circuits	3	1	0	4
BET407	Digital Signal Processing	3	1	0	4
BET408	Electronic Circuits	3	1	0	4
BEI406	Electronic Instrumentation	3	0	0	3
Practical					

BCS4L3	Computer Programming Lab Laboratory	0	0	3	1
BET4L1	Electronic Circuits Laboratory	0	0	3	1
BET4L3	Digital Signal Processing laboratory	0	0	4	2

Total Credits: 27

SEMESTER V

Code No.	Course Title	L	T	P	C
Theory					
BCS502	Computer Architecture	3	0	0	3
BEC502	Microprocessor and Microcontroller Applications	3	1	0	4
BEC503	Transmission lines, Networks and Waveguides	3	1	0	4
BET502	Analog and Digital Communication	3	0	0	3
BEI501	Control Systems	3	1	0	4
BET5E1	Elective I	3	1	0	4
Practical					
BET5L1	Microprocessor Lab	0	0	4	2
BET5L3	Communication Engineering Laboratory	0	0	4	2
BET5L2	Microcontrollers and Interfacing Laboratory	0	0	3	1
BET5S1	Technical Seminar - II	0	0	3	1

Total Credits: 28

SEMESTER VI

Code No.	Course Title	L	T	P	C
Theory					
BMA604	Random Processes	3	1	0	4
BEC603	Antennas and Wave Propagation	3	0	0	3
BEC601	Computer Communication and networks	3	0	0	3

BET603	Telecommunication Switching Systems	3	0	0	3
BET601	Microwave Engineering	3	0	0	3
BET6E1	Elective II	3	0	0	3
Practical					
BEC6L1	Computer Communication & Networks Lab	0	0	4	2
BET6L1	RF and Microwave Engineering lab	0	0	4	2
BET6L2	Object Oriented Programming Lab	0	0	4	2

Total Credits: 25

SEMESTER VII

Code No.	Course Title	L	T	P	C
Theory					
BBA701	Principles of Management and Professional Ethics	3	1	0	4
BET701	VLSI Design	3	0	0	3
BET702	Cellular Mobile Communication	3	1	0	4
BET703	Telecommunication System Modelling	3	1	0	4
BET7E1	Elective III	3	0	0	3
BET7E2	Elective IV	3	0	0	3
Practical					
BET7L2	VLSI Design Laboratory	0	0	4	2
BET7L1	System Modelling and Simulation Laboratory	0	0	4	2
BEC7L1	Electronics Design Lab	0	0	4	2

Total Credits: 27

SEMESTER VIII

Code No.	Course Title	L	T	P	C
Theory					
BET8E1	Elective V	3	0	0	3
BET8E2	Elective VI	3	0	0	3
BET8E3	Elective VII	3	0	0	3

Practical					
BET8P1	Project Work	0	0	18	6

Total Credits: 15

Overall credits for the programme: 198

LIST OF ELECTIVES

Code No.	Course Title	L	T	P	C
BETE101	Total Quality Management	3	0	0	3
BETE102	Operations Research	3	0	0	3
BETE103	Engineering Economics and Financial Management	3	0	0	3
BETE104	Foundation Skills in Integrated Product Development (FSIPD)	3	0	0	3
BETE201	Bio medical instrumentation	3	0	0	3
BETE202	Opto Electronic Devices	3	0	0	3
BETE203	Advanced Digital Signal Processing	3	0	0	3
BETE204	Advanced Microprocessors and Microcontrollers	3	0	0	3
BETE205	Television and Video Engineering	3	0	0	3
BETE206	Operating Systems	3	0	0	3
BETE301	High Speed Networks	3	0	0	3
BETE302	Advanced Computer Architecture	3	0	0	3
BETE303	Automotive Electronics- Embedded Software Developer	3	0	0	3
BETE304	Virtual Instrumentation	3	0	0	3
BETE305	Real-Time Embedded Systems	3	0	0	3
BETE306	Internet and Java Programming	3	0	0	3
BETE401	Speech Processing	3	0	0	3
BETE402	Digital Image Processing	3	0	0	3
BETE403	Soft Computing	3	0	0	3

BETE404	Robotics and Automation	3	0	0	3
BETE405	ASIC Design	3	0	0	3
BETE406	Network Security and Cryptography	3	0	0	3
BETE407	Telecommunication Switching Networks	3	0	0	3
BETE501	Mobile Communication	3	0	0	3
BETE502	Satellite Communication	3	0	0	3
BETE503	Radar and Navigational Aids	3	0	0	3
BETE504	RF MEMS	3	0	0	3
BETE505	Nano Electronics	3	0	0	3
BETE506	Wireless Networks	3	0	0	3

BEN101

ENGLISH - I

L	T	P	C
3	0	0	3

OBJECTIVES:

- To make the students learn the basics of communication in order to talk fluently, confidently and vividly.
- Students will be able to use strategies before, during, and after reading to aid in the construction and enhancement of meaning
- Students will be able to respond in discussions and in writing, using personal, literal, interpretative, and evaluative stances, to works of fiction and/or non-fiction.
- Students will be able to identify and explain the function of essential short story elements in the writer's craft (i.e. character, setting, conflict, plot, climax, resolution, theme, tone, point of view).

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To make them master the techniques of professional communication so that they become employable after completing the course

CO2: Students will be able to engage in informal writing assignments (i.e. reader response, free writing, focused free writing, prediction, response journals, dialectical notebook entries, and other pieces of writing that they do not take through the entire writing process).

CO3: Students will be able to engage in formal writing assignments that require utilization of all stages of the writing process.

CO4: Students will be able to choose and use a relevant pre-writing strategy that will help them to prepare for the assignment.

CO5: Students will be able to write several rough drafts of a paper to revise clarity and depth of content or to edit style and mechanics.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	W				S			
CO2	M		M	M	S	S	M					
CO3	S	M		S	M				W			
CO4	S	M		M	M	M	S					
CO5	S	M		M	S							
CO6	S		M	M	S							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I 9 3

Parts of speech - Active and passive voices - Subject verb agreement. - Writing about School life, Hobbies, Family and friends – Word formation with prefixes and suffixes - Tenses - Concord - Summarizing - Note-making

UNIT II 9+3

Cause and effect relations – Punctuations –Differences between verbal and nonverbal communication -E - mail communication – Homophones - Etiquettes of E mail communication. Interpreting graphic representation - Flow chart and Bar chart.

UNIT III 9+3

Degrees of comparison – Positive, Comparative, Superlative - wh questions - SI units -Lab reports - Physics, chemistry, workshop and Survey report for introducing new product in the market.

UNIT IV 9+3

Writing project proposals - Presentation skills - Prefixes and suffixes - If conditions - Writing a

review- Preparing minutes of the meeting , Agenda , official circulars.

UNIT V

9+3

Accident reports (due to flood and fire) - Hints development - Imperatives - Marking the stress Connectives , prepositional relatives.

Total: 60 Periods

Text Book:

1. Department of humanities and social sciences division, Anna university, oxford university press, 2013.

Reference:

1. S.P.Danavel, English and Communication for Students of Science and engineering, Orient Blackswan, Chennai,2011.
2. Rizvi, M.Asharaf, Effective Technical Communication, New Delhi, Tata McGraw Hill Publishibg Company, 2007. MuraliKrishna and SunithaMoishra, Communication Skills for Engineers . Pearson, New Delhi, 2011..

BMA101

MATHEMATICS -I

L	T	P	C
3	0	0	3

OBJECTIVES:

- This course aims at providing the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- recognize that mathematics is an art as well as a powerful foundational tool of science with limitless applications.
- demonstrate an understanding of the theoretical concepts and axiomatic underpinnings of mathematics and an ability to construct proofs at the appropriate level.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Solve a set of algebraic equations representing steady state models formed in engineering problems

CO2: Fit smooth curves for the discrete data connected to each other or to use interpolation methods over these data tables

CO3: Find the trend information from discrete data set through numerical differentiation and summary information through numerical integration

CO4: Predict the system dynamic behaviour through solution of ODEs modeling the system

CO5: Solve PDE models representing spatial and temporal variations in physical systems through numerical methods.

CO6: Have the necessary proficiency of using MATLAB for obtaining the above solutions

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	W							
CO2	M		M	M	S				S			
CO3	S	M		S	M	S						
CO4	S	M		M	M		S					
CO5	S	M		M	S	M	S		M			
CO6	S		M	M	S							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT-1 Matrices

9+3

Characteristic equations- Eigen values and eigen vectors of the real matrix- Properties- Cayley-Hamilton theorem(Excluding proof)- Orthogonal transformation of a symmetric matrix to diagonal form- Quadratic form- Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT-II Three Dimensional Analytical Geometry

9+3

Equation of a Sphere- Plane section of a sphere- Tangent plane- Equation of cone- Right circular cone- Equation of a cylinder- Right circular cylinder.

UNIT-III Differential Calculus

9+3

Curvature in Cartesian coordinates- Centre and radius of curvature- Circle of curvature- Evolutes- Envelopes- Applications of Evolutes and Envelopes.

UNIT-IV Functions of Several Variables

9+3

Partial derivatives- Euler's theorem for homogeneous functions- Total derivatives- Differentiation of implicit functions- Jacobians- Taylor's expansion- Maxima and Minima- Method of Lagrangian multipliers.

UNIT-V Multiple Integrals

9+3

Double integration- Cartesian and Polar coordinates- Change of order of integration- Change of variables between Cartesian and Polar coordinates- Triple integration in Cartesian coordinates- Area as double integral- Volume as triple integral.

Total : 60 Periods

TEXT BOOK:

1. Ravish R.Singh and Mukkul Bhatt, “Engineering Mathematics-I” First Reprint, Tata McGraw Hill Pub Co.,New Delhi. 2011.
2. Grewal.B.S, “Higher Engineering Mathematics” , 40th Edition, Khanna Publications, Delhi. 2007.

REFERENCES:

1. Ramana.B.V. “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, 2007.
2. Glyn James, “Advanced Engineering Mathematics”, 7th Edition, Pearson Education, 2007.
- 3.

BPH 101

ENGINEERING PHYSICS -I

L	T	P	C
3	0	0	3

OBJECTIVES:

- This course aims at providing the necessary basic concepts of a few basic science technology and give procedures occurring in engineering and technology.
- Identify a problem and generate equivalent statements of a problem
- Apply fundamental statistical methods to analyze data

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To make a bridge between the physics in school and engineering courses.

CO2: To impart a sound knowledge on the basic concepts of modern sciences like engineering applications of ultra-sonics, lasers, fundamentals of crystal physics and utility of solar energy.

CO3: Draw sound conclusions from the results of data analysis.

CO4: Produce precise and clear expository written material about physics

CO5: Produce well-organized and clear oral presentations of physics material.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	W	S		S				

CO2	M		M	M	S							
CO3	S	M		S	M	S		W		S		
CO4	S	M		M	M		M	M				
CO5	S	M		M	S							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT-I Ultrasonics

9

Introduction – Production- Magnetostriction Effect- Magnetostriction Generator- Piezoelectric Effect- Piezoelectric generator- Detection of ultrasonic waves- Properties- Cavitation- Acoustic grating -Industrial applications- Drilling, Welding, Soldering, Cleaning and SONAR- Velocity measurement- - Non-Destructive Testing (NDT) – Pulse-Echo System through transmission and reflection modes- A, B And C Scan Display methods- Important medical applications- Sonogram--problem.

UNIT-II LASER

9

Introduction- Principle of spontaneous emission and stimulated emission- Einstein's A & B Coefficients-Derivation-Condition for producing a laser beam- Population inversion- Pumping- Resonance cavity- Types Of Lasers- ND-YAG- He-Ne- Co2 Lasers-Industrial applications- Heat treatment- Welding-Cutting-Medical applications-Laser surgery- Advantages & disadvantages-problem.

UNIT-III Quantum Physics

9

Drawbacks with classical physics- Blackbody radiation: Max Planck theory and concept of energy quantization, deduction of Wien's displacement law, Raleigh-Jeans law – Matter waves- de Broglie wave length-photoelectric effect – Schrödinger equation (time-independent, and time-dependent equations)- wave functions and energy spectrum- application to particle in box-problem

UNIT – IV Electromagnetic Theory

9

Electric charges-Coulomb's law of inverse squares- Electric field and its calculations-field lines-Gauss's law-applications of Gauss law. Magnetism - Magnetic field- Magnetic field lines-Magnetic flux- Motion of charged particles in magnetic field- Magnetic field of a moving charge.

Electromagnetic wave- speed of electromagnetic wave and its quantitative deduction-group velocity- energy in electromagnetic waves- electromagnetic waves in matters-problems.

Unit-V Crystal Physics

9

Lattice- Unit Cell- Bravais Lattice- Lattice Plane- Miller Indices- d-spacing in cubic lattices- Calculation of number of atoms per unit cell- Atomic radius- Coordination number- Packing Factor- SC, BCC, FCC, HCP Structures- Polymorphism and Allotropy- Crystal defects- point, line and surface defects- Burger's vector- problems.

Total: 45 Periods

Text Books

1. Sears.F.W., Zemansky.M.W., Young.H.D.; 'University Physics; Narosa Publishing House.
2. Avadhanulu. M.N.; Engineering Physics-Vol-1; S.Chand And Company Ltd, 2010.

Reference Books

1. Rajendran.V, And Marikani . A, 'Engineering Physics' Tata Mcgrow Hill Publications Ltd, 3rd Edition, New Delhi (2004).
2. Sears., Zemansky., Young.; 'College Physics; Addison Wesley Publishing Company.
3. Mukundan. A, Usha.S., Lakshmi.V; 'Engineering Physics' Scitech Publications (India) Pvt.Ltd., Chennai, 2006.
4. Resnick, R., and Halliday, D. and Walker, J.; Fundamental of Physics; John Wiley and Sons.
- 5.

BCH 101

ENGINEERING CHEMISTRY -I

L	T	P	C
3	0	0	3

OBJECTIVES:

- To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.
- To prepare graduates for employment as chemists, for graduate study in chemistry, or for acceptance to medical or dental school.
- To prepare graduates with the skills to critically assess and solve problems requiring the application of chemical principles.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To make the student to be conversant with the principles, water characterization and treatment for portable and industrial purposes.

CO2: To impart knowledge on the essential aspects of Principles of polymer chemistry and engineering applications of polymers

CO3: To impart knowledge on the essential aspects of Principles electrochemistry, electrochemical cells, emf and applications of emf measurements

CO4: To make the students understand the Principles of corrosion and corrosion control

CO5: To impart knowledge about the Conventional and non-conventional energy sources and energy storage devices

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	W							
CO2	M		M	M	S	S		W				
CO3	S	M		S	M		M		S			
CO4	S	M		M	M	S		S			M	
CO5	S	M		M	S		M				W	
CO6	S		M	M	S							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I Water Technology

9

Introduction-Characteristics : Hardness of water – types - temporary and permanent hardness - estimation by EDTA method Alkalinity – types of alkalinity - Phenolphthalein and Methyl orange alkalinity - determination –Domestic water treatment – disinfection methods (Chlorination, ozonation , UV treatment) Boiler feed water – requirements – disadvantages of using hard water in boilers Internal conditioning (Calgon Conditioning method) – External conditioning – Demineralization process – Desalination and Reverse osmosis.

UNIT II Polymers

9

Introduction-Polymers- definition – polymerization – degree of polymerisation - types of polymerisation – Addition polymerization and Condensation polymerization – Mechanism of Polymerisation - free radical polymerization mechanism only, Plastics: Classification –

thermoplastics and thermosetting plastics – difference between thermoplastics and thermosetting plastics - preparation, properties and uses of PVC, Teflon, nylon-6,6, PET, Rubber :Types – drawbacks of natural rubber -vulcanization of rubber - properties and uses of vulcanized rubber Synthetic rubbers – butyl rubber and SBR

UNIT III Electrochemistry

9

Introduction CELLS : Types of Cells : Electrochemical cells , Electrolytic cells – Reversible and Irreversible cells EMF – measurement of emf – Single electrode potential – Nernst equation Reference electrodes : Standard Hydrogen electrode -Calomel electrode Ion selective electrode :Glass electrode and measurement of pH using Glass electrode Electrochemical series – significance Titrations :Potentiometer titrations (redox - Fe^{2+} vs dichromate titrations) Conductometric titrations (acid-base – HCl vs, NaOH titrations)

UNIT IV Corrosion and Corrosion Control

9

Introduction: Chemical corrosion Definition - Chemical Corrosion - Electrochemical corrosion – different types – galvanic corrosion –differential aeration corrosion – mechanism of Chemical and Electrochemical corrosion factors influencing corrosion Corrosion control – sacrificial anode and impressed cathodic current methods – Protective coatings :Paints – constituents of the paint and their functions Metallic coatings – electroplating of Gold and electroless plating of Nickel.

UNIT V Non-Conventional Energy Sources and Storage Devices

9

Introduction : Nuclear fission and nuclear fusion reactions – differences between nuclear fission and nuclear fusion reactions – nuclear chain Reactions – nuclear energy critical mass - super critical mass - sub - critical mass Light water nuclear reactor for power generation (block diagram only) – breeder reactor Solar energy conversion – solar cells – wind energy Fuel cells – hydrogen – oxygen fuel cell Batteries :Primary and secondary Batteries – differences between Primary and secondary Batteries Secondary batteries:Lead–acid storage battery –working –uses Nickel–cadmium battery - working –uses Solid – state battery : Lithium battery

TOTAL: 45 PERIODS

TEXT BOOKS:

1. P.C.Jain and Monica Jain, “Engineering Chemistry” Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S. Dara “A text book of engineering chemistry” S.Chand & Co.Ltd., New Delhi (2006).
3. P. J. Lucia, M. Subhashini, “Engineering Chemistry, Volume 1”, Crystal Publications, Chennai, (2007).

REFERENCES:

1. B.K.Sharma “Engineering chemistry” Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. B. Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008)

PROGRAMMING

3	0	0	3
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OBJECTIVES:

- To impart a sound knowledge on the principles of computers involving the different application oriented topics required for all engineering branches.
- Graduates will demonstrate the ability to apply knowledge of mathematics to develop and analyze computing systems.
- Graduates will have a solid understanding of the theory and concepts underlying computer science.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To enable the student to learn the major components of a computer system.

CO2: To know the correct and efficient way of solving problem.

CO3: To learn to use office automation tools.

CO4: To learn and write program in “C”.

CO5: To impart knowledge about the Conventional and non-conventional energy sources and energy storage devices

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	W							
CO2	M		M	M	S	S			W			
CO3	S	M		S	M	M					S	
CO4	S	M		M	M	S		S	M			
CO5	S	M		M	S		M					

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I: INTRODUCTION TO COMPUTER

9

Introduction-Characteristics of computer-Evolution of Computers-Computer Generations

Classification of Computers-Basic Computer Organization-Number system. Computer Software: Types of Software—System software-Application software-Software Development Steps

UNIT II: PROBLEM SOLVING AND OFFICE AUTOMATION 9

Planning the Computer Program – Purpose – Algorithm – Flowcharts– Pseudo code Introduction to Office Packages: MS Word , Spread Sheet, Power Point, MS Access, Outlook.

UNIT III: INTRODUCTION TO C 9

Overview of C-Constants-Variables-Keywords-Data types-Operators and Expressions Managing Input and Output statements-Decision making-Branching and Looping statements.

UNIT IV: ARRAYS AND STRUCTURES 9

Overview of C-Constants, Variables and Data types-Operators and Expressions -Managing Input and Output operators-Decision making-Branching and Looping.

UNIT V: INTRODUCTION TO C++ 9

Overview of C++ - Applications of C++-Classes and objects-OOPS concepts -Constructor and Destructor- A simple C++ program –Friend classes and Friend Function.

Total: 45Periods

Text books:

1. Ashok, N.Kamthane, "Computer Programming", Pearson Education (2012).
2. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling V Kindersley (India Pvt Ltd), Pearson Education in South Asia, (2011).
3. Yashavant P. Kanetkar, "Let us C", 13th Edition, BPB Publications (2013).
4. Yashavant P. Kanetkar, "Let us C++" 10th Edition, BPB Publications (2013).

References:

1. Pradeep K.Sinha, Priti Sinha "Foundations of Computing", BPB Publications (2013).
2. Byron Gottfried, "Programming with C", 2nd edition, (Indian Adapted Edition), TMH publication.
3. Pradip Dey, Manas Ghosh, Fundamentals of Computing and Programming in 'C' First Edition , Oxford University Press (2009)
4. The C++ Programming Language , 4th Edition, Bjarne Stroustrup, Addison-Wesley Publishing Company (2013)

BME 102

ENGINEERING GRAPHICS - C

L	T	P	C
3	0	0	3

OBJECTIVES:

- To develop graphical skills in students for communication of concepts, design ideas of engineering products, and expose them to existing standards related to technical drawings.

- To impart a sound knowledge on the principles of computers involving the different application oriented topics required for all engineering branches.
- Graduates will demonstrate the ability to apply knowledge of mathematics to develop and analyze computing systems.
- Graduates will have a solid understanding of the theory and concepts underlying computer science.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To visualize and produce two dimensional graphic representation of three dimensional objects and buildings.

CO2: To comprehend and visualize 3D views of objects.

CO3: To understand and generate the different curves used in engineering applications.

CO4: To learn and write program in “C”.

CO5: To introduce the fundamental of CAD Graphics used in design.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	W			S				
CO2	M		M	M	S		S	S	M			
CO3	S	M		S	M		M		M			
CO4	S	M		M	M			W				
CO5	S	M		M	S							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT-I Basic Curves, Projection of points and Straight lines

9

Conics-construction of ellipse, parabola and hyperbola by eccentricity method - construction of involutes of square and circle-Drawing of tangent and normal to the above curves-Scales-Basic drawing conventions and standards-Orthographic projection principles- Principal planes-First angle projection- Projection of points. Projection of straight lines (only first angle projections)

inclined to both the principal planes- Determination of true lengths and true inclinations by rotating line method.

UNIT-II Projections of Planes and solids

9

Projection of planes (Polygonal and circular surfaces) inclined to both the principal planes. Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method

UNIT-III Orthographic Projections, Isometric projections & Free hand sketching

9

Orthographic projection of Simple parts from 3D diagram-Principles of isometric projection and isometric view-isometric scale- Isometric projections of simple solids and truncated solids- Prisms, pyramids, cylinders, cones.

UNIT-IV Projection of Sectioned solids and development of surfaces

9

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other-obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids- Prisms, pyramids cylinders and cones.

UNIT-V Perspective projection, building drawing and Computer aided drafting

9

Perspective projection of cubes and cylinders by visual ray method. Introduction- components of simple residential or office building-specifications-plan and elevation of different types of Residential buildings and office buildings. Introduction to drafting packages and basic commands used in AUTO CAD. Demonstration of drafting packages.

Total: 45 Periods

Text Books:

1. N.D.Bhatt and V.M.Panchal, "Engineering drawing", charotar publishing house, 50th edition, 2010.
2. K.V.Natarajan "A Text book of Engineering Graphics",Dhanalakshmi Publishers, Chennai, 2009.

References

1. K.R.Gopalakrishna, "Engineering drawing", (Vol-I & II combined)Subhas stores, Bangalore,2007.
2. K.Venugopal and V. PrabhuRaja, "Engineering Graphics",New age International Private limited,2008.
3. Luzzader, Warren.J., and Duff, John.M.,, "Fundamentals of Engineering Drawing with an introduction to Interactive computer graphics for design and production", Eastern economy edition,Prentice Hall of India Pvt Ltd,New Delhi,2005

3	0	0	3
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Course Objective:

- Learning a language is almost akin to a journey of discovery. It not only opens up a whole new dimension but also contributes significantly to the development of an individual’s intelligence.
- Language gives us access and insights into another culture. It is a fundamental truth that cultures define themselves through languages.
- Since language is a symbol of culture, the curriculum for all the languages reflects this spirit.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Introduce the basics of the language to beginners

CO2: To develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.

CO3: Synchronies I consists of 13 lessons with each lesson presenting a dialogue and giving the know-how, grammatical and lexical notions as well as activities required for communication.

CO4: In addition, Synchronies I includes documents which initiate the learners to another world, another culture and which acclimatize them to the authentic use of the French language through the exploitation of written and iconographic documents.

CO5: The Indian context has been used.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M		S				
CO2	S	M		S								
CO3	S		M		W	M		S				
CO4	S			S	S		M					
CO5	S		M									
CO6				M	S							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni

5.	Online Test		
6.	End Semester Exam		

UNIT – I: 9

At the airport: Savoir– faire: exchanging greetings, self introduction, introducing another, welcoming someone, identifying someone - Grammar: verbs ‘to be’, ‘to call oneself’, subject pronouns, interrogation

UNIT – II 9

At the University: Savoir-faire: enquiring after one’s welfare, taking leave, expressing appreciation -Grammar: definite & indefinite articles, gender of nouns, adjectives, present tense of regular ‘er’ verbs, ‘to have’, ‘to learn’, negation, irregular verbs

UNIT – III 9

At the café: Savoir –faire: speaking about one’s likes, giving information, expressing admiration, asking information about someone - Grammar: Interrogative adjectives, irregular verbs, possessive and interrogative adjectives

UNIT – IV 9

At the beach: Savoir faire: proposing an outing, accepting/ refusing the proposal - Grammar: singular & plural, indefinite pronoun, demonstrative adjectives, negation, irregular verbs

UNIT – V 9

A concert: Savoir –faire: inviting, accepting, expressing one’s inability to accept an invitation, complimenting, speaking on the phone

UNIT – VI 9

Grammar: Present tense of more irregular verbs, contracted articles, future tense, interrogative adverbs, At Nalli’s Savoir- faire: asking the price of an article, protesting against the price, Grammar: possessive adjectives, exclamative adjectives, imperative tense

Total: 45 hours

REFERENCES:

1. Course Material: Synchronie I – Méthode de Français
2. K. Madana gobalane -Samita Publications, Chennai, 2007

BEE101

**BASIC ELECTRICAL &
ELECTRONICS ENGINEERING**

L	T	P	C
2	0	0	2

Course Objective:

- Develop the fundamental knowledge about the need for biasing and its various methods.
- Analyze the small signal equivalents circuits and high frequency analysis of BJT and FET.
- Examine the characteristics of multistage amplifiers.
- Classify and compare the types of large signal amplifier.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Discuss the concepts of various biasing methods for BJT.

CO2: Analyze the BJT configurations and BJT amplifiers using small signal model.

CO3: Analyze the FET Biasing concepts, FET and MOSFET amplifier small signal analysis

CO4: Analyze the frequency response of BJT, FET and multistage amplifiers

CO5: Explain the classification and performance of large signal amplifiers.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W		S		S						
CO2	W					S	M		S			
CO3	S	M	M		S			M				
CO4	M	W			M			S				
CO5	M	W	W				S		S			

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT – I D.C. AND A.C CIRCUITS

6

Ohm’s law – Kirchoff’s Laws, V – I Relationship of Resistor (R) Inductor (L) and capacitor (C). Series parallel combination of R, L&C – Current and voltage source transformation – mesh current & node voltage method –superposition theorem – Thevenin’s and Norton’s Theorem - Problems.

UNIT – II ELECTRICAL MACHINES **6**

Construction, principle of operation, Basic Equations and applications - D.C.Generators and D.C.Motors. -Single phase Induction Motor - Single Phase Transformer.

UNIT – III BASIC MEASUREMENT SYSTEMS **6**

Introduction to Measurement Systems, Construction and Operating principles of PMMC,

Moving Iron, Dynamometer Wattmeter, power measurement by three-watt meter and two watt method – and Energy meter.

UNIT IV – SEMICONDUCTOR DEVICES **6**

Basic Concepts of semiconductor devices – PN Junction Diode Characteristics and its Application – HWR, FWR – Zener Diode – BJT (CB, CE, CC) configuration & its characteristics.

UNIT V – DIGITAL ELECTRONICS **6**

Number system – Logic Gates – Boolean Algebra – De-Morgan’s Theorem – Half Adder & Full Adder – Flip Flops.

Total No. of Periods: 30

TEXT BOOKS:

1. N.Mittle “Basic Electrical Engineering”. Tata McGraw Hill Edition, New Delhi, 1990.
2. A.K. Sawhney, ‘A Course in Electrical & Electronic Measurements & Instrumentation’, Dhanpat Rai and Co, 2004.
6. Jacob Millman and Christos C-Halkias, “Electronic Devices and Circuits”, Tata McGraw Hill
- 7.

BCS1L1 COMPUTER PRACTICES LABORATORY

L	T	P	C
0	0	3	1

OBJECTIVES:

- To develop graphical skills in students for communication of concepts, design ideas of engineering products, and expose them to existing standards related to technical drawings.
- To impart a sound knowledge on the principles of computers involving the different application oriented topics required for all engineering branches.
- Graduates will demonstrate the ability to apply knowledge of mathematics to develop and analyze computing systems.
- Graduates will have a solid understanding of the theory and concepts underlying computer science.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To visualize and produce two dimensional graphic representation of three dimensional objects and buildings.

CO2: To comprehend and visualize 3D views of objects.

CO3: To understand and generate the different curves used in engineering applications.

CO4: To learn and write program in “C”.

CO5: To introduce the fundamental of CAD Graphics used in design.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	W	W					M	M		
CO2	S	M	W	W					M	M		
CO3		M							M	M		
CO4	M			W					M	M		
CO5					S				M	M		

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS:

A) Word Processing 11

Document creation, Text manipulation with Scientific Notations.

Table creation, Table formatting and Conversion.

.Mail merge and Letter Preparation. Drawing-Flow Chart

B) Spread Sheet 12

Chart – Line, XY, Bar and Pie.

Formula – Formula Editor.

Spread Sheet-Inclusion of Object , Picture and Graphics, Protecting the document and sheet.

Sorting and Import / Export features.

C) Simple C Programming * 11

Data types, Expression Evaluation, Condition Statements.

Arrays

D) Simple C++ Programming 11

13. Classes and Objects

14. Constructor and Destructor

*For Programming exercises Flow chart and Pseudo code are essential

Total: 45 Periods

**BASIC ELECTRICAL AND ELECTRONICS
ENGG. PRACTICES
LABORATORY**

BEEL1

L	T	P	C
0	0	3	1

Course Objective:

- To impart basic knowledge on electrical machines, principles and its operation.
- Be a practicing engineer in fields such as design, research, testing and manufacturing
- Engage in lifelong learning to maintain and enhance professional skills

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Outline the basics of electrical machines and analyze the characteristics of DC machines.

CO2: Understand and implement speed control techniques for practical applications.

CO3: Describe the working of transformer and assess its regulation and efficiency on load and no-load.

CO4: Know the working concept of different types of induction motor and analyze the operating behavior of induction motor using its performance indices.

CO5: Explain the basics of synchronous machines and interpret performance characteristics.

CO6: Relate how different special electrical machines are functioning and have knowledge to choose particular machines for their applications.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			M					M	M		
CO2	M		W						M	M		
CO3	M		W						M	M		
CO4	M		M						M	M		

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni

5.	End Semester Exam		
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LIST OF EXPERIMENTS

I - List of Experiments for Electrical Engineering Lab

1. Fluorescent lamp wiring
2. Stair case wiring
3. Measurement of electrical quantities-voltage current, power & power factor circuit
4. Residential house wiring using fuse, switch, indicator, lamp and energy meter
5. Measurement of energy using single phase energy meter
6. Measurement of resistance to earth of electrical equipment

I - List of Experiments for Electronics Engineering Lab

1. Study of electronic components and equipments.
 - A. Resistor colour coding using digital multi-meter.
 - B. Assembling electronic components on bread board.
2. Measurement of ac signal parameters using cathode ray oscilloscope and function generator.
3. Soldering and desoldering practice.
4. Verification of logic gates (OR, AND, NOR, NOT, NAND, EX-OR).
5. Implementation of half adder circuit using logic gates.

SEMESTER - II

BEN201

ENGLISH - II

L	T	P	C
3	0	0	3

OBJECTIVES:

- To make the students learn the basics of communication in order to talk fluently, confidently and vividly.
- Students will be able to use strategies before, during, and after reading to aid in the construction and enhancement of meaning
- Students will be able to respond in discussions and in writing, using personal, literal, interpretative, and evaluative stances, to works of fiction and/or non-fiction.
- Students will be able to identify and explain the function of essential short story elements in the writer's craft (i.e. character, setting, conflict, plot, climax, resolution, theme, tone, point of view).

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To make them master the techniques of professional communication so that they become employable after completing the course

CO2: Students will be able to engage in informal writing assignments (i.e. reader response, free writing, focused free writing, prediction, response journals, dialectical notebook entries, and other pieces of writing that they do not take through the entire writing process).

CO3: Students will be able to engage in formal writing assignments that require utilization of all stages of the writing process.

CO4: Students will be able to choose and use a relevant pre-writing strategy that will help them to prepare for the assignment.

CO5: Students will be able to write several rough drafts of a paper to revise clarity and depth of content or to edit style and mechanics.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	W							
CO2	M		M	M	S							
CO3	S	M		S	M							
CO4	S	M		M	M							
CO5	S	M		M	S							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I Orientation

9 + 3

Numerical adjectives - Meanings in context - Same words used as different parts of speech - Paragraph writing - Non- verbal communication - Regular and Irregular verbs.

UNIT II Oral Skill

9 + 3

Listening to audio cassettes - C.Ds , News bulletin - Special Lectures, Discourse - Note taking - Sentence patterns - SV, SVO, SVC, SVOC, SVOCA - Giving Instructions - Reading Comprehension and answering questions. Inferring meaning.

UNIT III Thinking Skill

9 + 3

Self- introduction - Describing things - Group Discussion – Debate - Role play – Telephone etiquette – Recommendations and suggestions – Sequencing jumbled sentences to make a paragraph - advertisement and notices, designing or drafting posters, writing formal and informal invitations and replies.

UNIT IV Writing Skill

9 + 3

Definitions - Compound nouns - Abbreviations and acronyms - business or official letters(for making enquiries, registering complaints, asking for and giving information, placing orders and sending replies): (b) letters to the editor(giving suggestions on an issue) .

UNIT V Formal Information

9 + 3

Editing – Prepositions - Articles - Permission letter for undergoing practical training , Essay writing - Application for a job , letter to the principal authorities regarding admissions, other issues, requirement or suitability of course etc.

Total: 60 periods

TEXT BOOK:

1. Meenakshi Raman, SangeethaSharma , Technical English for Communication: Principle and Practice, OUP, 2009.

REFERENCE BOOKS:

1. Sumanth , English for engineers, Vijay Nicole , Imprints pvt ltd.2013.
2. Meenakshi Raman and SangeethaSharma , Technical Communication Principles and Practice, Oxford University Press, 2009.
3. Sangeetha Sharma, Binodmishra , Communication skills for engineers and scientists , PHI Learning Pvt Ltd, NewDelhi, 2010.
- 4.

BMA201

**ENGINEERING
MATHEMATICS -II**

L	T	P	C
3	0	0	3

OBJECTIVES:

- This course aims at providing the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- recognize that mathematics is an art as well as a powerful foundational tool of science with limitless applications.
- demonstrate an understanding of the theoretical concepts and axiomatic underpinnings of mathematics and an ability to construct proofs at the appropriate level.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Solve a set of algebraic equations representing steady state models formed in engineering problems

CO2: Fit smooth curves for the discrete data connected to each other or to use interpolation methods over these data tables

CO3: Find the trend information from discrete data set through numerical differentiation and summary information through numerical integration

CO4: Predict the system dynamic behaviour through solution of ODEs modeling the system

CO5: Solve PDE models representing spatial and temporal variations in physical systems through numerical methods.

CO6: Have the necessary proficiency of using MATLAB for obtaining the above solutions

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	W							
CO2	M		M	M	S							
CO3	S	M		S	M							
CO4	S	M		M	M							
CO5	S	M		M	S							
CO6	S		M	M	S							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I Ordinary Differential Equation

9+3

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Cauchy’s and Legendre’s linear equations - simultaneous first order linear equations with constant coefficients.

UNIT II Vector Calculus

9+3

Gradient, divergence and curl – Directional derivatives – Irrotational and solenoidal vector fields – vector integration– Green’s theorem in a plane , Gauss divergence theorem and Stoke’s theorem (without proofs) – simple applications involving cubes and rectangular parallelepipeds.

UNIT III Analytic Functions 9+3

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy-Riemann equation and sufficient conditions (without proofs) – Harmonic and orthogonal properties of analytic functions – Harmonic conjugate – construction of analytic functions – conformal mapping : $W=Z+C, CZ, 1/Z$ and bilinear transformation.

UNIT IV Complex Integration 9+3

Complex integration – Statement and application of Cauchy’s integral theorem and Cauchy’s integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem –Application of Residue theorem to evaluate real integrals – Unit circle and semi-circular contour (excluding poles on boundaries).

UNIT V Statistics 9+3

Mean, Median, Mode – Moments – Skewness and Kurtosis – Correlation – Rank Correlation – Regression –Chi square test for contingency tables.

Total : 60 Periods

TEXT BOOK :

1. R.M.Kannan and B.Vijayakumar “ Engineering Mathematics – II “ 2nd Edition , SRB Publication , Chennai 2007.
2. Bali.N.P and Manish Goyal , “ Engineering Mathematics “ , 3rd Edition , Laxmi Publications (p) Ltd, 2008 .
3. Grewal .B/S “ Higher Engineering Mathematics” , 40th Editon , Khanna Publications , Delhi , 2007 .

REFERENCES :

1. Ramana.B.V , “ Higher Engineering Mathematics “ , Tata McGraw Hill Publishing Company , New Delhi, 2007.
2. Gupta SC, and VK.Kapoor, “Fundamentals Mathematical Statistics”, 11th edition, Sultan Chand Sons, , New Delhi, 2014.

BPH 201

ENGINEERING PHYSICS -II

L	T	P	C
3	0	0	3

OBJECTIVES:

- This course aims at providing the necessary basic concepts of a few basic science

technology and give procedures occurring in engineering and technology.

- Identify a problem and generate equivalent statements of a problem
- Apply fundamental statistical methods to analyze data

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To make a bridge between the physics in school and engineering courses.

CO2: To impart a sound knowledge on the basic concepts of modern sciences like engineering applications of ultra-sonics, lasers, fundamentals of crystal physics and utility of solar energy.

CO3: Draw sound conclusions from the results of data analysis.

CO4: Produce precise and clear expository written material about physics

CO5: Produce well-organized and clear oral presentations of physics material.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	W							
CO2	M		M	M	S							
CO3	S	M		S	M							
CO4	S	M		M	M							
CO5	S	M		M	S							
CO6	S		M	M	S							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT – I Conducting Materials

Classical Free Electron Theory of Metals- Drawback of Classical Theory – Wiedemann Franz Law- Density of States- Fermi-Dirac Statistics- Calculation of Fermi Energy and Its Importance

- High Resistivity Alloys – Super Conductors – Properties and Applications – Magnetic Levitation, SQUID, Cryotron.

UNIT – II Semiconducting Materials

9

Elemental and Compound Semiconductors and Their Properties- Carrier Concentrations (Electrons and Holes) In Intrinsic Semiconductors - Carrier Concentrations in N- Type and P-Type Semiconductors –Variation of Fermi Level and Carrier Concentration With Temperature - Variation of Conductivity With Temperature – Band Gap Determination – Hall Effect – Experimental Arrangement - Application.

UNIT-III Magnetic and Dielectric Materials

9

Different Type of Magnetic Material And Their Properties – Hard And Soft Magnetic Material – Domain Theory Of Ferromagnetism – Hysteresis – Energy Product of Magnetic Materials – Ferrites and Their Applications – Various Polarization Mechanisms In Dielectric – Frequency and Temperature Dependence – Internal Field and Detection of Clausius – Mosotti Equation – Dielectric Loss- Dielectric Breakdown.

UNIT- IV New Engineering Material

9

Shape memory Alloys- Types- General Characteristics- Applications – Metallic Glasses- Properties- Applications –transformer as a Core Material – Nano Phase Materials – Properties – Production – Ball Milling Technique – Sol- Gel Method – Chemical Vapour Deposition - Applications.

UNIT-V Optical Materials and Optical Fibers

9

Light Interaction With Solids- Classification of Optical Material – Optical Properties of Metals, Insulator And Semiconductors – Traps – Colour Centers – Luminescence – phosphorescence – LED – LCD – Construction and Working – Advantages and Disadvantages – Applications. Principle and Propagation of Light In Optical Fibers - Numerical Aperture And Acceptance Angle- Types Optical Fibers (Material, Refractive Index, Mode based) - Double Crucible Technique of Fiber Drawing.

Total: 45 Periods

TEXT BOOKS

1. “Science of engineering materials”, by Dr. A.Mukunthan and S.Usha – SciTech publications (india) Pvt Ltd; chennai, (2007).
2. Charles Kittel ‘introduction to solid state physics’, John Wiley & Sons, 7th edition, Singapore

REFERENCEBOOKS

1. Material science by R. Suresh, V. Jayakumar – Lakshmi Publications; Arapakkam (2006).
2. Material science by Dr. P. K. Palanisamy – Sciotech Publications (India) Pvt Ltd, Chennai (2006).

3. Rajendran V and Marikani a, 'material science' tata mcgraw hill publications Ltd, 3rd edition , new delhi (2004).
4. M.Arumugam, 'material science', anuradha publications, kumbakonam (2006).

BCH 201

ENGINEERING CHEMISTRY -II

L	T	P	C
3	0	0	3

OBJECTIVES:

- To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.
- To prepare graduates for employment as chemists, for graduate study in chemistry, or for acceptance to medical or dental school.
- To prepare graduates with the skills to critically assess and solve problems requiring the application of chemical principles.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To make the student to be conversant with the principles, water characterization and treatment

for portable and industrial purposes.

CO2: To impart knowledge on the essential aspects of Principles of polymer chemistry and engineering applications of polymers

CO3: To impart knowledge on the essential aspects of Principles electrochemistry, electrochemical cells, emf and applications of emf measurements

CO4: To make the students understand the Principles of corrosion and corrosion control

CO5: To impart knowledge about the Conventional and non-conventional energy sources and energy storage devices

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	W							
CO2	M		M	M	S							
CO3	S	M		S	M							
CO4	S	M		M	M							
CO5	S	M		M	S							
CO6	S		M	M	S							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I - Surface Chemistry

9

Introduction : Adsorption , absorption , desorption , adsorbent , adsorbate and sorption – (definition only) Differences between adsorption and absorption Adsorption of gases on solids – factors affecting adsorption of gases on solids – Adsorption isotherms – Freundlich adsorption isotherm and Langmuir adsorption isotherm Role of adsorbents in catalysis, Ion-exchange adsorption and pollution abatement.

UNIT II - Phase Rule and Alloys

9

Introduction :Statement of Phase Rule and explanation of terms involved – one component system – water system – Construction of phase diagram by thermal analysis - Condensed phase rule [Definition only] Two Component System : Simple eutectic systems (lead-silver system only) – eutectic temperature – eutectic composition – Pattinsons Process of desilverisation of Lead Alloys : Importance, ferrous alloys – nichrome and stainless steel – 18/8 stainless steel -heat treatment of steel – annealing –hardening – tempering - normalizing – carburizing - nitriding . Non- ferrous alloys: Brass and Bronze

UNIT III - Analytical Techniques

9

Introduction: Type of Spectroscopy - Atomic spectroscopy – molecular spectroscopy - Explanation IR spectroscopy – principles – instrumentation (block diagram only) – applications - finger print region UV- visible spectroscopy — principle – instrumentation (block diagram only) – Beer-Lambert's law- – estimation of iron by colorimetry – Atomic absorption spectroscopy- principle - instrumentation (block diagram only) - estimation of Nickel by Atomic absorption spectroscopy Flame photometry– principles – instrumentation (block diagram only) - estimation of sodium ion by Flame photometry

UNIT IV - Fuels

9

Introduction : Calorific value – types of Calorific value - gross calorific value – net calorific value Analysis of Coal -- Proximate and ultimate analysis – hydrogenation of coal - Metallurgical coke – manufacture by Otto- Hoffmann method Petroleum processing and fractions – cracking – catalytic cracking – types – fixed bed catalytic cracking method- Octane number and Cetane number (definition only) Synthetic petrol – Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG (definition and composition only) Flue gas analysis – importance - Orsat apparatus

UNIT V **Engineering Materials**

9

Introduction : Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) Manufacture of Refractories :alumina bricks and Magnesite bricks, Abrasives – natural and synthetic abrasives Natural type : Siliceous - quartz ; Non –siliceous – diamond Synthetic Abrasives : silicon carbide and boron carbide. Lubricants : Liquid lubricants - Properties – viscosity index, flash and fire points, cloud and pour points, oiliness) Solid lubricants – graphite and molybdenum sulphide

TOTAL: 45 PERIODS

TEXT BOOKS:

1. P.C.Jain and Monica Jain, “Engineering Chemistry” Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S.Dara “A text book of Engineering Chemistry” S.Chand & Co.Ltd., New Delhi (2006).
3. P. J. Lucia, M. Subhashini, “Engineering Chemistry, Volume 1”, Crystal Publications, Chennai, (2007).

REFERENCES:

1. B.Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
2. B.K.Sharma “Engineering Chemistry” Krishna Prakasan Media (P) Ltd., Meerut (2001).

BBA 201

PERSONALITY DEVELOPMENT

L	T	P	C
2	0	0	2

OBJECTIVES:

- To provide a basic understanding of personality development and their applications from the perspective of engineers
- To understand the fundamentals of living things, their classification
- The students should be able to act with confidence, be clear about their own personality, character and future goals.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To make students understand the concept and components of personality and thereby to apply the acquired knowledge to themselves and mould their personality.

CO2: To impart training for positive thinking, this will keep the students in a good stead to face the challenges.

CO3: To bring out creativity and other latent talents with proper goal setting so that self-esteem gets enhanced.

CO4: To develop an individual style and sharpen the skills in the area of leadership, decision making, time management and conflict management.

CO5: To sharpen the employability skills of the professional undergraduate students and aid them in landing in the desired job.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	W							
CO2	M		M	M	S							
CO3	S	M		S	M							
CO4	S	M		M	M							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I Introduction to Personality Development

9

The concept personality - Dimensions of personality – Theories of Freud & Erickson- Significance of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analyses.

UNIT II Attitude & Motivation

9

Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude - Advantages – Negative attitude - Disadvantages - Ways to develop positive attitude - Difference between personalities having positive and negative attitude. Concept of motivation - Significance - Internal and external motives - Importance of self-motivation- Factors leading to demotivation

Unit III Self-esteem

9

Term self-esteem - Symptoms - Advantages - Do's and Don'ts to develop positive self-esteem – Low self- esteem - Symptoms - Personality having low self esteem - Positive and negative self-esteem. Interpersonal Relationships – Defining the difference between aggressive, submissive and assertive behaviours - Lateral thinking.

Unit IV Other Aspects of Personality Development 9

Body language - Problem-solving - Conflict and Stress Management - Decision-making skills - Leadership and qualities of a successful leader - Character-building -Team-work - Time management -Work ethics –Good manners and etiquette.

Unit V Employability Quotient 9

Resume building- The art of participating in Group Discussion – Acing the Personal (HR & Technical)

Interview -Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions.

Total: 45 Periods

Text Books:

1. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata Mc Graw Hill.
2. Stephen P. Robbins and Timothy A. Judge(2014), *Organizational Behavior 16 th Edition*: Prentice Hall.

Reference Books:

1. Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi.Tata McGraw-Hill 1988.
2. Heller, Robert.Effective leadership. Essential Manager series. Dk Publishing, 2002
3. Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003
4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001
5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).
6. Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005.
7. Smith, B . Body Language. Delhi: Rohan Book Company. 2004
- 8.

BBT 202

BIOLOGY FOR ENGINEERS

L	T	P	C
2	0	0	2

OBJECTIVES:

- To understand the fundamentals of living things, their classification
- To provide a basic understanding of biological mechanisms and their applications from the perspective of engineers

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To understand the fundamentals of living things, their classification, cell structure and biochemical constituents

CO2: To apply the concept of plant, animal and microbial systems and growth in real life situations

CO3: To comprehend genetics and the immune system

CO4: To know the cause, symptoms, diagnosis and treatment of common diseases

CO5: To give a basic knowledge of the applications of biological systems in relevant industries

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	W							
CO2	M		M	M	S							
CO3	S	M		S	M							
CO4	S	M		M	M							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT-I Introduction to Life

7

Characteristics of living organisms-Basic classification-cell theory-structure of prokaryotic and eukaryotic cell-Introduction to biomolecules: definition-general classification and important functions of carbohydrates-lipids-proteins-nucleic acids vitamins and enzymes-genes and chromosome

UNIT-II Biodiversity

6

Plant System: basic concepts of plant growth-nutrition-photosynthesis and nitrogen fixation-Animal System: elementary study of digestive-respiratory-circulatory-excretory systems and their functions- Microbial System: history-types of microbes-economic importance and control of microbes.

UNIT-III Genetics and Immune System

5

Evolution: theories of evolution-Mendel's laws of inheritance-variation and speciation- cell division-mitosis and meiosis-evidence of nucleic acids as a genetic material-central dogma- immunity-antigens-antibody-immune response

UNIT-IV Human Diseases **4**

Definition- causes, symptoms, diagnosis, treatment and prevention of diabetes, cancer, hypertension, influenza, AIDS and Hepatitis

UNIT-V Biology and its Industrial Application **8**

Transgenic plants and animals-stem cell and tissue engineering-bioreactors-bio pharming-recombinant vaccines-cloning-drug discovery-biological neural networks-bioremediation-bio fertilizer-bio control- biofilters-biosensors-biopolymers-bioenergy-biomaterials-biochips-basic biomedical instrumentation

Total: 45 Periods

Text Books:

1. A Text book of Biotechnology, R.C.Dubey, S. Chand Higher Academic Publications, 2013
2. Diseases of the Human Body, Carol D. Tamparo and Marcia A. Lewis, F.A. Davis Company, 2011
3. Biomedical instrumentation, Technology and applications, R. Khandpur, McGraw Hill Professional, 2004

Reference Books

1. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
2. Cell Biology and Genetics (Biology: The unity and diversity of life Volume I), Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, Cengage Learning, 2008
3. Biotechnology Expanding horizon, B.D. Singh, Kalyani Publishers, 2012

BCS 202

INTERNET PROGRAMMING

L	T	P	C
2	0	0	2

OBJECTIVES:

- To impart a sound knowledge on the principles of computers involving the different application oriented topics required for all engineering branches.
- Graduates will demonstrate the ability to apply knowledge of mathematics to develop and analyze computing systems.
- Graduates will have a solid understanding of the theory and concepts underlying computer science.

Course Outcomes:**After successful completion of this course, the students should be able to****CO1:** To enable the student to learn the major components of a computer system.**CO2:** To know the correct and efficient way of solving problem.**CO3:** To learn to use office automation tools.**CO4:** To learn and write program in “C”.**CO5:** To impart knowledge about the Conventional and non-conventional energy sources and energy storage devices

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	W							
CO2	M		M	M	S							
CO3	S	M		S	M							
CO4	S	M		M	M							
CO5	S	M		M	S							
CO6	S		M	M	S							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Unit – I Basic Internet Concepts

6

Internet principles-IP addressing-Internet Service Provider (ISP)-URL-Basic web concepts-World Wide Web (WWW)-Intranet and Extranet-Internet Protocols: HTTP, TCP, UDP,FTP, Telnet-Domain Name System(DNS)-E mail-Next generation internet.

Unit-II Web Design Basics

6

Introduction to HTML – Structure of HTML Document – Tags-Headings – Links – Images – Lists – Tables – Forms – Frames - Style sheets and its types.

Unit-III Dynamic HTML

6

Introduction to Dynamic HTML-Object model and collections-Event model-Filters and transition-Data binding-Data control-Activex control.

Unit-IV Client and Server Side Programming

6

VB Script & Java Script: Introduction-Operators –Data type-Control structures-Looping Classes and Objects – Arrays-Functions-Events-Example programs.

Unit-V Internet Applications

6

Online database-functions of online database-Merits and Demerits-Internet Information Systems (IIS)-EDI applications in business and its types-Internet commerce-Types and Applications.

TOTAL: 30 Periods

Text Books:

1. Deitel, Deitel and Nieto, “ Internet and World Wide Web-How to program”, Pearson Education Publishers,5th edition, 2008.
2. Elliotte Rusty Harold , “Java Network Programming”, O’Reilly Publishers,2010
3. JavaScript: A Beginners Guide John Pollock 4th Edition, TMH Edition(2013)
4. VB Script Beginners Guide, JyotiB.Giramkar,Create Space Independent Publishing(2014)

References:

1. R.Krishnamoorthy&S.Prabhu, “ Internet and Java Programming”, New Age International Publishers, 2010.
2. ThomnoA.Powell, ”The Complete Reference HTML and XHTML”, fourth edition, Tata McGraw Hill, 2012
3. E Commerce KamleshK.Bajaj, DebjaniNag, TataMcGrawHill, Second edition,2010

BCE201

BASIC CIVIL ENGINEERING

L	T	P	C
2	0	0	2

Course Objective:

- To impart basic knowledge on electrical machines, principles and its operation.
- Fulfilling lives by pursuing professional licensure, advanced studies, or alternate career paths.
- Meaningful work by applying their strong Civil Engineering, business, leadership, and communication skills to meet the expectations of their employers.
- Responsible citizenship by serving the Civil Engineering profession and their community locally, nationally, and internationally.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: an ability to apply knowledge of mathematics, science, and engineering

CO2: an ability to design and conduct experiments, as well as to analyze and interpret data

CO3: an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

CO4: K an ability to function on multidisciplinary teams

CO5: an ability to identify, formulate, and solve engineering problems

CO6: an understanding of professional and ethical responsibility

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2	S	M										
CO3	S		M									
CO4	S											
CO5	S		M									
CO6												

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT-I Basic Curves, Projection of points and Straight lines

9

Conics-construction of ellipse, parabola and hyperbola by eccentricity method - construction of involutes of square and circle-Drawing of tangent and normal to the above curves-Scales-Basic drawing conventions and standards-Orthographic projection principles- Principal planes-First angle projection- Projection of points. Projection of straight lines (only first angle projections) inclined to both the principal planes- Determination of true lengths and true inclinations by rotating line method.

UNIT-II Projections of Planes and solids

9

Projection of planes (Polygonal and circular surfaces) inclined to both the principal planes. Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method

UNIT-III Orthographic Projections, Isometric projections & Free hand sketching 9

Orthographic projection of Simple parts from 3D diagram-Principles of isometric projection and isometric view-isometric scale- Isometric projections of simple solids and truncated solids- Prisms, pyramids, cylinders, cones.

UNIT-IV Projection of Sectioned solids and development of surfaces 9

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other-obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids- Prisms, pyramids cylinders and cones.

UNIT-V Perspective projection, building drawing and Computer aided drafting 9

Perspective projection of cubes and cylinders by visual ray method. Introduction- components of simple residential or office building-specifications-plan and elevation of different types of Residential buildings and office buildings. Introduction to drafting packages and basic commands used in AUTO CAD. Demonstration of drafting packages.

Total: 45 Periods

Text Books:

1. N.D.Bhatt and V.M.Panchal, “Engineering drawing”, charotar publishing house, 50th edition, 2010.
2. K.V.Natarajan “A Text book of Engineering Graphics”,Dhanalakshmi Publishers, Chennai, 2009.

References:

1. K.R.Gopalakrishna, “Engineering drawing”,(Vol-I & II combined)Subhas stores, Bangalore,2007.
2. K.Venugopal and V. Prabhuraja, “Engineering Graphics”,New age International Private limited,2008.
3. Luzzader, Warren.J., and Duff, John.M.,, “Fundamentals of Engineering Drawing with an introduction to Interactive computer graphics for design and production”, Eastern economy edition,Prentice Hall of India Pvt Ltd,New Delhi,2005

BME201

**BASIC MECHANICAL
ENGINEERING**

L	T	P	C
2	0	0	2

Course Objectives:

- The program educational objectives (PEOs) for the mechanical-engineering program are to educate graduates who will be ethical, productive, and contributing members of society.
- The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

- The ability to apply principles of engineering, basic science, and mathematics to design and realize physical systems, components, or processes

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: an ability to apply knowledge of mathematics, science, and engineering

CO2: an ability to design and conduct experiments, as well as to analyze and interpret data .

CO3: To provide basic Knowledge of basic manufacturing process.

CO4: an ability to function on multi-disciplinary teams

CO5: an ability to identify, formulate, and solve engineering problems

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M								
CO2		S	M									
CO3	M		W									
CO4	M											
CO5	S		M									

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT-I Energy Resources and Power Generation

6

Renewable and Non-renewable resources- solar, wind, geothermal, steam, nuclear and hydel power plants- Layout, major components and working. Importance of Energy storage, Environmental constraints of power generation using fossil fuels and nuclear energy.

UNIT-II IC Engines

6

Classification, Working principles of petrol and diesel engines- two stroke and four stroke cycles, functions of main components of I.C engine. Alternate fuels and emission control.

UNIT-III Refrigeration and Air-Conditioning System

6

Terminology of Refrigeration and Air-Conditioning, Principle of Vapour Compression & Absorption system- Layout of typical domestic refrigerator- window & Split type room air conditioner.

UNIT-IV Manufacturing Processes

6

Brief description of Mould making and casting process, Metal forming, Classification types of forging, forging operations, Brief description of extrusion, rolling, sheet forging, and drawing. Brief description of welding, brazing and soldering. Principal metal cutting processes and cutting tools, Brief description of Centre lathe and radial drilling machine.

UNIT-V Mechanical Design

6

Mechanical properties of material-Yield strength, ultimate strength, endurance limit etc., Stress-Strain curves of materials. Stresses induced in simple elements. Factor of safety - Design of Shafts and belts. Types of bearings and its applications. Introduction to CAD/CAM/CIM & Mechatronics.

Total: 30 Periods

TEXT BOOKS:

1. T.J.Prabhu et al , “Basic Mechanical Engineering“ , Scitech Publications(p) Ltd, 2000

REFERENCES :

1. NAGPAL, G.R, “Power plant Engineering”, Khanna Publishers, 2004.
2. RAO.P.N, “Manufacturing Technology”, Tata McGraw-Hill Education, 2000.
3. Kalpakjian, “Manufacturing Engineering and Technology”, Adisso Wesley publishers, 1995.
4. Ganesan. V, “Internal combustion engines”, Tata McGraw-Hill Education, 2000.
5. C.P.Arora, “Refrigeration and Air Conditioning”, Tata McGraw-Hill Education, 2001.
6. V.B.Bhandari, ”Design of Machine elements”, Tata McGraw-Hill Education, 2010

BCS2L1 INTERNET PRACTICES LABORATORY

L	T	P	C
0	0	3	1

OBJECTIVES:

- To impart a sound knowledge on the principles of computers involving the different application oriented topics required for all engineering branches.
- Graduates will demonstrate the ability to apply knowledge of mathematics to develop and analyze computing systems.
- Graduates will have a solid understanding of the theory and concepts underlying computer science.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To enable the student to learn the major components of a computer system.

CO2: To know the correct and efficient way of solving problem.

CO3: To learn to use office automation tools.

CO4: To learn and write program in “C”.

CO5: To impart knowledge about the Conventional and non-conventional energy sources and energy storage devices

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	W	W					M	M		
CO2	S	M	W	W					M	M		
CO3		M							M	M		
CO4	M			W					M	M		
CO5					S				M	M		

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS

1. HTML (Hypertext Mark-up Language):

Basics of HTML.

How to create HTML Document

Steps for creating a simple HTML Program.

- a) Favorite Personality b) Resume Preparation

2. Advanced HTML: Advanced Topics of HTML

- a) Time Table
- b) Table Creation

3. JavaScript:

Script Basics.

Incorporating JavaScript into Web page.

- a) Star Triangle

b) Temperature Converters

4. VBScript:

VBScript Basics.

Incorporating VBScript into HTML.

**BASIC CIVIL AND MECHANICAL ENGG.
PRACTICES
LABORATORY**

L	T	P	C
0	0	3	1

BCM2L1

Course Objectives:

- The program educational objectives (PEOs) for the mechanical-engineering program are to educate graduates who will be ethical, productive, and contributing members of society.
- The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- The ability to apply principles of engineering, basic science, and mathematics to design and realize physical systems, components, or processes

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: an ability to apply knowledge of mathematics, science, and engineering

CO2: an ability to design and conduct experiments, as well as to analyze and interpret data .

CO3: To provide basic Knowledge of basic manufacturing process.

CO4: an ability to function on multi-disciplinary teams

CO5: an ability to identify, formulate, and solve engineering problems

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			M					M	M		
CO2	M		W						M	M		
CO3	M		W						M	M		
CO4	M		M						M	M		
CO5	M		M	S					S	S		

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey

2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS

I. CIVIL ENGINEERING PRACTICE Buildings:

Study of plumbing and carpentry components of residential and industrial buildings.
Safety aspects.

Plumbing Works:

- Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- Study of pipe connections requirements for pumps and turbines.
- Preparation of plumbing line sketches for water supply and sewage works.
- Hands-on-exercise: Basic pipe connection of PVC pipes & G.I. Pipes – Mixed pipe material connection – Pipe connections with different joining components.
- Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Hand tools and Power tools:

- Study of the joints in roofs, doors, windows and furniture.
- Hands-on-exercise: Wood work, joints by sawing, planing and cutting.
- Preparation of half joints, Mortise and Tenon joints.

II MECHANICAL ENGINEERING PRACTICE

Basic Machining:

- Simple Turning and Taper turning
- Drilling Practice

Sheet Metal Work:

- Forming & Bending:
- Model making – Trays, funnels, etc.
- Different type of joints.
- Preparation of air-conditioning ducts.

Machine assembly practice:

- Assembling, dismantling and Study of centrifugal pump
- Assembling, dismantling and Study of air conditioner
- Assembling, dismantling and Study of lathe.

TOTAL: 45 PERIODS

BPC2L1**PHYSICS AND CHEMISTRY
LABORATORY**

L	T	P	C
0	0	3	1

OBJECTIVES:

- To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.
- To prepare graduates for employment as chemists, for graduate study in chemistry, or for acceptance to medical or dental school.
- To prepare graduates with the skills to critically assess and solve problems requiring the application of chemical principles.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: To make the student to be conversant with the principles, water characterization and treatment for portable and industrial purposes.

CO2: To impart knowledge on the essential aspects of Principles of polymer chemistry and engineering applications of polymers

CO3: To impart knowledge on the essential aspects of Principles electrochemistry, electrochemical cells, emf and applications of emf measurements

CO4: To make the students understand the Principles of corrosion and corrosion control

CO5: To impart knowledge about the Conventional and non-conventional energy sources and energy storage devices

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			M					M	M		
CO2	M		W						M	M		
CO3	M		W						M	M		
CO4	M		M						M	M		

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni

5.	End Semester Exam		
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LIST OF EXPERIMENTS

I. LIST OF EXPERIMENTS – PHYSICS

1. Determination of particle size using laser
2. Determination of wavelength of laser light
3. Determination of numerical aperture and acceptance angle of an optical fibre
4. Study of photo electric effect
5. Determination of velocity of sound and compressibility of liquid-ultrasonic
6. Determination of wave lengths of mercury spectrum - spectrometer grating

II. LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of hardness of Water by EDTA
2. Estimation of Copper in brass by EDTA
3. Determination of DO in water (Winkler's method)
4. Estimation of Chloride in Water sample (Argento metry)
5. Estimation of alkalinity of Water sample
6. Determination of molecular weight and degree of polymerization using Viscometer.

BMA301

MATHEMATICS -III

L	T	P	C
3	1	0	4

OBJECTIVES:

- This course aims at providing the necessary basic concepts of a few numerical methods
- Give procedures for solving numerically different kinds of problems occurring in engineering and technology.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Solve a set of algebraic equations representing steady state models formed in engineering problems

CO2: Fit smooth curves for the discrete data connected to each other or to use interpolation methods over these data tables

CO3: Find the trend information from discrete data set through numerical differentiation and summary information through numerical integration

CO4: Predict the system dynamic behaviour through solution of ODEs modeling the system

CO5: Solve PDE models representing spatial and temporal variations in physical systems

through numerical methods.

CO6: Have the necessary proficiency of using MATLAB for obtaining the above solutions

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	W							
CO2	M		M	M	S							
CO3	S	M		S	M							
CO4	S	M		M	M							
CO5	S	M		M	S							
CO6	S		M	M	S							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation - Solutions of standard types of first order equations Lagrange's Linear equation - Linear partial differential equations of second and higher order with constant coefficients.

UNIT II FOURIER SERIES 12

Dirichlet's conditions - General Fourier series - Half-range Sine and Cosine series - Parseval's identity - Harmonic Analysis.

UNIT III BOUNDARY VALUE PROBLEMS 12

Classification of second order linear partial differential equations - Solutions of one - dimensional wave equation, one-dimensional heat equation - Steady state solution of two-dimensional heat equation - Fourier series solutions in Cartesian coordinates.

UNIT IV LAPLACE TRANSFORMS 12

Transforms of simple functions - Basic operational properties - Transforms of derivatives and integrals - Initial and final value theorems - Inverse transforms - Convolution theorem - Periodic functions-Applications of Laplace transforms for solving linear ordinary differential equations upto second order with constant coefficients and simultaneous equations of first order with constant

coefficients.

UNIT V FOURIER TRANSFORMS

12

Statement of Fourier integral theorem - Fourier transform pairs - Fourier Sine and Cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

Total No of periods:60

Text Books:

1. Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons, (Asia) Pte Ltd., Singapore, 2000.
2. Grewal, B.S., " Higher Engineering Mathematics " (35th Edition), Khanna Publishers, Delhi 2000.

References:

1. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., " Engineering Mathematics ", Volumes II & III (4th Revised Edition), S. Chand & Co., New Delhi, 2001.
2. Narayanan, S., Manicavachagom Pillay, T.K., Ramanaiah, G., " Advanced Mathematics for Engineering Students ", Volumes II & III (2nd Edition), S.Viswanathan (Printers & Publishers, Pvt, Ltd.) 1992.
3. Venkataraman, M.K. " Engineering Mathematics " Volumes III - A & B, 13th Edition National Publishing Company, Chennai, 1998.
4. Shanmugam, T.N. : <http://www.annauniv.edu/shan/trans.htm>

BEC301

SIGNALS AND SYSTEMS

L	T	P	C
3	0	0	3

Course Objectives:

This course trains students for an intermediate level of fluency with signals and systems in both continuous time and discrete time, in preparation for more advanced subjects in digital signal processing (including audio, image and video processing), communication theory, and system theory, control, and robotics.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Be able to classify systems based on their properties: in particular, to understand and exploit the implications of linearity, time-invariance, causality, memory, and bounded-input, bounded-out (BIBO) stability.

CO2: Know the principles of vector spaces, including how to relate the concepts of basis, dimension, inner product, and norm to signals.

CO3: Learn to treat signals as vectors in a vector space and ascribe geometry to that space by defining an appropriate inner product—in both discrete-time and continuous-time, and for both periodic and aperiodic signals.

CO4: Know how to analyze, design, approximate, and manipulate signals using vector-space concepts

CO5: Determine Fourier transforms for continuous-time and discrete-time signals (or impulse-response functions), and understand how to interpret and plot Fourier transform magnitude and phase functions.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2	S	W										
CO3	M	M	S									
CO4	M		M		S							
CO5	W	M	M									

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Hrs

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS

12

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.

UNIT II ANALYSIS OF C.T. SIGNALS

12

Fourier series analysis, Spectrum of C.T. signals, Fourier Transform and Laplace Transform in Signal Analysis.

UNIT III LTI-CT SYSTEMS

12

Differential equation, Block diagram representation, Impulse response, Convolution integral,

Frequency response, Fourier Methods and Laplace transforms in analysis, State equations and Matrix.

UNIT IV ANALYSIS OF D.T. SIGNALS

12

Spectrum of D.T. signals, Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT), Properties of Z-transform in signal analysis.

UNIT V LTI-DT SYSTEMS

12

Difference equations, Block diagram representation, Impulse response, Convolution SUM, Frequency response, FFT and Z-transform analysis, State variable equation and Matrix.

Total No of periods:60

References:

- 1.AllanV.Oppenheim et al, "SIGNALS AND SYSTEMS", Prentice Hall of India Pvt. Ltd., 1997.
- 2.Douglas K. Lindner, " Signals and Systems ", McGraw Hill International, 1999.
- 3.Simon Haykin and Barry Van Veen, " Signals and Systems ", John Wiley & Sons Inc., 1999.
- 4.Robert A. Gabel and Richard A. Roberts, " SIGNALS AND LINEAR SYSTEMS ", John Wiley, 3rd Edition, 1987.
- 5.Roger E. Zeimer et al, " SIGNALS AND SYSTEMS : Continuous and Discrete ", McMillan, 2nd Edition, 1990.

BET301 PRINCIPLES OF ANALOG AND DIGITAL SYSTEM

L	T	P	C
3	1	0	4

Course Objective:

- to familiarize students with the fundamentals of analog and digital communication systems
- to provide students with tools for communication signal analysis
- to familiarize students with various techniques for amplitude modulation and demodulation of analog signals

Course Outcomes:

After successful completion of this course, the students should be able to

- to develop the students' ability to determine the effects of receiver frequency and phase errors in synchronous modulation systems
- to familiarize students with techniques for generating and demodulating narrow-band and wide-band frequency and phase modulated signals
- to familiarize students with techniques for generating and demodulating narrow-band and wide-band frequency and phase modulated signals
- to familiarize students with basic techniques for generating and demodulating pulse code modulated signals

- to familiarize students with issues pertaining to the transmission of digital signals over bandwidth-limited communication channels

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M										
CO2	S	M	S	W								
CO3	S	S										
CO4	S	M	M									
CO5	M	W										

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I OP-AMP FUNDAMENTALS AND APPLICATIONS 9

Introduction to op-amp : op-amp symbol - terminals - packages - specifications - block diagram representation - ideal op-amp - practical op-amp - open-loop and closed-loop configurations. Practical Limitations of op-amp circuits: Bias and offset currents / offset voltage - frequency compensation and stability - slew rate - CMRR. Op-amp applications: Instrumentation amplifier - clipper and clamper circuits – LP HP BP and BR filters.

UNIT II OP-AMP OSCILLATORS AND DATA CONVERSION DEVICES 9

Op-amp oscillators: positive feedback and Barkhausen criterion - Wien Bridge oscillator - phase shift oscillator - square / triangle / ramp function generator. Single-chip oscillators: VCO and its applications - 555 timer (Astable & Monostable operation) and its applications. Data converters: Performance specifications - D/A conversion circuits(R-2R & inverted R-2R Ladder D/A converters) - A/D conversion circuits (Successive approximation, dual slope and flash A/D converters).

UNIT III DIGITAL DESIGN PRINCIPLES 9

Number systems: Binary codes: Weighted binary codes - non-weighted codes - error-detecting codes - error-correcting codes - alphanumeric codes. Boolean algebra and Logic simplification :

Basic theorems and properties of Boolean algebra – DeMorgan’s theorems - canonical and standard forms - universal property of NAND & NOR gates - minimization of logic functions, SOPs & POSs representations, minimization of Boolean expressions using algebraic, k-map and tabular methods - minimization of multiple output functions.

UNIT IV COMBINATIONAL & SEQUENTIAL SYSTEM DESIGN 9

Arithmetic functions: Basic adders - subtractors - carry look-ahead adder - decimal adder - magnitude comparator. MSI Logic circuits : Decoders - Encoders - Multiplexers - DeMultiplexers - Code converters - Parity generators/checkers - implementation of combinational functions using MUX, DeMUX, decoders and code converters. Flip-flops: RS flip-flop - T flip-flop - D flip-flop - JK flip-flop - Master-Slave flip-flops - IC flip-flops - their truth table and excitation table. Shift Registers: SISO, SIPO, PISO and PIPO shift registers - bidirectional and universal shift registers. Counters: Asynchronous counter operation - Synchronous counter operation - up/down synchronous counter - ring counter - shift register counter

UNIT V MEMORY AND PLDS 9

Introduction to memories: Memory types and terminology - general memory operation. Read-only-Memory: ROM architecture - ROM types - ROM timing - ROM applications. Read/Write Memory: RAM architecture - Static RAM - Dynamic RAM - expanding word size and capacity. PLDs : Fundamentals of PLD - SPLDs - PAL - GAL - Introduction to CPLDs and FPGAs

Total No of periods:45

TEXT BOOKS

1. Floyd and Jain, "Digital Fundamentals", Pearson Education, 8th edition, 2007
2. Morris Mano, "Digital Design", Pearson Education 3rd edition.
3. Ramakant A. Gayakwad, "op-amps and Linear Integrated Circuits", Pearson Education, 4th edition

REFERENCE BOOKS

1. John F. Wakerly, "Digital design - Principles and Practices", Prentice Hall International, 3rd edition, 2001
2. Ronald J.Tocci, Neal S.Widmer, "Digital Systems - Principles and Applications", Pearson Education, 8th edition, 2001
3. William I. Fletcher, "An Engineering Approach to Digital Design", Prentice Hall of India, 1980
4. Theodore F.Bogart. Jr, "Introduction to digital circuits", Tata McGraw-Hill International, 1992
5. Coughlin & Driscull, "Operational Amplifiers & Linear Integrated Circuits", Pearson Education, 6th edition, 2003

Course Objective:

- Develop the fundamental knowledge about the need for biasing and its various methods.
- Analyze the small signal equivalents circuits and high frequency analysis of BJT and FET.
- Examine the characteristics of multistage amplifiers.
- Classify and compare the types of large signal amplifier.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Discuss the concepts of various biasing methods for BJT.

CO2: Analyze the BJT configurations and BJT amplifiers using small signal model.

CO3: Analyze the FET Biasing concepts, FET and MOSFET amplifier small signal analysis

CO4: Analyze the frequency response of BJT, FET and multistage amplifiers

CO5: Explain the classification and performance of large signal amplifiers.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W										
CO2	W											
CO3	S	M	M									
CO4	M	W										
CO5	M	W	W									

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I ELECTRON BALLISTICS:

9

Motion of charged particles in electric, magnetic & combined electric & magnetic fields- parallel & perpendicular E & H Fields-Applications -electric & magnetic deflection of beam in CRO- deflection sensitivity-focussing of electron beam in CRO.

UNIT II SEMICONDUCTOR THEORY & PN JUNCTION DIODES: 9

Review of intrinsic & extrinsic semiconductors- classical theory & energy band theory -charge densities in semiconductors- mobility & conductivity - drift & diffusion currents. Construction of PN junction diodes- VI characteristics- quantitative theory of PN diode current components- diode resistances-transition & diffusion capacitances-effect of temperature on diode characteristics- model of diode - diode specifications-Clipping & Clamping Circuits- Voltage multipliers Using diodes.

UNIT III BIPOLAR JUNCTION TRANSISTORS: 9

Construction of transistor -principle of transistor action – current components -input & output characteristics of a transistor in CE,CB,CC configurations- cut off ,active saturation & breakdown regions - current gain in CE, CB, CC Configurations.- h parameter model for BJT.-BJT specifications.

UNIT IV FET & UJT: 9

Construction & characteristics of JFET -parameters of JFET -MOSFET -depletion & enhancement modes-FET in CS,CD,CG Configurations-equivalent circuit of FET at low frequencies-FET model at high frequencies-FET Specifications. Construction, theory of operation & characteristics of UJT, PUT.

UNIT V SPECIAL SEMICONDUCTOR DEVICES : 9

Fabrication & characteristics of zener diode, tunnel diode- PIN diode –varactor diode. Construction & characteristics of SCR-two transistor equivalent circuit - applications-TRIAC & DIAC,-LASCR-CCD.Photodiodes- photoconductive cell & photovoltaic cellconstruction & working of LED & LCD - phototransistorsolarcell- optocouplers.

Total No of periods: 45

TEXT BOOKS:

- 1.Salivahanan & Others - Electron Devices & Circuits, Tmh,1998.
- 2.Millman & Halkias,"Electronic Devices & Circuits",Tata Mcgraw Hill,1995.

REFERENCE BOOKS:

- 1.David.A.Bell, "Electronic Devices & Circuits ",Phi,1998.
- 2.Robert Boylestad, "Electronic Devices & Circuit Theory",Sixth Edition,Phi,1998.
- 3.Bogart, "Electronic Devices & Circuits",Universal Book Stall, New Delhi,1994.

BEC306 ENVIRONMENTAL STUDIES

L	T	P	C
3	1	0	4

Course Objective:

- Develop the fundamental knowledge about the need for Programming and Data Structures.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Develop solutions to a given problems using class object concepts.

CO2: Illustrate overloading, inheritance and polymorphism concepts with example.

CO3: Explain the basic data structures and its operations.

CO4: Make use of basic data structures to solve problems.

CO5: Outline various searching and sorting algorithms.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W										
CO2	M	S										
CO3	M											
CO4	M	S										
CO5	M											

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT 1 THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES 2

Definition, scope and importance Need of public awareness NATURAL RESOURCES: Renewable and non Renewable resources: Natural resources and associated problems Forest resources: use and over exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people. Water resources: use and over utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: use and over exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: world food problems- changes caused by agriculture and over grazing, effects of modern agriculture, fertilizer- pesticide problems, water logging,

Salinity, Case studies Energy Resource: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy source, Case studies. Land Resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT 2 ECO STSTEMS

8

Concept of an eco system Structure and function of an eco system Producers, Consumers and decomposers Energy flow in the eco system Ecological succession Food Chains, Food webs and ecological pyramids Introduction, Types, Characteristic features, structure and function of the following eco systems Forest ecosystem Grassland ecosystem Desert ecosystem Aquatic ecosystem(Ponds, Streams, Lakes, Rivers, Oceans, Estuaries)

UNIT 3 BIO DIVERSITY AND ITS CONSERVATION

6

Introduction- Definition: Genetic, Species and ecosystem diversity Bio geographical classification of India Value of Bio Diversity: Consumptive use, productive use, social, ethical, aesthetic and option values Bio diversity at global, national and local levels. India as a mega diversity nation Hot spots of Bio diversity Threats to Bio Diversity: Habitat loss, Poaching of wild life, Man wild life conflicts Endangered and endemic species of India Conservation of Bio diversity: In-situ and ex-situ conservation of biodiversity

ENVIRONMENTAL POLLUTION

8

Definition Causes, effects and control measures of :- Air Pollution Water Pollution Soil Pollution Marine Pollution Noise Pollution Thermal Pollution Nuclear Hazards Solid waste management: Causes, effects and control measures of urban and industrial wastes Role of an individual in prevention of pollution Pollution case studies Disaster Management : Floods, earthquake, cyclone and landslides.

UNIT 4 SOCIAL ISSUES AND THE ENVIRONMENT

8

From unsustainable to Sustainable development Urban Problems related to energy Water conservation, Rain water harvesting, Water shed management Resettlement and Rehabilitation of people: its problems and concerns, case studies Environmental ethics: Issues and possible solutions Climate Change, Global warming, Acid Rain, Ozone layer depletion, Nuclear accidents and Holocaust, Case studies Wasteland reclamation Consumerism and waste products Environment protection act Air(Prevention and control of pollution)Act Water(Prevention and control of pollution)Act Wildlife protection act Forest conservation act Issues involved in enforcement of environmental legislation Public awareness

UNIT 5 HUMAN POPULATION AND THE ENVIRONMENT

7

Population growth, variation among nations Population explosion- Family welfare programme Environment and human health Human rights Value education HIV or AIDS Women and Child welfare Role of information technology in environment and human health Case studies

Total No of periods:45

TEXT BOOK

- 1. “Environmental science and engineering”, p.Akil

REFERENCE

- 1. “An introduction to environmental science engineering”, Ram Sivakumar

BEE305

ELECTRICAL ENGINEERING

L	T	P	C
3	0	0	3

Course Objective:

- To impart basic knowledge on electrical machines, principles and its operation.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Outline the basics of electrical machines and analyze the characteristics of DC machines.

CO2: Understand and implement speed control techniques for practical applications.

CO3: Describe the working of transformer and assess its regulation and efficiency on load and no-load.

CO4: Know the working concept of different types of induction motor and analyze the operating behavior of induction motor using its performance indices.

CO5: Explain the basics of synchronous machines and interpret performance characteristics.

CO6: Relate how different special electrical machines are functioning and have knowledge to choose particular machines for their applications.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2	S	M										
CO3	S		M									
CO4	S											
CO5	S		M									
CO6												

Course Assessment methods:

DIRECT	INDIRECT
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1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I CIRCUITS AND TRANSFORMERS 9

Three phase circuits and transformers, Three phase balanced circuits with R-L-C loads, Power measurement in 3 Phase circuit, Two watt meter method, Principle of operation of Transformers, Equivalent circuit, Voltage regulation, Efficiency, Transformer connections.

UNIT II DC MOTORS 9

Construction, Operating principle of motor, Types, Characteristics, Starting, Speed control, Testing.

UNIT III INDUCTION MOTORS 9

Construction, Types, Principle of operation of 3 phase induction motors, Equivalent circuit, Performance calculation, Starting and Speed control.

UNIT IV SYNCHRONOUS AND SPECIAL MACHINES 9

Construction of synchronous machines, Types, Induced EMF, Voltage regulation of round rotor alternators. Brushless Alternators, Permanent magnet Synchronous machines, Reluctance machines, Hysteresis motors, Stepper motor.

UNIT V TRANSMISSION AND DISTRIBUTION 9

Structure of Electric Power systems, Generation, Transmission, Sub Transmission and Distribution systems, EHVAC and EHVDC transmission systems, Substation layout, Insulators, Cables.

Total No of periods:45

Text Books:

1. Nasar S.A., " Electric Machines and Power Systems ", Vol. 1, McGraw Hill Inc., New Delhi, 1995.
2. Wadhwa C.L., " Electrical Power Systems ", Wiley eastern Ltd., India, 1985.

**BET3L1 ANALOG AND DIGITAL SYSTEM
LABORATORY**

L	T	P	C
0	0	3	1

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Course Objectives:

- To design and implement combinational and sequential digital circuits
- To design a digital systems (real-time) and test using simulation.

Course Outcomes:

After successful completion of this course, the students should be able to

- CO1:** Perform number conversions between different number systems
CO2: Construct basic combinational circuits and verify their functionalities.
CO3: Apply the design Procedures to design basic sequential circuits.
CO4: Determine the appropriateness of the choice of the ICs used in a given digital circuit.
CO5: Demonstrate skills to test and trouble shoot a digital circuit.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S								M	M		
CO2	M		M						M	M		
CO3	M		S						M	M		
CO4			M	W					M	M		
CO5				M					M	M		

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS

Analog Electronic Systems

1. Basic op-amp circuits such as Inverting & Non-Inverting amplifiers, Voltage Follower, Summing and Differential amplifiers
2. Linear op-amp circuits such as Instrumentation amplifier, Integrator & Differentiator
3. Non-Linear op-amp circuits such as Precision Diodes, Comparators and their applications

- Op-amp oscillators Phase shift & Wein bridge oscillators, VCO and 555 Timer in Astable and Monostable operation

Digital Electronic Systems

- Verification of Logic gates using ICs.
- Design and Implement Multiplexers, DeMultiplexers, Decoders and Encoders using Logic gates
- Implementation of combinational functions using MUX, DeMUX and decoders
- Implementation of Arithmetic functions using logic gates, MUX, DeMUX and decoder ICs
- Study the operation of the following flip-flop ICs and verify their truth table
 - JK flip-flop
 - D flip-flop
 - T flip-flop
- Study the operation of a 4 bit shift register in the following modes
 - SISO
 - SIPO
 - PISO
 - PIPO
- Asynchronous and Synchronous counter design

Total : 45 Hrs

Experiments beyond the syllabus should be conducted.

BET3L3

ELECTRICAL ENGINEERING LAB

L	T	P	C
0	0	3	1

Course Objectives:

- To understand the programming of OOPs and Data Structures.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Implement various object oriented concepts through simple programs.

CO2: Implement different data structures using C++.

CO3: Apply the different data structures for implementing solutions to practical problems.

CO4: Demonstrate searching and sorting algorithms.

CO/PO Mapping			
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(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	M	M										
CO3	S	M										
CO4	M	W										

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

List of Experiments:

1. Power Measurements in 3-phase circuits.
2. Swinburne's Test.
3. Speed control of DC motors
4. Load Test on DC shunt generator
5. OCC and Load Test on DC shunt generator
6. OC and SC tests on Transformers
7. Load Test on Transformer.
8. Regulation of alternator by EMF and MMF methods.
9. Equivalent circuit on 3-phase induction motor.
10. Load test on 3-phase induction motor
11. Equivalent circuit of single-phase induction motor.
12. Study of DC and AC motor starters.

Total :45Hrs

Experiments beyond the syllabus should be conducted.

**BMA402 SEMESTER IV
NUMERICAL METHODS**

L	T	P	C
3	1	0	4

OBJECTIVES:

This course aims at providing the necessary basic concepts of a few linear Algebra and give procedures for solving numerically different kinds of problems occurring in engineering and

technology.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Apply the concepts of linear algebra to model linear system.

CO2: Use Echelon forms to solve systems of linear equations.

CO3: Use linear transformations to form linear models in Science and Engineering.

CO4: Apply the concepts of eigen values and eigenvectors to solve differential equations.

CO5: Demonstrate competence with the basic ideas of linear algebra including concepts of Inner Product, Orthogonal sets and Inner Product Spaces

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M		M							
CO2	M	M		M	M							
CO3	S		M	M	S							
CO4	S	M	M	M	S							
CO5	M	M		M	M							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEM 12

Iterative method, Newton-Raphson method for single variable-solutions of linear system by Gaussian, Gauss-Jordan, Jacobian and Gauss-Siedal methods, Inverse of matrix by Gauss-Jordan method, Eigen value of a matrix power and Jacobian methods.

UNIT II INTERPOLATION (FINITE DIFFERENCES) 12

Newton’s Divide difference formula, Lagrange’s Interpolation, forward and backward difference formula Stirling’s, Bessel’s central difference formula.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Numerical Differentiation with interpolation polynomials, Numerical integration by Trapezoidal

Simpson's (Both $1/3$ and $3/8$) rule, Double integrals using Trapezoidal and Simpson's rule.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATION 12

Single step methods, Taylor series, Euler and modified Euler, Runge kutta method of first and second order differential equations, multiple step methods, Milne and Adam's –bash forth predict and corrected method.

UNIT V BOUNDARY VALUE PROBLEMS FOR ODE AND PDE 12

Finite difference for the second order ordinary differential equations, finite difference solutions for one dimensional heat equations(both implicit and explicit), one dimensional wave equation, Two dimensional, Laplace and Poisson equation.

Total No of periods:60

Text Books :

1. M.K.venkataraman ' Numerical methods', NPC, Chennai.

References :

1. Jain.M.K.Iyengar, S.R.K.Andjain, RK Numerical mehods for scientific and engineering computation, (3rd edition, New age International pub, Co(1993))
2. Grewall.B.S.' Higher Engineering Mathematics ' (36th edition) khanna publishers, Delhi, 2001.
- 3.

BET403

ELECTROMAGNETIC FIELDS AND WAVES

L	T	P	C
3	1	0	4

Course Objectives:

- Analyze the methods of constructing feedback amplifiers, oscillators and tuned amplifiers.
- List the advantages and applications of feedback amplifiers, oscillators and tuned amplifiers.
- Outline the performance of wave shaping circuits, multi-vibrators and time base generators.
- Construction of power supplies.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Classify the various types of feedback amplifiers and analyze them.

CO2: Design the various types of RC and LC oscillators.

CO3: Understand the basic principles of different types of tuned amplifiers and learn the neutralization techniques.

CO4: Describe the operation of multivibrator circuits, time base generators, wave shaping circuits and their applications

CO5: Discuss the working and characteristics of regulated power supply and SMPS.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M								
CO2		S	M									
CO3	M		W									
CO4	M											
CO5	S		M									

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I STATIC ELECTROMAGNETIC FIELDS

12

Introduction to co-ordinate system, Gradient, Divergence, Curl, Divergence Theorem, Stoke's Theorem, Coulomb's Law, Electric field Intensity, Principle of superposition, Electric Scalar potential, Line charge distribution by Moment method, Electric flux Density, Gaus's Law and its applications, Field Computations and Problems.

UNIT II STATIC MAGNETIC FIELD

12

Magnetic field of a current carrying element, Ampere's Force law, The Biot-Savart Law, Magnetic Flux density, Gauss law for magnetic fields, Torgue on a loop, Magnetic moment, Ampere's Law and Magnetic field intensity, Magneto motive force, Field cells and permeability, Vector potential, Field computation and problems.

UNIT III ELECTRIC FIELD IN DIELECTRICS

12

Permittivity, Polarization, Boundary relation, Capacitance, Dielectric strength, Energy and energy density, Poisson's and Laplace equations and applications, Electric Current, Current Density, Ohms law at a point, Resistance and Conductance, Continuity relations for current problems.

UNIT IV MAGNETIC FIELD IN FERROMAGNETIC MATERIALS

12

Magnetic materials, Magnetic dipoles, Loops and Solenoids, Magnetization, Inductance, Energy in

an Inductor and Energy Density, Boundary relations, Ferro magnetism, Hysteresis, Reluctance and Permeance, Problems.

UNIT V TIME VARYING ELECTRIC AND MAGNETIC FIELDS 12

Faraday's Law, Transformer and Motional Induction, Maxwell's equation from Faraday's Law, Self and Mutual Inductance, Displacement current, Maxwell's equation from Ampere's Law and its inconsistency, Boundary relation, Poynting Vector, Comparison of field and circuit theory, Circuit Application of pointing Vector.

Total No of periods:60

Text Books:

1. John D. Krauss, " Electromagnetics ", McGraw Hill, 1992.
2. David K. Chang, " Field and Wave Electromagnetics ", Second edition, Addison Wesley, New Delhi, 1999.

BEC405 LINEAR INTEGRATED CIRCUITS

L	T	P	C
3	1	0	4

Course Objectives:

- Analyze and design differential amplifier and current sources.
- Enable the students to analyze AC and DC characteristics of operational amplifier.
- To design and analyze different linear, non-linear and mathematical application circuits using operational amplifier.
- To introduce the operation and applications of analog multiplier and PLL.
- To discuss the concept and applications of ADC and DAC

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the various current mirror circuits and analyze differential amplifier with active load.

CO2: Describe the characteristics, linear and non linear application of operational amplifier

CO3: Analyze the internal modules of PLL, Analog Multiplier and review its applications

CO4: Discuss the different types of data convertor architectures

CO5: Review the special function ICs and its application

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W										

CO2	M											
CO3	S	M	M									
CO4	M											
CO5	M											

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

BIASING CIRCUITS AND OPERATIONAL AMPLIFIER CHARACTERISTICS 09

Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Operational Amplifier- DC Characteristics- Frequency response characteristics - Stability - Limitations -Frequency compensation-Slew rate.

APPLICATION OF OPERATIONAL AMPLIFIERS 09

Inverting and Non-inverting amplifiers - Voltage Follower - Summing amplifier - Differential amplifier-Log and antilog amplifier - Instrumentation amplifier - Integrator and Differentiator - Voltage to Current converter - Sinusoidal Oscillators - Active filters(butterworth) - Types-Sample and Hold circuit - Precision diode Half Wave and Full wave rectifiers - . Comparator - Zero crossing detector -Active peak detector, Clipper and Clamper - Square and Triangular waveform generators

PHASE LOCKED LOOP AND ANALOG MULTIPLIERS 09

556 Voltage Controlled Oscillator -Basic principles of PLL - Basic components- Functional Block Schematic-. Derivations of expressions for Lock and Capture ranges- PLL Applications: Frequency Synthesis - Frequency Translation - AM and FM detection. Analog Multipliers- Variable Transconductance Multiplier- Log Antilog Multiplier- Time Division Multiplier-variable Conductance Multiplier

ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTORS 09

Digital to Analog converters - Binary weighed and R-2R Ladder types - Analog to digital converters - Continuous - Counter ramp, successive approximation, single, dual slope and

parallel types - DAC/ADC performance characteristics and comparison.

APPLICATION ICs

09

555 Timer Functional block diagram and description - Monostable and Astable operation - Applications - - ICL 8038 Function generator IC - IC voltage Regulators: Three terminal Regulator, General purpose regulators-MA780, LM380 Power Amplifier- Isolation Amplifier, Optocoupler ICs

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Roy Choudhury and Shail Jain "Linear Integrated Circuits", New Age Science, 2010.
2. Ramakant A. Gayakwad, "OP - AMP and Linear IC's ", Prentice Hall, 2002.
3. Sonde, B.S, —Introduction to System Design using Integrated Circuits, Second Edition, Wiley Eastern Limited, New Delhi, 1994.
4. Michael Jacob J., "Applications and Design with Analog Integrated Circuits ", Prentice Hall of India, 1996.
5. Robert F Coughlin and Fedrick F Driscoll —Operational amplifiers and linear Integrated Circuits, 6th edition, Prentice Hall of India, New Delhi, 2006.
6. Richard J. Higgins "Electronics with Digital and Analog Integrated Circuits, Prentice Hall of India, New Delhi, 1983.
7. Millman J. and Halkias C.C., " Integrated Electronics ", McGraw Hill, 2001

BET407

DIGITAL SIGNAL PROCESSING

L	T	P	C
3	1	0	4

Course Objective:

- To introduce the concepts and techniques associated with the understanding of signals and systems.
- To familiarize the concepts of transform based continuous time and discrete time analysis of signals and systems
- To provide fundamental knowledge about sampling process
- To provide a foundation to the courses like communication, digital signal processing, control systems, instrumentation, and so on, that deal with signal and system concepts directly or indirectly

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Understand different types of signals- continuous and discrete, odd and even, periodic and aperiodic etc.

CO2: Analyze continuous time signals and systems by using appropriate mathematical tools

like Fourier Transform.

CO3: Analyze sampling process and sampling of discrete time signals.

CO4: Analyze discrete time signals and systems by using appropriate mathematical tools like Fourier Transform.

CO5: Utilize standard signals such as sine, ramp, exponential to characterize systems.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W										
CO2	S			W								
CO3	S			M								
CO4	S	M										
CO5	M		M									

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I DISCRETE – TIME SIGNALS AND SYSTEMS : 12

Sampling of Analogue signals – aliasing – standard discrete time signals – classification – discrete time systems – Linear time invariant stable casual discrete time systems – classification methods – linear and circular convolution – difference equation representation – DFS, DTFT, DFT – FFT computations using DIT and DIF algorithms. Time response and frequency response analysis of discrete time systems to standard input signals.

UNIT II INFINITE IMPULSE RESPONSE DIGITAL FILTERS: 12

Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain – Design of IIR digital filters using impulse invariance technique – Design of digital filters using bilinear transform – pre warping – Frequency transformation in digital domain – Realization using direct, cascade and parallel forms.

UNIT III FINITE IMPULSE RESPONSE DIGITAL FILTERS: 12

Symmetric and Antisymmetric FIR filters – Linear phase FIR filters – Design using Frequency sampling technique – Window design using Hamming, Hanning and Blackmann Windows – Concept of optimum equiripple approximation – Realisation of FIR filters – Transversal, Linear phase and Polyphase realization structures.

UNIT IV FINITE WORD LENGTH EFFECTS: 12

Quantization noise – derivation for quantization noise power – Fixed point and binary floating point number representations – Comparison – Overflow error – truncation error – coefficient quantization error – limit cycle oscillations- signal scaling – analytical model of sample and hold operations.

UNIT V SPECIAL TOPICS IN DSP: 12

Discrete Random Signals- Mean, Variance, Co-variance and PSD – Periodiogram Computation – Principle of Multi rate DSP – decimation and Interpolation by integer factors – Time and frequency domain descriptions – Single, Multi stage, polyphase structures – QMF filters – Subband Coding

TEXT BOOK:

1. John G. Proakis and Dimitris G.Manolakis, ‘Digital Signal Processing, Algorithms and Applications ‘, PHI of India Ltd., New Delhi 3rd Edition 2000.

REFERENCES:

1.Sanjit K.Mitra ‘Digital Signal Processing’, A Computer Based Approach, Tata McGraw-Hill, New Delhi, 1998. Printing, Prentice Hall of India Pvt. Ltd., New Delhi, 1999.

BEC408

ELECTRONIC CIRCUITS

L	T	P	C
3	1	0	4

Course Objectives:

- To become familiar with propagation of signals through transmission lines
- Understand signal propagation at Radio frequencies
- Understand radio propagation in guided systems
- To become familiar with resonators

Course Outcomes:

After successful completion of this course, the students should be able to

CO1:Discuss the fundamental concepts of wave propagation in Transmission Lines and Wave Guides

CO2:Analyze the line parameters and various losses in transmission lines.

CO3:Apply smith chart for line parameter and impedance calculations

CO4:Evaluate the characteristics of parallel plane and rectangular wave guides.

CO5: Evaluate the characteristics of Circular wave guides and resonators.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	S	W										
CO3	S	M		W								
CO4	S	W	W	W								
CO5	S	M	W									

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

BIASING METHODS AND SMALL SIGNAL MODELS (BJT, JFET, MOSFET) 9

DC & AC Load Lines-Operating Point-Q- Point variation-various Biasing Methods- Small signal equivalent -Calculation of voltage gain, current gain, power gain, input impedance and output impedance.

TRANSISTOR AMPLIFIER AND ANALYSIS 9

Small Signal analysis of BJT, JFET and MOSFET amplifiers - Cascade amplifier- Cascode amplifier- Darlington Bootstrap amplifier- Differential amplifier.

FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Concept of feedback- Types of feedback- Analysis of voltage & current feedback amplifiers Barkhausen criterion for oscillation- mechanism for start of oscillation & stabilization of amplitude - Analysis of RC & LC oscillators.

LARGE SIGNAL AND TUNED AMPLIFIERS 9

Class-A CE amplifier - Q point placement - Power calculation - Maximum dissipation Hyperbola - Transformer coupled Amplifier - Class-B push pull amplifier - Class-AB operation-- Direct coupled push pull amplifier - Amplifier using complementary symmetry- Heat sink. Single Tuned Amplifiers - Double tuned and synchronously tuned amplifiers.

FREQUENCY RESPONSE AND WAVE SHAPING CIRCUITS

9

Low frequency and High frequency response of BJT and FET amplifier. Nonlinear wave shaping circuits: Astable - Bistable - Monostable Multivibrators. Schmitt Trigger - Time Base Generators.

Total No of periods:45

TEXT BOOKS

1. Robert Boylestad, Louis Nashelsky, "Electronic Devices and circuit Theory", Pearson, 1997
2. G K Mithal, "Electronic Devices & Circuits", Khanna Publishers, 1993

REFERENCES

1. David A Bell, "Electronic Devices and Circuits", Prentice Hall of India, 1998
2. Jacob Millman, Christos C Halkias, "Electron Devices and Circuits", Tata McGraw Hill, Edition 1991
3. Donald L Schilling, Charles Belove, "Electronic Circuits", 3rd edition, 1989
4. Stanley G. Burns, Paul R, Bond, "Principles of Electronic Circuits ", Galgottia publishers

BEI406

ELECTRONIC INSTRUMENTATION

L	T	P	C
3	0	0	3

Course Objectives:

- To understand what constitutes the environment, what are precious resources in the environment,
- Ways of conservation of resources.
- The role of a human being in maintaining a clean environment and useful environment for the future generations.
- How to maintain ecological balance.
- Preserve bio-diversity.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Play a important role in transferring a healthy environment for future generations

CO2: Analyze the impact of engineering solutions in a global and societal context

CO3: Discuss contemporary issues that results in environmental degradation and would attempt to provide solutions to overcome those problems

CO4: Ability to consider issues of environment and sustainable development in his personal and professional undertakings

CO5: Highlight the importance of ecosystem and biodiversity

CO6: Paraphrase the importance of conservation of resources.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			W			S						
CO2						S						
CO3			M					W				
CO4			M			W	M					
CO5	W		M				M					
CO6			M				W					

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I TRANSDUCERS

9

Measurements, Instrumentation, Errors in measurements, Calibration and standard, Classification and characteristics of Transducers, Digital, Electrical, Electronic Weighing System, AC / DC Bridge measurement and their applications.

UNIT II SIGNAL GENERATOR AND SIGNAL ANALYZERS

9

A.F. Generator, Pulse Generator, AM/FM Signal generator, Function generator, Sweep frequency generator, wave analyzers, Spectrum Analyzers, Logic Analyzers, Distortion Analyzers.

UNIT III DIGITAL INSTRUMENTS

9

Digital Voltmeters and Multimeters, Automation in Voltmeters, Accuracy of DVM, Guarding Techniques, frequency, period, time interval and pulswidth measurements, automatic vector voltmeter.

UNIT IV DATA DISPLAY AND RECORDING SYSTEM

9

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.

UNIT V COMPUTER CONTROLLED TEST SYSTEM

9

Testing and Audio amplifier, Testing a Radio Receiver, Instrument used in Computer Controlled

Instrumentation, Digital Control Description, Microprocessor based measurements, Case studies in Instrumentation.

Text Books:

1. Rangan C.S., " Instrumentation Devices and Systems ", Tata McGraw Hill,1998.
2. Cooper, " Electronic Instrumentation and Measurement Techniques ", Prentice Hall of India, 1988.

References:

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 Instrumentation ", McGraw Hill, 1975.

BCS4L3 COMPUTER PROGRAMMING LABORATORY

L	T	P	C
0	0	3	1

Course Objectives:

- To design and analyze different amplifier, oscillator and multivibrator circuits.
- Model the electronic circuits using tools such as PSPICE and Multisim and test

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Design the various feedback amplifiers

CO2: Design various sinusoidal and non-sinusoidal oscillators.

CO3: Demonstrate the various wave shaping circuits.

CO4: Analyze the response of the tuned amplifiers.

CO5: Perform simulation of amplifiers and multivibrators.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	W	W					M	M		
CO2	S	M	W	W					M	M		
CO3		M							M	M		
CO4	M			W					M	M		
CO5					S				M	M		

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS

1. Factorial using recursion
2. Armstrong Number
3. Matrix Addition and Subtraction
4. Matrix Multiplication
5. Sorting of numbers in Ascending and descending
6. Quadratic Equation
7. File reading and writing
8. Stack
9. Queue
10. Linear search
11. Binary search
12. Constructor and destructor in c++
13. Function over loading
14. Inheritance
15. Operator overloading
16. Template

Total: 45 Hrs

Experiments beyond the syllabus should be conducted.

BET4L1

ELECTRONIC CIRCUITS LABORATORY

L	T	P	C
0	0	3	1

Course Objectives:

- To design and test several applications of operational amplifiers.
- To study the function generator IC
- To design DAC & ADC.
- Construct waveform generation circuits

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Design and analyze the various op-amp and 555 timer applications.

CO2: Distinguish various active filters.

CO3: Acquire knowledge about the function generator IC.

CO4: Relate Schmitt trigger, comparator and PLL for real time applications.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			M					M	M		
CO2	M		W						M	M		
CO3	M		W						M	M		
CO4	M		M						M	M		

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS

1. Feedback amplifier
2. Transistor phase shift oscillator
3. Class A single tuned amplifier
4. LC Oscillators
5. Collector coupled and Emitter coupled Astable multivibrator
6. Wein bridge oscillator
7. Schmitt Trigger
8. Emitter coupled bistable multivibrator
9. Monostable multivibrator
10. Class C tuned amplifier

Total: 45 Hrs

Experiments beyond the syllabus should be conducted.

BET4L3 DIGITAL SIGNAL PROCESSING LABORATORY

L	T	P	C
0	0	3	1

Course Objectives:

- To equip students of engineering and technology with effective speaking and listening skills in English
- To help them develop their soft skills and people skills, which will make the transition from college to workplace smoother
- To help them to excel in their jobs and to enhance students' performance at Placement Interviews, Group discussions and other recruitment exercises.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Imparting the role of communicative ability as one of the soft skills needed for placement.

CO2: Developing communicative ability and soft skills needed for placement.

CO3: Making students Industry-Ready through inculcating team-playing capacity.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				M							M	
CO2				W						M	S	
CO3				S						W	S	

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS

1. DFT computation
2. Computational experiments with digital filtering
3. DSP processor implementation (50 % of course)
4. Sampling & Waveform generation
5. FIR & IIR Filters Implementation
6. Fast Fourier transforms
7. Quantization Noise
8. Adaptive Filters
9. Multirate Signal Processing

10. DSP Projects

Total: 45 Hrs

Experiments beyond the syllabus should be conducted.

SEMESTER V
BCS502 COMPUTER ARCHITECTURE

L	T	P	C
3	0	0	3

Course Objectives:

- Study the Architecture of 8086 microprocessor.
- Learn the design aspects of I/O and Memory Interfacing circuits.
- Study about communication and bus interfacing.
- Study the Architecture of 8051 / ARM microcontroller.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Design and implement programs on 8086 microprocessor.

CO2: Design I/O circuits.

CO3: Design Memory Interfacing circuits.

CO4: Design and implement 8051 microcontroller based systems.

CO5: Describe the architecture and instruction set of ARM microcontroller

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W	S									
CO2			S									
CO3			S									
CO4			S									
CO5	M	W										

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni

5.	Online Test		
6.	End Semester Exam		

UNIT I INTRODUCTION: 9

Computing and Computers, evolution of computers, VLSI era, system design- register level, processor level, CPU organization, Data representation, fixed – point numbers, floating point numbers, instruction formats, instruction types.

UNIT II DATA PATH DESIGN: 9

Fixed point arithmetic, addition, subtraction, multiplication and division, combinational and sequential ALUs, carry look ahead adder, Robertson algorithm, booth’s algorithm, non-restoring division algorithm, floating point arithmetic, coprocessor, pipeline processing, pipeline design, modified booth’s algorithm

UNIT III CONTROL DESIGN: 9

Hardwired Control, micro programmed control, Multiplier control unit, CPU control unit, Pipeline control, instruction pipelines, pipeline performance, super scaling processing, Nano programming.

UNIT IV MEMORY ORGANIZATION: 9

Random access memories, serial access memories, RAM interfaces, magnetic surface recording, optical memories, multilevel memories, Cache & virtual memory, memory allocation, Associative memory.

UNIT V SYSTEM ORGANIZATION: 9

Communication methods, buses, bus control, bus interfacing, bus arbitration, IO and system control, IO interface circuits, DMA and interrupts, vectored interrupts, PCI interrupts, pipeline interrupts, IOP organization, operation systems, multiprocessors, fault tolerance.

Total No of periods:45

TEXT BOOKS:

- 1.Morris Mano, “Computer System Architecture”, Prentice-Hall of India, 2000.
2. John P.Hayes, ‘Computer architecture and organisation’, Tata McGraw-Hill, Third edition, 1998.

REFERENCES:

1. V.Carl Hamacher, Zvonko G. Varanescic and Safat G. Zaky, “ Computer Organisation “
IV
edition, McGraw-Hill Inc, 1996.

2. H.S. Stone, "High Performance computer architecture", Addison Wesley, Third Edition, 1993.
3. K.Hwang, ' Advanced computer architecture ', Tata McGraw-Hill, 1993.
4. J.Vaideeswaran, ' Computer architecture ', New Age International, 1999.
5. G.Kane & J.Heinrich, ' MIPS RISC Architecture ', Englewood cliffs, New Jersey, Prentice Hall, 1992.

**MICROPROCESSOR AND
MICROCONTROLLER
APPLICATIONS**

BEC502

L	T	P	C
3	1	0	4

Course Objectives:

- To impart knowledge on Amplitude Modulation principles, generation and its types.
- To impart knowledge on Angle modulation principles and generation
- To study various demodulation methods and compare them
- To provide in-depth analysis of noise performance in various receivers.
- To understand the basic concepts of analog pulse modulation techniques.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Discuss principles of different analog modulation techniques

CO2: Explain blocks used for building communication systems

CO3: Identify Modulation/demodulation circuits

CO4: Compare noise performance of receivers

CO5: Describe various Pulse modulation techniques

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	W										
CO2	S	M										
CO3	S	W										
CO4		M										
CO5	S	W										

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey

REFERENCES:

1. Kenneth J.Ayala., “The 8051 Microcontroller Architecture Programming and Applications”, Penram International Publishing (India). 1996.
2. Kenneth J.Ayala “The 8086 Microprocessor, Programming and Interfacing the PC”, Penram International Publishing. 1995.

**TRANSMISSION LINES, NETWORKS
AND WAVEGUIDES**

BEC503

L	T	P	C
3	1	0	4

Course Objectives:

- To study DFT and its computation
- To study design techniques for digital filters
- To study fundamentals of Digital signal processors

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain Properties and algorithms for implementation of DFT

CO2: Describe Filters and their structures

CO3: Illustrate the design of FIR and IIR filters

CO4: Discuss finite word length effects.

CO5: Relate the architectures and instruction set of a Digital Signal Processor

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M									
CO2	S	M	M									
CO3	S	M	W	M								
CO4	S	W										
CO5	W	W	W	M								

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I FILTERS

12

The neper - the decibel - Characteristic impedance of Symmetrical Networks – Current and voltage ratios - Propagation constant, - Properties of Symmetrical Networks – Filter fundamentals – Pass and Stop bands. Behaviour of the Characteristic impedance. Constant K Filters - Low pass, High pass band, pass band elimination filters - m -derived sections – Filter circuit design – Filter performance – Crystal Filters.

UNIT II TRANSMISSION LINE PARAMETERS

12

A line of cascaded T sections - Transmission lines - General Solution, Physical Significance of the equations, the infinite line, wavelength, velocity, propagation, Distortion line, the telephone cable, Reflection on a line not terminated in Z_0 , Reflection Coefficient, Open and short circuited lines, Insertion loss.

UNIT III THE LINE AT RADIO FREQUENCY

12

Parameters of open wire line and Coaxial cable at RF – Line constants for dissipation -voltages and currents on the dissipation less line - standing waves – nodes – standing wave ratio - input impedance of open and short circuited lines - power and impedance measurement on lines – $\lambda / 4$ line, Impedance matching – single and double-stub matching circle diagram, smith chart and its applications – Problem solving using Smith chart.

UNIT IV GUIDED WAVES BETWEEN PARALLEL PLANES

1

Application of the restrictions to Maxwell's equations – transmission of TM waves between Parallel planes – Transmission of TE waves between Parallel planes. Transmission of TEM waves between Parallel planes – Manner of wave travel. Velocities of the waves – characteristic impedance – Attenuators.

UNIT V WAVEGUIDES

12

Application of Maxwell's equations to the rectangular waveguide. TM waves in Rectangular guide. TE waves in Rectangular waveguide – Cylindrical waveguides. The TEM wave in coaxial lines. Excitation of wave guides. Guide termination and resonant cavities.

Total No of Periods : 60

TEXT BOOK:

1. John D.Ryder, "Networks, lines and fields", Prentice Hall of India, 2nd Edition, 2006.

REFERENCES:

1. E.C.Jordan, K.G. Balmain: "E.M.Waves & Radiating Systems", Pearson Education, 2006.
2. Joseph Edminister, Schaum's Series, Electromagnetics, TMH, 2007.
3. G S N Raju, Electromagnetic Field Theory and Transmission Lines, Pearson Education, 2006.

BET502

**ANALOG AND DIGITAL
COMMUNICATION**

L	T	P	C
3	0	0	3

Course Objectives:

- Brief the historical development of computing machines
- Understand the arithmetic algorithms and circuits needed to process data.
- Focus on concepts of pipelining to speed up the data processing
- Explain the organization of main memory, cache memory and virtual memory mechanisms and examine the design of I/O system
- Distinguish the approaches to control unit design – hardwired and micro programmed

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Describe the central processing unit focusing on instruction set design and data representation.

CO2: Apply arithmetic algorithms and interpret the processed data.

CO3: Appraise the control unit design and I/O system design

CO4: Recognize the principal memory technologies from a hierarchical view point with emphasis on cache memory.

CO5: Outline the design of a pipelined and superscalar processor.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W	M									
CO2	M	W	M									
CO3	M	M	M									
CO4	M	W	M									
CO5	M	M	M									

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I AMPLITUDE MODULATION SYSTEMS**12**

Need for modulation-AM modulation systems-Modulation index-Phase diagram-Power relations-Efficiency - Spectrum diagram of AM, DSB-SC & SSB systems. Generation of AM Waves: Square law modulator-Product Modulator-Switching Modulator. Detection of AM waves: Envelope detector-Coherent detector. FDM.

UNIT II ANGLE MODULATION**12**

Frequency Modulation-Transmission Bandwidth of FM signals-Frequency spectrum-Phase Modulation-relationship between FM & PM- Narrow Band FM & Wide Band FM.Generation of FM Waves: Direct method- Indirect method of FM generation.

Detection of FM waves: Ratio Detector-PLL FM demodulator- Super heterodyne Receiver.

UNIT III DIGITAL TRANSMISSION**12**

Introduction, Pulse modulation, PCM – PCM sampling, sampling rate, signal to quantization noise rate, companding – analog and digital – percentage error, delta modulation, adaptive delta modulation, differential pulse code modulation, pulse transmission – Intersymbol interference, eye patterns.

UNIT IV DIGITAL COMMUNICATION**12**

Introduction, Shannon limit for information capacity, digital amplitude modulation, frequency shift keying, FSK bit rate and baud, FSK transmitter, BW consideration of FSK, FSK receiver, phase shift keying – binary phase shift keying – QPSK, Quadrature Amplitude modulation, bandwidth efficiency, carrier recovery – squaring loop, Costas loop, DPSK.

UNIT-V SPREAD SPECTRUM AND MULTIPLE ACCESS TECHNIQUES**12**

Introduction, Pseudo-noise sequence, DS spread spectrum with coherent binary PSK, processing gain, FH spread spectrum, multiple access techniques – wireless communication, TDMA and CDMA in wireless communication systems, source coding of speech for wireless communications.

TEXT BOOK

1. Wayne Tomasi, “Electronic Communication Systems: Fundamentals Through Advanced”, Pearson Education, 2001. (UNIT I-IV Chapters- 3,4,6,7,12,13,15).
2. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley & Sons.,2001. (Unit V Chapters- 7,8).

REFERENCE BOOK

1. Blake, “Electronic Communication Systems”, Thomson Delmar Publications,2002.
2. Martin S.Roden, “Analog and Digital Communication System”, 3rd Edition, PHI,2002.

BEI501**CONTROL SYSTEMS**

L	T	P	C
3	1	0	4

Course Objectives:

- To study control problem, control system dynamics and feedback principles.
- To study time response of first and second order systems and basic state variable analysis and to do simple problems.
- To study the concept of stability and criteria for stability and to do simple problems.
- To study the frequency response through polar plots and Bode plots and Nyquist stability criteria and to do simple problems.
- To study the different types of compensators

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Outline the development of mathematical models to represent systems and their representation by transfer functions

CO2: Discuss the transient and steady state response of control systems

CO3: Practice frequency domain plots (Bode and Polar)

CO4: Analyze performance of control systems **CO5:** Design compensation networks

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M										
CO2	S	W										
CO3	M	M	W	W								
CO4	M	M	M	W								
CO5	S	W										

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Hrs

SYSTEMS AND THEIR REPRESENTATION

9+3

Basic elements in control systems–Open and closed loop system Mathematical modeling of physical systems: Transfer function model of Mechanical and Electrical systems-Block diagram

reduction techniques – Signal flow graphs-Control System components: Synchronous-Potentiometer- Transfer function of DC Servo motor and AC Servomotor, Typical application of control system in industry

TIME RESPONSE ANALYSIS 9+3

Time response–Types of test input-step, ramp, impulse and parabolic inputs– I order system response for step, ramp and impulse input and II order system Response for step input– Time domain specifications- Error coefficients–Generalized error series–Steady state error– P,PI,PID modes of feedback control.

FREQUENCY RESPONSE ANALYSIS 9+3

Frequency response – Frequency domain specifications- Correlation between frequency domain and time domain specifications–Polar plot– Bode plot-Determination of closed loop response from open loop response – Introduction to Constant M and N circles and Nichols Chart.

STABILITY OF CONTROL SYSTEM 9+3

Definition of Stability-Location of roots of Characteristics equation in S plane for stability–Routh Hurwitz criterion–Root locus Techniques–Effect of pole,zero addition–Gain margin and phase margin–Nyquist stability criterions

COMPENSATOR DESIGN 9+3

Performance criteria – Lag, lead and lag-lead networks – Cascade Compensator design using bode plots

Theory: 45 Hrs Tutorial: 15 Hrs Total: 60 Hrs

REFERENCES:

1. K.Ogata,g‘,5thedition,PearsonEducation,NewDelhi,2003/PHI.
2. I.J.Nagrath&M.Gopal,okofControlSystemsEngineering‘,5theditionNewAgeInternational Publishers,2010
3. B.C.Kuo,ms‘,&7theditionPrenticeHallofIndiaLtd.,NewDelhi,2003
4. M.Gopal,es&Design‘,2ndeditionTataMcGraw Hill,NewDelhi,2002
5. M.N.Bandyopadhyay,rolEngineeringTheoryandPractice‘ Prentice HallofIndia,2004
6. NormanS.Nise,‘ControlsystemsEngineering_4thedition Johnwileyandsons,Inc.,2005

BET5E1

STATISTICAL THEORY OF COMMUNICATION

L	T	P	C
3	1	0	4

Course Objectives:

- To understand linear time invariant system with random inputs, and optimum receiver for AWGN channel.
- To study the joint distributions of multidimensional random variables and random process
- To understand the Discrete channel models and its properties
- To understand the Continuous channel models and its properties

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Apply fundamental probability theory for real time problems

CO2: Classify random variables and random process

CO3: Analyze linear time invariant systems performance for random inputs

CO4: Demonstrate fundamental information theory concepts and source coding algorithms

CO5: Classify and analyze the discrete and continuous channel models

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M										
CO2	S	M										
CO3	S	M										
CO4	S	M	W									
CO5	S	M	W									

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Hrs

BASIC CONCEPTS OF PROBABILITY

5+1

Sets: Definition and Operations, Probability: Definition through Sets, Joint and Conditional Probabilities, Baye’s theorem

RANDOM VARIABLES

10+5

Randomvariable – Definition, Discrete and Continuous Random Variables – Probability Density

Functions, Probability Distribution Functions –Properties – Gaussian, Binominal,Poisson,Uniform,Exponential Distributionsand theirproperties – Operations on one random variable. Multiple RandomVariables: - Joint Density and Distribution Functions – Marginal and conditional distributions –Properties – Operations on multiple random variables.

RANDOM PROCESSES

10+5

Random Process – Stationary Process – Wide sense stationary and Ergodic processes– Gaussian Random Process – Markov process–Markov chain–Poisson process– Correlation: Autocorrelation, Cross Correlation and their properties – Covariance– R egression – Central Limit Theorem. Power spectral density and its properties – Cross power spectral density and its properties – Relationship between power spectrum and correlations – Wiener-Khintchine relation.

OPTIMUM FILTERING

10+2

Linear time invariant system – System transfer function – Properties – Linear systems withrandominputs – Autocorrelation and Cross Correlation of inputs and outputs – Spectral Characterization – Optimum linear time invariant systems – Matched Filter – Properties.

INFORMATION THEORY

10+2

Uncertainty Principle – Measure of information – Self information – Entropy – Definitions and Properties – Source coding theorem – Shannon-Fano coding – Huffman coding.Discrete Memoryless channels – BSC, BEC – Mutual Information – Channel capacity – Channel coding theorem. Differential entropy and Mutual Information for Continuous ensembles – channel capacity – Information capacity theorem – Implications of the information capacity theorem – Rate distortion theory.

Theory: 45 Hrs

Tutorial: 15 Hrs

Total: 60 Hrs

REFERENCES:

1. Peebles P. Z., —Probability, Random Variables and Random Signal Principles, Fourth Edition , McGraw Hill, New Delhi, 2000
2. Reza F.M. —An Introduction to information theory, McGraw Hill, New Delhi.1994.
3. JohnG.Proakis,—DigitalCommunication,McGrawHill 4thEdition,2008
4. Popoulis, —Probability, Random Variables & Stochastic Processes, McGraw Hill International Editions, Second Edition, SixthReprint, New Delhi, 1989

BET5L1

MICROPROCESSOR LABORATORY

L	T	P	C
0	0	4	2

Course Objectives:

- Introduce ALP concepts and features

- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors
- Be familiar with MASM

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Write ALP Programmes for fixed and Floating Point and Arithmetic

CO2: Interface different I/Os with processor

CO3: Generate waveforms using Microprocessors

CO4: Execute Programs in 8051

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M		M				M	M		
CO2		M	S						M	M		
CO3		M	S						M	M		
CO4	M	M	M		M				M	M		

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS

PROGRAMMING WITH 8085:

- 1.Addition and Subtraction of two 8 bit number and 16 bit numbers
- 2.Multiplication and division of two 8 bit numbers
- 3.Ascending and descending order.
- 4.Finding Largest and Smallest in an array of numbers
- 5.Code conversion of numbers.

PROGRAMMING WITH 8086

- 6.Addition and Subtraction of two 16 bit numbers
- 7.Multiplication and division of two 16 bit numbers
- 8.Finding Largest and Smallest in an array of numbers.

Total: 45 Hrs

Experiments beyond the syllabus should be conducted.

BET5L3

**COMMUNICATION ENGINEERING
LABORATORY**

L	T	P	C
0	0	4	2

Course Objectives:

- To examine the parameters of an amplitude modulated signal
- To investigate the demodulation of AM signal using envelope detector
- To study and measure received characteristics
- To become familiar with AM, FM and PM in MATLAB environment

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Demonstrate analog modulation techniques

CO2: Construct various receiver circuits

CO3: Measure and analyze receiver characteristics.

CO4: Demonstrate various pulse modulation techniques

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			W					M	M		
CO2	S		M						M	M		
CO3	S	W							M	M		
CO4	S		M						M	M		

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS

1. Amplitude Modulation and demodulation
2. Frequency Modulation and demodulation
3. Pre-emphasis & de-emphasis
4. Phase shift keying modulation and demodulation
5. Frequency shift keying modulation and demodulation
6. AM Receiver Characteristics
7. Pulse Amplitude modulation
8. Verification of sampling theorem
9. Pulse Code Modulation and demodulation
10. Line coding and decoding
11. Pulse width modulation
12. Time division multiplexing

Total:45 Hrs

Experiments beyond the syllabus should be conducted.

**MICROCONTROLLERS AND
INTERFACING
LABORATORY**

BET5L2

L	T	P	C
0	0	4	2

Course Objectives:

- Develop simple algorithms for signal processing and test them using MATLAB
- Write programs to perform computation in DSP processor using CCS.
- To design and test digital filters for signal processing.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Experiment concepts of DSP and its applications using MATLAB Software

CO2: Practice programming concepts of TMS320C54xx/67xx processor using Code Composer Studio

CO3: Develop digital filters using MATLAB and Code composer studio

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	W		S				M	M		
CO2	M	M	M	W	S				M	M		
CO3	S	M	W	W	S				M	M		

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS USING MATLAB

- 1.Simple programs by using 8051 microcontroller
a.Addition b.Subtraction
- 2.Simple programs by using 8051 microcontroller
a.Multiplication b.Division
- 3.Stepper motor interfacing with 8051 microcontroller
- 4.Keyboard interfacing with 8051 microcontroller
- 5.ADC interfacing with 8051 microcontroller
- 6.DAC interfacing with 8051 microcontroller
- 7.Seven segment LED interfacing with 8051 microcontroller
- 8.Traffic light interfacing with 8051 microcontroller
- 9.Study of PIC Microcontroller

Experiments beyond the syllabus should be conducted.

Total: 45 Hrs

BMA604

RANDOM PROCESS

L	T	P	C
3	1	0	4

Course Objectives:

- Acquire basics involved in digital communication.
- Impart knowledge of digital pulse modulation techniques.
- Learn error control coding that encompasses techniques for encoding and decoding of
- Digital data streams for reliable transmission over noisy channels.
- Learn baseband pulse transmission, Nyquist criterion and solutions.
- Study pass band transmission which deals with fundamental modulation schemes and their performance.

- Understand the fundamental carrier and symbol synchronization techniques

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Recall fundamentals of Digital communication system

CO2: Demonstrate digital pulse modulation techniques

CO3: Apply channel coding techniques for data transmission

CO4: Apply line coding and pulse shaping techniques for data transmission

CO5: Analyze digital modulation schemes.

CO6: Describe synchronization techniques.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2	S	M										
CO3		S	M	W								
CO4	S	M										
CO5	M			S								
CO6	M		M									

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I PROBABILITY AND RANDOM VARIABLES

12

Probability concepts, Random variables, Moments, Moment Generating function, Binomial, Poisson, Geometric, Negative binomial, Exponential, Gamma, Weibull distributions, Functions of random variable, Chebychev inequality.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES

12

Marginal and conditional distributions, Covariance, Correlation and regression, Transformation of random variables, Central limit theorem.

UNIT III RANDOM PROCESSES

12

Classification, Stationary and Markov processes, Binomial process, Poisson process, Sine-wave process, Ergodic processes.

UNIT IV CORRELATION FUNCTION

12

Auto correlation for discrete and continuous processes, Cross correlation functions, Correlation integrals, Applications, Linear systems with random inputs.

UNIT V SPECTRAL DENSITIES

12

Power spectral density, Cross spectral density, Applications to linear systems with random inputs.

Total No of periods: 60

Text Books:

1. Kapur J.N. and Saxena H.C., " Mathematical statistics ", S.Chand & Company Ltd, New Delhi, (1997).
2. O Flynn M., "Probability, Random variables and random processes", Harper and Row Publishers, New York, (1982).

References:

1. Peebles Jr., " Probability, Random variables and random signal Principles ", McGraw Hill Publishers, (1987).
2. Ochi M.K., " Applied probability and stochastic processes ", John Wiley & Sons, New York,(1990).

BEC6023

ANTENNA AND WAVE PROPAGATION

L	T	P	C
3	0	0	3

Course Objectives:

- To make the students to understand the different layers of ISO /OSI model and TCP/IP Network IEEE standards.
- To understand IP addressing methods and QOS parameters.
- To know the functions and congestion control mechanism of TCP.
- To know about application layer and network security.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the networks, topologies and layers of OSI model, compare with TCP/IP model.

CO2: Classify error control and flow control techniques and types of LAN technologies.

CO3: Analyze different routing algorithms and methods to improve QOS.

CO4: Summarize the transport layer protocols and congestion controls methods.

CO5: Describe various application layer services and cryptographic techniques.

CO/PO Mapping	
(S/M/W indicates strength of correlation)	S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	W	S										
CO3	M											
CO4	S	S			M							
CO5	M	M										

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I BASIC ANTENNA CONCEPTS

12

Radiation Patterns, Beam solid angle, radiation intensity, Directivity, effective aperture, Antenna field zones, Polarization, impedance, cross field, Poynting vector. Friis Transmission formula, Duality of Antennas, Antenna and Transmission line, Radiation from a dipole antenna, Antenna temperature System temperature.

UNIT II POINT SOURCES

12

Definition, Power patterns, Array of two point sources – Pattern multiplication, Broad side array, End fire array, n-isotropic array, Evaluation of null directions and maxima, Amplitude distributions.

UNIT III SMALL ANTENNAS

12

Halfwave dipole antenna radiated fields of short dipole, small loop and helical Antenna, monofilar- multifilar helix. Radiation resistance, Directivity and Design Feature. Half wave dipole: radiated fields and other feature.

UNIT IV SPECIAL ANTENNAS

12

Yagi uda Antenna, Tumstile antenna, Log periodic antenna, Phased array, rhombic antenna, Horn antenna, Reflector antennas and their feed systems, Micro strip antenna, Impedance and antenna measurements; Selection of antenna based on frequency of operation and application.

UNIT V WAVE PROPOGATION

12

Ground wave propagation, Troposphere wave, wave- tilt of the surface wave, Ionosphere propagation – effective permittivity and Conductivity of ionized gas, Reflection – Refraction of

waves from ionosphere, regular – irregular variation of Ionosphere, earth magnetic field, Faraday rotation, wave propagation in the Ionosphere. Critical frequency and Space propagation, Diversity reception.

TEXT BOOK:

1. John D.Krauss, “Antennas, “ II edition, McGraw-Hill International edition, 1988.

REFERENCES:

1. Edward C.Jordan, Keith G.Balmain, “Electromagnetic waves and Radiating systems”, Prentice Hall of India 1Td, 1993.
2. Balanis E.S. “Antenna Theory Analysis and Design Technology 1982.
3. P.E – Collins “Antennas and Radio Propagation “ McGraw-Hill 1985.

BEC601 COMPUTER COMMUNICATION AND NETWORKS

L	T	P	C
3	0	0	3

Course Objectives:

- Explain basic concepts and definitions in measurement.
- Describe the bridge configurations and their applications.
- Elaborate discussion about the importance of signal generators and analyzers in measurements.
- Exposure to various data acquisition system.

Course Outcomes:

After successful completion of this course, the students should be able to

- CO1:** Recognize the evolution and history of units and standards in measurements.
- CO2:** Identify the various parameters that are measurable in electronic instrumentation
- CO3:** Employ appropriate instruments to measure given sets of parameters.
- CO4:** Practice the construction of testing and measuring set up for electronic systems.
- CO5:** Relate the usage of various instrumentation standards.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2	S	M										
CO3	S	S	W									
CO4		S	M	W								
CO5	M	M	M									

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I DATA COMMUNICATION: 9

ISO reference model, Open system standard, Transmission of Digital Data – Electrical Interface, MODEMS, Line Configuration, Encoding and Decoding, Multiplexing, Error Detection and Correction (CRC).

UNIT II DATA LINK CONTROL AND PROTOCOLS: 9

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 III LOCAL AREA NETWORKS: 9

IEEE 802 standards, LLC, MAC layer protocols – CSMA/CD Ethernet, Token Bus, Token Ring, FDDI, Distributed Queue Dual Bus, Switched Multimega Bit Data Service.

UNIT IV WIDE AREA NETWORKS: 9

Circuit Switch packet Switch, Message Switching, X .25 Protocols, Architecture And Layers of Protocol, Frame Delay, ISDN and ATM Protocol, Internet working Device, Repeater, Bridge, Routes and Gateways, Routing Algorithms.

UNIT V UPPER OSI LAYERS: 9

Session layer protocols, Presentation layer – Data Security, Encryption/Decryption, Authentication, Data Composition, Application layer protocols – MHS, File transfer, Virtual terminal, CMIP.

Total No of Periods:45**TEXT BOOK:**

1. Behrus A. Forouzan etal, “Data Communication and Networking”, 2nd Edition, Tata McGraw-Hill, 2000.

REFERENCES:

1. William Stallings, “Data and Computer Communication”, Fifth Edition, Prentice Hall of India,1997.
2. Andrew S.Tanenbaum, “Computer networks”, Third Edition, prentice Hall of India, 1996.

BET603 TELECOMMUNICATION SWITCHING SYSTEM

L	T	P	C
3	0	0	3

Course Objectives:

- To impart knowledge on basics of antenna theory.
- To study antenna arrays
- To study aperture antennas
- To learn special antennas such as frequency independent and broad band antennas.
- To understand various techniques involved in various antenna parameter measurements.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Define various antenna parameters

CO2: Analyze radiation patterns of antennas

CO3: Evaluate antennas for given specifications

CO4: Illustrate techniques for antenna parameter measurements

CO5: Discuss radio wave propagation

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M									
CO2	S	S	W	W								
CO3	M	M	S	M	W							
CO4	M		W									
CO5	S	M										

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Introduction-Message switching-Circuit switching-Manual switching-Functions of switching system- Strowger step by step system-Register translator-Senders-Distribution frames-Cross bar systems-General trunking-Electronic switching-Reed electronic systems-Digital switching systems.

UNIT II TIME DIVISION SWITCHING 9

Introduction-Space and time switching-Time division switching networks-grades of services-Time division swithching networks-non blocking networks-synchronization.

UNIT III TELECOMMUNICATION TRAFFIC 9

Introduction-Unit of traffic-Congestion-Traffic measurement-A mathematical model-Local call systems-Queuing systems.

UNIT IV TELECOMMUNICATION SIGNALLING 9

Introduction-Customer line signaling- Audio frequency junction and trunk circuits-FDM carrier systems-PCM signaling- Inter register signaling- Common channel signaling principles-CCITT signaling, CCITT signaling, Digital customer line signaling.

UNIT-V TELECOMMUNICATION NETWORKS 9

Introduction-Analog networks-Integrated digital networks-Integrated service digital networks-Cellular radio networks-Intelligent networks-Private networks-numbering-charging-Routing-Network management.

Total No of Periods : 45

TEXTBOOK:

1. J.E FLOOD, "telecommunication swithching ,traffic and networks" Pearson education.

REFERENCE BOOK:

1. T.V.SWAMINATHAN,Telecommunication Swithching System & Networks,PHI.

BET601

MICROWAVE ENGINEERING

L	T	P	C
3	0	0	3

Course Objectives:

- To create an awareness on Engineering Ethics and its use in ones profession
- To instill moral values, social values and loyalty
- To provide an insight into ones professional rights and a view of professional ethics in the global context

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Understand the ethical theories and concepts

CO2: Understanding an engineer’s work in the context of its impact on society

CO3: Understand and analyze the concepts of safety and risk

CO4: Understand the professional responsibilities and rights of Engineers

CO5: Understand the concepts of ethics in the global context

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						M	M	S	M			
CO2						M	M	S	M			
CO3						M	M	S	M			
CO4						M	M	S	M			
CO5						M	M	S	M			

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I MICROWAVE NETWORK THEORY

9

Introduction – Symmetrical Z and Y matrices for reciprocal network – Scattering matrix representation of multi port network properties of S-parameters – S matrix of a two port network with mismatched load – Comparison between [S] - [Z] and [Y] matrices –Relationship between Y-Z and ABCD parameters with S parameters – Numerical problems.

UNIT II MICROWAVE PASSIVE DEVICES

9

Coaxial connectors and adapters – Wave guide choke flanges – Matched terminations –Short circuit plunger – Rectangular to circular wave guide transition – Tuning screws –Wave guide corners – Bends and twists – Windows – Coaxial line to wave guide adapters– Coupling loops and coupling aperture – Attenuators – Phase shifters – Wave guide tees– E plane tee – H plane tee – Magic tee and their applications – Isolators – Circulators –Directional couplers – Scattering matrix derivation for all components – Numerical problems.

UNIT III MICROWAVE VACCUM TUBE DEVICES

9

Introduction – Two cavity klystron amplifier – Mechanism and mode of operation –Power output and efficiency – Mode curve – Equivalent circuit and voltage gain – Beam loading –

Applications – Reflex klystron oscillator – Mechanism and mode of operation Power output – Efficiency – Mode curve – Equivalent circuit – Electronic admittance – Modulation of reflex klystron – Applications – TWT amplifier – Principle of operation gain and applications – Magnetron oscillator – Hull cut-off voltage mechanism of operation – Mode separation – Phase focusing – Power output and efficiency – Applications – Numerical problems.

UNIT IV MICROWAVE SOLID STATE DEVICES AND CIRCUITS 9

Microwave diodes – Crystal diode – Schottky diode – Harmonic mixer – PIN diode – Operation switches – Phase switches and attenuators – Gunn diode – Mode of operation – Oscillator circuit – IMPATT diodes – Mechanism of operation – Application as oscillator and amplifier – Tunnel diodes oscillator / amplifiers – Varactor diode – VCO – Parametric amplifier – Microwave transistors – Unipolar and bipolar – Applications – Numerical problems.

UNIT V MICROWAVE MEASUREMENTS 9

Introduction – Tunable detector – Slotted line carriage – VSWR meter – Spectrum analyzer – Network analyzer – Power measurements – Schottky barrier diode sensor – Bolometer sensor – Power sensor – High power measurement – Insertion loss and attenuation measurement – VSWR measurement – Low and high VSWR – Impedance measurement – Frequency measurement – Measurement of cavity Q – Dielectric measurement of a solid by wave-guide method – Antenna measurement – Radiation pattern – Phase and gain.

TEXT BOOK

1. Annapurna Das, Sisir K. Das, “Microwave Engineering”, TMH Co., Ltd., 1999.Reprint 2001.

REFERENCES

1. Collin R.E., “Foundation of Microwave Engineering”, 2nd Edition, TMH, 1992.
 2. Samuel Y. Liao, “Microwave devices and Circuits”, PHI Pvt Ltd., 1995.

BEC6L1 COMPUTER COMMUNICATION AND NETWORKS LAB

L	T	P	C
0	0	4	2

Course Objectives:

- To analyze the radiation pattern characteristics of different antennas.
- To become familiar with various modulation techniques.
- To analyze the performance of block codes and cyclic codes.
- To study the performance of spread spectrum techniques.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Assess the performance of source coding algorithms

CO2: Generate pulse modulation signals

CO3: Implement and analyze various digital modulation schemes

CO4: Apply channel coding techniques for data transmission

CO5: Experiment special modulation schemes.

CO6: Design and analyze radiation pattern of antenna.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W	M		M	W			M			
CO2	M	W	M		M	W			M			
CO3	M	W	M		M	W			M			
CO4	M	W	M		M	W			M			
CO5	M	W	M		M	W			M			
CO6	M	W	M		S	W			M			

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS

1. PC to PC Communication Parallel Communication using 8 bit parallel cable
Serial communication using RS 232C
2. Ethernet LAN protocol: To create scenario and study the performance of CSMA/CD protocol through simulation
3. Token bus and token ring protocols: To create scenario and study the performance of token bus and token ring protocols through simulation
4. Wireless LAN protocols: To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
5. Implementation and study of stop and wait protocol
6. Implementation and study of Goback-N and selective repeat protocols
7. Implementation of distance vector routing algorithm
8. Implementation of Link state routing algorithm
9. Implementation of Data encryption and decryption
10. Transfer of files from PC to PC using Windows / Unix socket processing

Total:45 Hrs

Experiments beyond the syllabus should be conducted.

BET6L1 RF AND MICROWAVE ENGINEERING LABORATORY

L	T	P	C
0	0	4	2

Course Objectives:

- To understand the working principle of various communication protocols.
- To analyze the various routing algorithms.
- To know the concept of data transfer between nodes.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Analyze performance of various communication protocols.

CO2: Compare routing algorithms.

CO3: Practice packet /file transmission between nodes.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S		W	M				M	M		

CO2	M		M	W	M				M	M		
CO3	M	M			M				M	M		

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS

- 1.Characteristics of Reflex klystron oscillator.
2. Characteristics of Gunn diode oscillator.
3. Study of power distribution in directional coupler, E/H plane Tee, Magic Tee.
4. Radiation pattern of Horn Antenna.
- 5.Frequency measurement.
6. Impedance measurement by slotted line method.
7. Design of Attenuators using simulation tool.
8. Design of match filters.
- 9.Design of higer order filters.
10. Impedance matching experiment.

Experiments beyond the syllabus should be conducted.

Total: 45 Hrs

BET6L2

**OBJECT ORIENTED
PROGRAMMING LAB**

L	T	P	C
0	0	4	2

Course Objectives:

- Develop hardware solutions for simple applications.
- Learn to work in a team.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Apply knowledge of basic science and engineering to electronics and communication engineering problems.

CO2: Identify, formulate simple problem statements and find solutions.

CO3: Implement the hardware and test.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M									
CO2		S	M	M								
CO3			S	M								

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS

I. C++ PROGRAMMING

1. Simple C++ program
2. Function overloading.
3. Operator overloading.
4. Inheritance.
5. Virtual functions and dynamic binding.
6. Templates.
7. File handling.
8. Exception handling.

II. JAVA PROGRAMMING

1. Simple Java Programs.
2. Inheritance.
3. Event handling programs.

BET701

VLSI DESIGN

L	T	P	C
3	1	0	4

Course Objectives:

- To learn basic CMOS Circuits.
- To learn CMOS process technology.
- To learn techniques of chip design using programmable devices.
- To learn the concepts of designing VLSI Subsystems.
- To learn the concepts of modeling a digital system using Hardware Description Language.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Identify the various IC fabrication methods.

CO2: Express the Layout of simple MOS circuit using Lambda based design rules.

CO3: Apply the Lambda based design rules for subsystem design.

CO4: Differentiate various FPGA architectures.

CO5: Design an application using Verilog HDL.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	S											
CO3	S		M									
CO4		S		W								
CO5		S		M								

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

MOS TRANSISTOR THEORY

09

MOSFET– Enhancement mode & Depletion mode – Fabrication – NMOS, PMOS – CMOS fabrication – P-well, N-well, Twin-Tub, SOI – BiCMOS Technology –Comparison with CMOS.

MOS CIRCUITS AND DESIGN

09

Basic Electrical properties of MOS circuits – DC Equations, NMOS & CMOS inverter –Second

Order Effects– Basic circuit concepts-Sheet resistance-Area Capacitances-Capacitance calculations-Inverter delays–Scaling of MOS Devices –Scaling Models and Scaling Factors-MOS layers – Stick diagram – NMOS Design Style – CMOS Design style – lambda based design rules– Simple Layout examples

SUBSYSTEM DESIGN & LAYOUT

09

Switch Logic – Pass transistors and transmission gates – Two input NMOS, CMOS gates: NOT– NAND– NOR gates – Other forms of CMOS logic – Static CMOS logic-Dynamic CMOS logic – Clocked CMOS logic - Precharged domino CMOS logic – Structured design of simple Combinational logic design– Multiplexers – Clocked sequential circuits – Two phase clocking – D-Flip-flop-Charge storage - Dynamic register element –Dynamic shift register

PROGRAMMABLE LOGIC DEVICES

09

Programmable Logic Devices – PLA , PAL – Finite State Machine design using PLA – Introduction to FPGA – FPGA Design flow –Architecture – FPGA devices: Xilinx XC 4000 – Altera cyclone III

VERILOG HDL DESIGN PROGRAMMING

09

Basic concepts: VLSI Design flow, Modeling, Syntax and Programming, Design Examples:Combinational Logic – Multiplexer, Decoder/Encoder, Comparator, Adders, Multipliers, Sequential logic- Flip Flops, Registers, and Counters, Memory- Introduction to back end tools.

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Douglas A.Pucknell, K. Eshragian,—Basic VLSI Design, Third edition,PHI,2009
2. Neil.H.E.Weste,KamaranEshraghian,—PrinciplesofCMOSVLSIDesign,Second Edition, AddisonWesleyPublications,2002
3. SamirPalnitkar,—VerilogHDL–GuidetoDigitaldesignandsynthesis,SecondEdition Pearson Education,2009
4. WayneWolf, —ModernVLSIDesign,PearsonEducation , 2003

BBA701

PRINCIPLES OF MANAGEMENT AND PROFESSIONAL ETHICS

L	T	P	C
3	1	0	4

Course Objectives:

- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
- To understand the different kind of losses, signal distortion, SM fibers.
- To learn the various optical sources, materials and fiber splicing.

- To learn the fiber optical receivers and noise performance in photo detector.
- To learn link budget, WDM, solitons and SONET/SDH network.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1:Demonstrate an understanding of optical fiber communication link, structure, propagation and transmission properties of an optical fiber.

CO2:Estimate the losses and analyze the propagation characteristics of an optical signal in different types of fibers

CO3:Describe the principles of optical sources and power launching -coupling methods.

CO4:Compare the characteristics of fiber optic receivers.

CO5:Design a fiber optic link based on budgets and assess the different techniques to improve the capacity of the system.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M									
CO2		S										
CO3	S	M										
CO4	S	M										
CO5	S				W							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I MANAGEMENT FUNCTIONS & STRUCTURE

9

Management – Definition - Basic Functions – Contributions of Taylor & Fayol. Types of Structures – Line, Staff, Functional, Committee, Project & Matrix – Structures. Departmentalization – Centralization - Decentralization – Span of Control. Management by Objectives, Management by Exception

UNIT II MANAGEMENT OF ORGANISATION

9

Forms of Business / Industrial Ownership – Sole Trader, Partnership, Company. Performance Appraisal – Basic Principles – Pitfalls – Methods to Overcome. Industrial Safety –Causes of

Accidents – Cost of Accidents – How to minimize Accidents. Plant Layout & Maintenance – Need, Types & Managerial Aspects.

UNIT III ORGANISATIONAL BEHAVIOUR 9

OB – Definition – Nature & Scope – Contributing Disciplines – Importance of OB to Managers. Personality – Definition – Theories – Factors Influencing Personality. Motivation – Definition Theories. Theory X & Y – Transactional Analysis. Morale & Job Satisfaction – Factors Influencing Job Satisfaction.

UNIT IV GROUP DYNAMICS 9

Group – Definition – Types – Determinants of Group Cohesiveness. Communication – Process – Barriers – Effective Communication. Leadership Theories – Factors Contributing To Effective Leadership. Role of Trade Union In Organizations – Functions of Trade Union – Why Trade Union Is Required?–Types of trade union.

UNIT V PROFESSIONAL ETHICS 9

Ethics in workplace- Formulation of Ethics- Managerial Ethics- Managing Ethical Behaviour- codes of Ethics – Encouraging Ethical Behaviour- Social Responsibility-Spirituality.

Total No of Periods: 45

TEXT BOOKS:

- 1.PrinciplesofManagement-L.M.Prasad,Sultanchand&Sons.
- 2.OrganisationalBehaviour-L.M.Prasad,Sultanchand&Sons.
3. Management Today Principles & Pracitce - Gene Burton & Manab Thakur,

REFERENCES:

- 1.OrganisationalBehaviour-StephenRobbins,PrenticeHallIndia.
- 2.OrganisationalBehaviour-FredLuthans,FredLuthans,TataMcGrawHill
3. Management Principles - Koontz & Weirich, Tata McGraw Hill Publications

BET702 CELLULAR MOBILE COMMUNICATION

L	T	P	C
3	1	0	4

Course Objectives :

- To introduce advanced wireless communication systems.
- To learn the wireless channel characteristics and models
- To import knowledge of signal processing techniques for wireless communication.
- To understand the fundamentals of cellular communication system.
- To acquire knowledge of satellite communication system.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the various standards used in Wireless communication

CO2: Describe different propagation models

CO3: Classify different Equalization & diversity techniques used in wireless communication

CO4: Apply signal processing for wireless communication

CO5: Demonstrate cellular communication techniques

CO6: Summarize satellite communication system

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	W											
CO2	S											
CO3	M											
CO4	S	M		M								
CO5	M	W										
CO6	M	W										

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT I INTRODUCTION TO WIRELESS MOBILE COMMUNICATIONS 12

History and evolution of mobile radio systems, Types of mobile wireless services/systems – Cellular, WLL, Paging, Satellite systems, Standard, Future trends in personal wireless systems.

UNIT-II CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS 12

Cellular concept and frequency reuse, Multiple Access Schemes, Channel assignment and handoff, Interface and system capacity, Trunking and Erlang capacity calculations.

UNIT-III MOBILE RADIO PROPAGATION

12

Radio wave propagation issues in personal wireless systems, Propagation models, Multipath fading and based and impulse models, Parameters of mobile multipath channels, Antenna systems in mobile radio.

UNIT-IV MODULATION AND SIGNAL PROCESSING **12**

Analog and digital modulation techniques, Performance of various modulation techniques – Spectral efficiency, Error rate, Power Amplification, Equalization/Rake receiver concepts, Diversity and Space-time processing, Speech coding and channel coding.

UNIT-V SYSTEM EXAMPLES AND DESIGN ISSUES **12**

Multiple Access Techniques – FDMA, TDMA and CDMA systems, Operational systems, Wireless networking, design issues in personal wireless systems.

Total No of Periods : 60

TEXT BOOK:

1. K. Feher, Wireless Digital Communication, Prentice Hall of India, New Delhi, 1995.

REFERENCES:

1. T.S. Rappaport, Wireless Communication; Principles and Practice, Prentice Hall, NJ, 1996.
2. W.C.Y. Lee, Mobile Communication Engineering; Theory and Application, Second Edition, McGraw-Hill International, 1998.

**TELECOMMUNICATION SYSTEM
MODELLING**

BET704

L	T	P	C
3	1	0	4

Course Objectives:

- To impart knowledge on basics of microwave electron beam devices and their applications in X band frequency.
- Understand Microwave sources and amplifiers.
- To study Microwave semiconductor devices & applications
- To become familiar with the concepts of Microwave Integrated Circuits.
- To know the concepts of Microwave Measurements

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Describe the various waveguide components.

CO2: Classify the microwave tubes(Linear beam tubes and Crossed field tubes) .

CO3: Discuss the various microwave semiconductor devices as oscillators for their Performance.

CO4: Design of waveguide components and microwave transmission lines for a given set of parameters.

CO5: Identify the measurement techniques for different parameters like VSWR, impedance, frequency, power of microwave sources and loads.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W										
CO2	S	M										
CO3	M	W										
CO4	M	S	M	W								
CO5	S	M	M	S								

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

UNIT-I TELECOMMUNICATION SYSTEM MODELING 12

Simulation of Random Variables and Random Process Generation of random number and sequences, Gaussian and uniform random numbers, Correlated random sequences, Testing of random numbers generators, Stationary and uncorrelatedness, Goodness of fit test.

UNIT-II MODELING OF COMMUNICATION SYSTEMS 12

Radio frequency and optical sources, Analog and Digital signals, Communication channel and models, Free space channels, Multipath channel and discrete channel noise and interference.

UNIT-III ESTIMATION OF PERFORMANCE MEASURE FOR SIMULATION 12

Quality of estimator, Estimation of SNR, Probability density function and bit error rate, Monte Carlo method, Importance sampling method, Extreme value theory.

UNIT-IV SIMULATION AND MODELING METHODOLOGY 12

Simulation environment, Modeling considerations, Performance evaluation techniques, Error source simulation Validation.

UNIT-V CASE STUDIES

12

Simulations of QAM digital radio link in a fading environment, Light wave communication link and satellite system.

Total No of Periods : 60

TEXT BOOKS:

1. MC.Jeruchim, P.Balaban and K.Samshanmugam, "Simulation of Communication Systems, Plenum press, New York, 1992.
2. Averill.M.Law and W.David Kelton, "Simulation Modeling and Analysis, McGraw-Hill, 1991.

REFERENCES:

1. Geoffrey Gorden, "System Simulation", Prentice Hall of India, 2nd Edition, 1992.
2. W.Turin, "Performance Analysis of Digital Communication Systems", Computer Science Press, New York, 1990.
3. Jerry banks and John S.Carson, "Discrete Event System Simulation", Prentice Hall of India, 1984.

BET7E1

PRINCIPLES OF MANAGEMENT

L	T	P	C
3	0	0	3

Course Objectives:

- To study the importance and functions of management in an organization
- To study the importance of planning and also the different types of plan
- To understand the different types of organization structure in management
- To understand the basis and importance of directing and controlling in management
- To understand to the importance of corporate governance and social responsibilities.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Understand the concepts of management, administration and the evolution of management thoughts.

CO2: Understand and apply the planning concepts.

CO3: Analyze the different organizational structures and understand the staffing process.

CO4: Analyze the various motivational and leadership theories and understand the communication and controlling processes.

CO5: Understand the various international approaches to management

CO/PO Mapping									
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(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							M		S		S	W
CO2								M	S	M		M
CO3							M	M	M			W
CO4									M	M	M	M
CO5									S			M

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

MANAGEMENT CONTEXT 9

Management – Definition – Importance – Functions – Skills required for managers - Roles and functions of managers – Science and Art of Management –Management and Administration. Evolution of Classical, Behavioral and Contemporary management thoughts.

PLANNING 9

Nature & Purpose – Steps involved in Planning – Forms of Planning – Types of plans – Plans at Individual, Department and Organization level - Managing by Objectives. Forecasting – Purpose – Steps and techniques. Decision-making – Steps in decision making.

ORGANISING 9

Nature and Purpose of Organizing - Types of Business Organization - Formal and informal organization – Organization Chart – Structure and Process – Strategies of Departmentation– Line and Staff authority – Benefits and Limitations. Centralization Vs De-Centralization and Delegation of Authority. Staffing – Manpower Planning – Recruitment – Selection – Placement – Induction.

DIRECTING & CONTROLLING 9

Nature & Purpose – Manager Vs. Leader - Motivation - Theories and Techniques of Motivation. Leadership – Styles and theories of Leadership. Communication – Process– Types – Barriers – Improving effectiveness in Communication. Controlling – Nature – Significance – Tools and Techniques.

CONTEMPORARY ISSUES IN MANAGEMENT

9

Corporate Governance Social responsibilities – Ethics in business – Recent issues. American approach to Management, Japanese approach to Management, Chinese approach to Management and Indian approach to Management.

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Tripathy PC And Reddy PN, —Principles of Management, Tata McGraw-Hill, 4th Edition, 2008.
2. Dinkar Pagare, —Principles of Management, Sultan Chand & Sons, 2000.
3. Kanagasapathi. P (2008) —Indian Models of Economy, Business and Management, Prentice Hall of India, New Delhi, ISBN: 978-81-203-3423-6.
4. G.K.Vijayaraghavan and M.Sivakumar, —Principles of Management, Lakshmi Publications, 5th Edition, 2009.
5. Harold Koontz & Heinz Weihrich, —Essentials of Management – An International perspective, 8th edition. Tata McGraw-Hill, 2009.
6. Charles W.L. Hill and Steven L McShane – —Principles of Management, Tata Mc Graw-Hill, 2009.

BET7L2

VLSI LABORATORY

L	T	P	C
0	0	4	2

Course Objectives:

- Understand the use of front-end ASIC/FPGA Tools.
- To develop code and test digital circuits on FPGA.
- To understand back-end design by design by develops simple circuits on Microwind.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Demonstrate a clear Understanding in hardware design language Verilog HDL.

CO2: Model a digital circuit using hardware description language Verilog HDL and validate its functionality.

CO3: Design and implement a sub system on a FPGA board.

CO4: Apply lambda based design rules & solve problems in the design of CMOS logic circuits.

CO5: Demonstrate hands-on skills of using CAD tools in VLSI design.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		M	S		S							
CO3			S	W	M							
CO4		M	S	M								
CO5					S							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS

VERILOG EXPERIMENTS

1. Design and implementation of logic gates
2. Design and implementation of Half adder and full adder
3. Design and implementation of Half subtractor and full subtractor
4. Design and implementation of simple Arithmetic functions
5. Design and implementation of SOP and POS expression
6. Design and implementation of Boolean expressions
7. Design and implementation of simple logic circuits
8. Design and implementation of MUX & DEMUX – 4x1 and 8x1
9. Design and implementation of combinational circuits
 - Encoder and decoder – 2x4 and 3x8
 - Magnitude comparator
 - Code converters
10. Design and implementation of counters
11. Design and implementation of flipflops
12. FPGA implementation of ADC
13. FPGA implementation of LCD module
14. FPGA implementation of traffic light controller

Total: 45 Hrs

Experiments beyond the syllabus should be conducted.

BET7L1

**SYSTEM MODELLING AND
SIMULATION LAB**

L	T	P	C
0	0	4	2

Course Objectives:

- To study the performance parameters of optical source and detector.
- To become familiar with different modes.
- To analyze the radiation pattern of horn and microstrip antennas.
- To understand the characteristics of different microwave components.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Demonstrate the characteristics of Microwave sources and directional couplers

CO2: Analyze the radiation patterns of conventional and Micro strip antennas.

CO3: Demonstrate a fiber optic communication link and analyze its frequency responses.

CO4: Determine the characteristics of optical source and detector.

CO5: Identify the optical loss characteristics in optical fiber that affect the performance of transmission systems.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M							M			
CO2	M		M						M			
CO3	M	S							M			
CO4	M		S			M			M			
CO5	M		S			M			M			

Course Assessment methods:

DIRECT		INDIRECT	
1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS

- 1. Embedded System Design with FPGA using HDL-
 - A. Simple Alarm System
 - B. Parity Checker
 - C. Scrolling Message Display
 - D. Multimode Calculators.
- 1. Logical Design- advanced Verification and Digital Implementation and PCB Design Using SPICE.
- 2. Modeling and Prototyping with Simulink and Code Composer Studio with DSK.
- 3. Graphical Simulation and Modeling Using Mathematical Tools.
- 4. Simulation of a communication system like Delta Modulation – Adaptive Delta Modulation – QPSK – Constellation Diagrams using simulink.

Total: 45 Hrs

Experiments beyond the syllabus should be conducted.

BEC7L1

ELECTRONICS DESIGN LAB

L	T	P	C
0	0	6	2

Course Objectives:

- Learn the use of simulation tools such as PSPICE, MATLAB, CCS, VLSI- Front end and back end tools.
- Develop simple algorithms for realizing real time problems.
- Build hardware / software problems for simulation using appropriate tools.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Apply knowledge of basic science and engineering to electronics and communication engineering problems

CO2: Implement the simple applications and verify using modern simulation tools.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M	M								
CO2			S	M	M							

Course Assessment methods:

DIRECT	INDIRECT
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1.	Observation Books	1.	Student Exit Survey
2.	Lab Records	2.	Faculty Survey
3.	Viva-Voce	3.	Industry
4.	Model Exam	4.	Alumni
5.	End Semester Exam		

LIST OF EXPERIMENTS

1. Design of high current linear variable DC Power supply.
2. Design of Switched Mode power supply.
3. Design of AC / DC Voltage regulator using SCR.
4. Design of Programmable Logic controller.
5. Design of process control timer.
6. Design of AM / FM transreceiver
7. Design of wireless data Modems
8. Design of Instrumentation amplifier and Digital Indicator
9. PCB layout Design using CAD
10. Microprocessor based system design.
11. DSP based system design.

Experiments beyond the syllabus should be conducted.

Total: 45 Hrs

BET8P1

PROJECT WORK

L	T	P	C
0	0	18	6

Course Objectives:

- Learn to work as a member of a project team.
- Understand project management tasks.
- Develop a hardware / software solution for a real-time, industry relevant problem.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Apply knowledge of basic science and engineering to electronics and communication engineering problems

CO2: Recognize the real world applications and to solve with core engineering knowledge.

CO3: Analyze and work on multidisciplinary tasks

CO4: Choose latest tools, software and equipment to solve real world problems

CO5: Identify, formulate, and model engineering equipment

CO/PO Mapping			

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M									
CO2		S	M	M								
CO3		M	M	S	S							
CO4			S	S	M							
CO5				S	S					M	M	

Course Assessment methods:

DIRECT		INDIRECT	
1.	Project Review	1.	Student Exit Survey
2.	Project Report	2.	Faculty Survey
3.	End Semester Exam	3.	Industry
		4.	Alumni

Every student will be required to undertake a suitable project work in Industry / Department during VIII semester in consultation with the Head of the Department and the faculty guide and submit the project at the end of the Semester on dates announced by the Institute/Department.

BETE101 TOTAL QUALITY MANAGEMENT

L	T	P	C
3	0	0	3

Course Objectives:

- Acquire knowledge on TQM concepts
- Acquire knowledge on quality systems
- Develop skills to use TQM tools for domain specific applications

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Understand quality concepts and philosophies of TQM

CO2: Apply TQM principles and concepts of continuous improvement

CO3: Apply and analyze the quality tools, management tools and statistical fundamentals to improve quality

CO4: Understand the TQM tools as a means to improve quality

CO5: Remember and understand the quality systems and procedures adopted

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						S			M		S	M
CO2						S			M		S	W
CO3						S			M		S	M
CO4						M			S		S	S
CO5						M			M		S	S

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

INTRODUCTION

09

Definition of Quality, Dimensions of Quality, Quality costs, Top Management Commitment, Quality Council, Quality Statements, Barriers to TQM Implementation, Contributions of Deming, Juran and Crosby, Team Balancing

TQM PRINCIPLES

09

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Continuous Process Improvement, 5S, Kaizen, Just-In-Time and TPS

STATISTICAL PROCESS CONTROL

09

The seven tools of quality, New seven Management tools, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Concept of six sigma.

TQM TOOLS

09

Quality Policy Deployment (QPD), Quality Function Deployment (QFD), Benchmarking, Taguchi Quality Loss Function, Total Productive Maintenance (TPM), FMEA

QUALITY SYSTEMS

09

Need for ISO 9000 and Other Quality Systems, ISO 9001:2008 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, ISO 14001:2004

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Dale H.Besterfiled, —Total Quality Managementl, Pearson Education
2. James R.Evans & William M.Lidsay, —The Management and Control of Qualityl, South-Western (Thomson Learning), 2008.
3. Feigenbaum.A.V. —Total Quality Managementl, McGraw Hill
4. Oakland.J.S. —Total Quality Managementl, Butterworth – Heinemann Ltd., Oxford

BETE102

OPERATIONS RESEARCH

L	T	P	C
3	0	0	3

Course Objectives:

- Apply knowledge of OR techniques to domain specific industrial situations to optimize the quality of decisions
- Conduct investigations by the use of OR techniques

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Apply linear programming model and assignment model to domain specific situations

CO2: Analyze the various methods under transportation model and apply the model for testing the closeness of their results to optimal results

CO3: Apply the concepts of PERT and CPM for decision making and optimally managing projects

CO4: Analyze the various replacement and sequencing models and apply them for arriving at optimal decisions

CO5: Analyze the inventory and queuing theories and apply them in domain specific situations.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S										
CO2		S										
CO3	M	M				M						
CO4		S										
CO5	M	S										

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey

2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

LINEAR MODEL

09

The phases of OR study – formation of an L.P model – graphical solution – simplex algorithm – artificial variables technique (Big M method, two phase method), duality in simplex

TRANSPORTATION AND ASSIGNMENT MODELS

09

Transportation model – Initial solution by North West corner method – least cost method – VAM. Optimality test – MODI method and stepping stone method Assignment model – formulation – balanced and unbalanced assignment problems

PROJECT MANAGEMENT BY PERT & CPM

09

Basic terminologies – Constructing a project network – Scheduling computations – PERT - CPM– Resource smoothing, Resource leveling, PERT cost

REPLACEMENT AND SEQUENCING MODELS

09

Replacement policies - Replacement of items that deteriorate with time (value of money not changing with time) – Replacement of items that deteriorate with time (Value of money changing with time) – Replacement of items that fail suddenly (individual and group replacement policies) Sequencing models- n job on 2 machines – n jobs on 3 machines – n jobs on m machines, Traveling salesman problem

INVENTORY AND QUEUING THEORY

09

Variables in inventory problems, EOQ, deterministic inventory models, order quantity with price break, techniques in inventory management Queuing system and its structure – Kendall's notation – Common queuing models - M/M/1: FCFS/ ∞/∞ - M/M/1: FCFS/n/ ∞ - M/M/C: FCFS/ ∞/∞ - M/M/1: FCFS/n/m

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Taha H.A., —Operation Research, Pearson Education
2. Hira and Gupta —Introduction to Operations Research, S.Chand and Co.2002
3. Hira and Gupta —Problems in Operations Research, S.Chand and Co.2008
4. Wagner, —Operations Research, Prentice Hall of India, 2000
5. S.Bhaskar, —Operations Research, Anuradha Agencies, Second Edition, 2004

BETE103**ENGINEERING ECONOMICS AND
FINANCIAL MANAGEMENT**

L	T	P	C
3	0	0	3

Course Objectives:

- Acquire knowledge of economics to facilitate the process of economic decision making
- Acquire knowledge on basic financial management aspects
- Develop the skills to analyze financial statements

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Evaluate the economic theories, cost concepts and pricing policies

CO2: Understand the market structures and integration concepts

CO3: Understand the measures of national income, the functions of banks and concepts of globalization

CO4: Apply the concepts of financial management for project appraisal

CO5: Understand accounting systems and analyze financial statements using ratio analysis

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						W			W		S	W
CO2						W			W		S	W
CO3						W			W		S	W
CO4						W			W		S	W
CO5						W			W		S	W

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Hrs**ECONOMICS, COST AND PRICING CONCEPTS****09**

Economic theories – Demand analysis – Determinants of demand – Demand forecasting – Supply – Actual cost and opportunity cost – Incremental cost and sunk cost – Fixed and variable cost – Marginal costing – Total cost – Elements of cost – Cost curves – Breakeven point and

breakeven chart – Limitations of break even chart – Interpretation of break even chart – Contribution – P/V-ratio, profit-volume ratio or relationship – Price fixation – Pricing policies – Pricing methods

CONCEPTS ON FIRMS AND MANUFACTURING PRACTICES 09

Firm – Industry – Market – Market structure – Diversification – Vertical integration – Merger – Horizontal integration

NATIONAL INCOME, MONEY AND BANKING, ECONOMIC ENVIRONMENT 09

National income concepts – GNP – NNP – Methods of measuring national income – Inflation – Deflation – Kinds of money – Value of money – Functions of bank – Types of bank – Economic liberalization – Privatization – Globalization

CONCEPTS OF FINANCIAL MANAGEMENT 09

Financial management – Scope – Objectives – Time value of money – Methods of appraising project profitability – Sources of finance – Working capital and management of working capital

ACCOUNTING SYSTEM, STATEMENT AND FINANCIAL ANALYSIS 09

Accounting system – Systems of book-keeping – Journal – Ledger – Trail balance – Financial statements – Ratio analysis – Types of ratios – Significance – Limitations

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Prasanna Chandra, — Financial Management (Theory & Practice) TMH
2. Weston & Brigham, — Essentials of Managerial Finance
3. Pandey, I. M., —Financial Management
4. Fundamentals of Financial Management- James C. Van Horne.

BETE104

**FOUNDATION SKILLS IN INTEGRATED
PRODUCT DEVELOPMENT (FSIPD)**

L	T	P	C
3	0	0	3

Course Objectives:

- To facilitate the acquisition of the foundation skills in the process, tools and techniques in the Integrated Product Development area of the Engineering Services industry.
- To provide the requisite understanding towards application of academic topics from engineering disciplines into real world engineering projects.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Analyze various global trends and decide on the scope of a new product

CO2: Outline the product development methodologies and management.

CO3: Develop product management plan for a new product based on the type of the new product and development methodology.

CO4: Summarize requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification.

CO5: Conceptualize new product integrating the hardware, software, controls, electronics and mechanical systems.

CO6: Develop test specifications and coordinate the respective activities with testing group, validate the product and confirm its performance as per design specification.

CO7: Develop product documentation as required.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO2			M	W	S				M			
CO3			W								S	
CO4			S								S	
CO5			M		S							
CO6					S							
CO7			S						M			

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

FUNDAMENTALS OF PRODUCT DEVELOPMENT

9

Global Trends Analysis and Product decision: Types of various trends affecting product decision-Social Trends (Demographic, Behavioral, Psychographic), Technical Trends(Technology, Applications, Tools, Methods), Economical Trends (Market, Economy, GDP, Income Levels, Spending Pattern, target cost, TCO), Environmental Trends

(Environmental Regulations and Compliance), Political/Policy Trends (Regulations, Political Scenario, IP Trends and Company Policies); PESTLE Analysis

Introduction to Product Development Methodologies and Management:

Overview of Products and Services (Consumer product, Industrial product, Specialty Products etc); Types of Product Development (NPD/ Re-Engineering (Enhancements, Cost Improvements)/ Reverse Engineering/Design Porting & Homologation); Overview of Product Development methodologies (Over the Wall/ Waterfall/ V-Model/ Stage-Gate Process/Spiral/Systems Engineering/Agile); Product Life Cycle (S Curve, Reverse Bath Tub Curve); Product Development Planning and Management (Budgeting, Risk, Resources and Design Collaboration, Scheduling, Change Management, Product Cost Management).

REQUIREMENTS AND SYSTEM DESIGN 9

Requirement Engineering: Types of Requirements (Functional, Performance, Physical, Regulatory, Economical, Behavioral, Technical, Stakeholder, Environmental, Industry specific, Internal-Company Specific); Requirement Engineering (Gathering (VOC), Analysis (QFD), Design Specification); Traceability Matrix and Analysis; Requirement Management .

System Design & Modeling: Introduction to System Modeling; System Optimization; System Specification; Sub-System Design; Interface Design.

DESIGN AND TESTING 15

Conceptualization: Industrial Design and User Interface Design; Introduction to Concept generation Techniques; Concept Screening & Evaluation-Concept Design, S/W Architecture, Hardware Schematics and simulation.

Detailed Design: Component Design and Verification; High Level Design/Low Level Design of S/W Programs, S/W Testing; Hardware Schematic, Component design, Layout and Hardware Testing. **Prototyping:** Types of Prototypes (Mockups, Engineering Assessment Prototype, Alpha, Beta, Gamma); Introduction to Rapid Prototyping and Rapid Manufacturing.

System Integration, Testing, Certification and Documentation: Manufacturing/Purchase and Assembly of Systems; Integration of Mechanical, Embedded and S/W systems; Introduction to Product verification processes and stages - Industry specific (DFMEA, FEA, CFD); Introduction to Product validation processes and stages - Industry specific (Sub-system Testing/Integration Testing/Functional Testing/Performance Testing /Compliance Testing); Product Testing standards and Certification - Industry specific; Product Documentation (Compliance Documentation, Catalogue, Brochures, user manual, maintenance Manual, Spares Parts List, Warranty, Disposal Guide, IETMS, Web Tools).

SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 6

Sustenance: Maintenance and Repair; Enhancements. **Product**

EoL: Obsolescence Management; Configuration Management; EoL Disposal.

BUSINESS DYNAMICS–ENGINEERING SERVICES INDUSTRY

6

The Industry: Engineering Services Industry–Overview; Product development in Industry versus Academia.

The IPD Essentials: Introduction to vertical specific product development processes; Product development Trade-offs; Intellectual Property Rights and Confidentiality; Security and Configuration management.

Theory: 45 Hrs **Total: 45 Hrs**

REFERENCES:

1. Foundation Skills in Integrated Product Development (FSIPD)ll, I st Edition, 2013, Published by NASSCOM.
2. Ulrich, Karl T. and Eppinger, Steven D (2004) —Product Design and Developmentll, 5th Edition, McGraw-Hill, 2012.

BETE201 BIO MEDICAL INSTRUMENTATION

L	T	P	C
3	0	0	3

Course Objectives:

- To understand the basic Physiology of - Nervous system, Circulatory system, Respiratory system and Urinary system.
- To understand the concept of action potential, electrode theory and different biopotential characteristics and recording methods.
- To study various computer aided devices for biomedical applications.
- To study and understand basics of biotelemetry systems.
- To study the use of physiological assist devices.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the basic Physiology of - Nervous system, Circulatory system, Respiratory system and Urinary system.

CO2: Describe the concept of action potential, electrode theory and various bioelectric potentials generated in human body and related equipments.

CO3: Interpret various computer aided devices for biomedical applications.

CO4: Discuss concepts of biotelemetry systems.

CO5: Discuss working and use of physiological assist devices.

CO/PO Mapping			
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak			
COs		Programme Outcomes(POs)	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M									
CO2	S	M										
CO3	S	M	M	M		M						M
CO4	S	M		M								M
CO5	S	S		M								

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

06

BASIC PHYSIOLOGY: Cells and their structures - Transport of ions through cell membrane - Resting and excited state transmembrane potential - Action potential - Propagation of Bioelectric potential - Nervous system - Physiology of muscles - Heart and Blood circulation - Respiratory system - Urinary system.

ELECTRODES, TRANSDUCERS AND SIGNAL CONDITIONERS 10

ELECTRODES AND TRANSDUCERS: Basic electrode theory -Nernst equation, electrical conductivity of electrode jelliesand creams, skin contact impedance and its measurement. Micro electrodes - Skin surface electrodes - Needle electrodes - Equivalent circuit - Electrode materials - Chemical electrodes - Reference electrodes - The pH electrode - Blood gas electrode - Active transducers and passive transducers - Strain gauges - Thermistor - Biomedical applications.

SIGNAL CONDITIONERS: Instrumentation amplifiers - Current amplifiers - Isolation amplifier - Need for filters - Low pass, High pass and Band pass active filters - Notch filters - Heated stylus and ink pen recorders

DIAGNOSTIC EQUIPMENTS 11

DIAGNOSTIC EQUIPMENTS I: Electrical and mechanical activities of the heart - Typical Electrocardiogram (ECG) - Electrocardiograph - Bipolar and unipolar leads - Einthoven triangle - Electrical activities of the brain - Electroencephalogram (EEG) - Various rhythms - EEG equipment - Muscle response - Electromyograph (EMG) - Nerve Conduction velocity measurements - Intensity - Duration characteristics.

DIAGNOSTIC EQUIPMENTS II: Spirometer - X-ray imaging - Radio fluoroscopy - Image Intensifiers - angiography - Endoscopy - Diathermy - Laser and its application.

COMPUTER APPLICATIONS

07

COMPUTER APPLICATIONS: Data acquisition systems - Analysis of ECG signals - Computerised Axial Tomography (CAT) Scanner - Ultrasonic scanner - Magnetic resonance imaging - Computer based patient monitoring system - Introduction to expert system and hospital management.

PHYSIOLOGICAL ASSIST DEVICES, BIOTELEMETRY AND PATIENT SAFETY **PHYSIOLOGICAL ASSIST DEVICES:** Need for pacemakers - Pacemaker parameters and circuits - Demand pacemakers - Different modes of operation - DC defibrillator - Artificial heart valves - Heart lung machines - Artificial lung machines - Artificial kidney machine - Nerve and Muscle stimulator - continuous patient monitoring system.

BIOTELEMETRY AND PATIENT SAFETY: Need for biotelemetry - Elements of telemetry system - Radio telemetry system - Physiological signals used in telemetry - TDM and FDM - Implantable units - Physiological effects of electrical current - Shock hazards from electrical equipments - Electrical accidents and their prevention.

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Khandpur,R.S—Handbook of Biomedical Instrumentation, TATA McGraw Hill, New Delhi, Second Edition, 2005.
2. Leslie Cromwell, Fred J. Weibell, and Erich A. Pfeiffer, —Biomedical instrumentation and measurement, Pearson Education, New Delhi.
3. Joseph J. Carr and John M. Brown,—Introduction To Biomedical equipment Technology, Pearson Education, New Delhi Fourth, Indian Reprint 2004.
4. John G. Webster, Ed., —Medical Instrumentation Application and Design, Fourth Edition, John Wiley & Son's, Singapore, 2007.

BETE202

OPTO ELECTRONIC DEVICES

L	T	P	C
3	0	0	3

Course Objectives:

- To know the basics of solid state physics and understand the nature and characteristics of light.
- To understand different methods of luminescence, display devices and laser types and their applications.
- To learn the principle of optical detection mechanism in different detection devices.
- To understand different light modulation techniques and the concepts and applications of optical switching.
- To study the integration process and application of opto electronic integrated circuits in transmitters and receivers.

Course Outcomes:

After successful completion of this course, the students should be able to

- CO1:** Review Solid state semiconductor physics.
CO2: Explain concepts of lasers.
CO3: Classify different optical detection devices.
CO4: Distinguish among different light modulation techniques.
CO5: Summarize applications of opto electronic circuits.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		W									
CO2	M											
CO3	M		W									
CO4	S		M	W								
CO5		M										

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

ELEMENTS OF LIGHT AND SOLID STATE PHYSICS

09

Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physics and Semiconductor Junction Device.

DISPLAY DEVICES AND LASERS

09

Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking, laser applications.

OPTICAL DETECTION DEVICES

09

Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.

OPTOELECTRONIC MODULATORS AND SWITCHING DEVICES

09

Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Acousto- optic devices, Optical, Switching and Logic Devices.

OPTOELECTRONIC INTEGRATED CIRCUITS

09

Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices.

Total: 45 Hrs

REFERENCES:

1. J. Wilson and J. Haukes, —Opto Electronics – An Introduction, Prentice Hall of India Pvt. Ltd., New Delhi, 1995.
2. Jasprit Singh, —Opto Electronics – As Introduction to materials and devices, McGraw-Hill International Edition, 1998.
3. Bhattacharya — Semiconductor Opto Electronic Devices, Prentice Hall of India Pvt., Ltd., New Delhi, 1995.

BETE203 ADVANCED DIGITAL SIGNAL PROCESSING

L	T	P	C
3	0	0	3

Course Objectives:

- To explore the concepts of discrete random processes
- To study the parametric and nonparametric methods for power spectrum estimation.
- To design filters for estimation of desired signal
- To study adaptive filtering techniques and the applications of adaptive filtering.
- To know the basic concepts of wavelet transforms

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Employ the concepts of discrete random processes

CO2: Distinguish between parametric and nonparametric methods for power spectrum estimation.

CO3: Relate the concepts of linear prediction and wiener filtering.

CO4: Analyze the concepts of adaptive filtering

CO5: Correlate wavelets and wavelet transform for signal processing

CO/PO Mapping			
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak			
COs	Programme Outcomes(POs)		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	W		W	W							
CO2	S	M										
CO3	S	M	W									
CO4	M	M	W									
CO5	S	M		W	M							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

DISCRETE-TIME RANDOM SIGNALS

09

Discrete random process – Ensemble averages, Stationary and ergodic processes, Autocorrelation and Autocovariance properties and matrices, White noise, Power Spectral Density, Spectral Factorization, Innovations Representation and Process, Filtering random processes.

SPECTRUM ESTIMATION

09

Introduction to power spectrum estimation - Parameter estimation - Bias and consistency – Non-parametric methods- Periodogram - Modified Periodogram – Bartlett Method - Welch Method - Blackman-Tukey method - ARMA, AR, MA processes- Yule-Walker equations – Parametric methods for spectral estimation.

LINEAR PREDICTION AND ESTIMATION

09

Forward and backward linear prediction – Lattice filter realization- Optimum Filtering – FIR Weiner filter – Filtering and Linear prediction – Non-causal and causal IIR Weiner filters

ADAPTIVE FILTERS

09

Principles of adaptive filters – FIR adaptive filters– Newton’s steepest descent adaptive filter– LMS adaptation algorithms–RLS algorithm, Applications- Noise cancellation–Channel equalization– echo cancellers.

WAVELET TRANSFORM

09

Fourier Transform and its limitations – Short Time Fourier Transform – Continuous Wavelet

Transform - Multi-resolution analysis - Discrete Wavelet Transform - Haar Wavelet – Daubechies Wavelet – Implementation of wavelet transform with sub-band coding.

Theory: 45 Hrs **Total: 45 Hrs**

REFERENCES:

1. Monson H.Hayes– —Statistical Digital Signal Processing and Modeling, Wiley Eastern,2009.
2. JohnG.Proakis,Dimitris G.Manolakis, — Digital Signal Processing, Principles, Algorithms and Applications, PHI, 3rd Edition,2014.
3. Sanjit K. Mitra, —Digital Signal Processing: A Computer Based Approach, 2nd Edition, Tata McGraw-Hill, 2001.
4. Dimitris G. Manolakis, Vinay K. Ingle, Stephen M. Kogon, —Statistical and Adaptive Signal Processing, Artech House, 2005.
5. C. Sidney Burrus, Ramesh A. Gopinath, Haitao Guo, —Introduction to Wavelets and Wavelet Transforms, Prentice Hall, 1998.

BETE204 **ADVANCEDMICROPROCESSORSAND**
MICROCONTROLLERS

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the basic architecture of Pentium family of processors.
- To introduce the architecture programming and interfacing of 16 bit microcontrollers.
- To introduce the concepts and architecture of RISC processor and ARM.

Course Outcomes:

After successful completion of this course, the students should be able to

- CO1:** Explain architecture and addressing modes of generic microprocessor.
- CO2:** Illustrate simple programming using standard instructions.
- CO3:** Discuss memory management features of Pentium processor
- CO4:** Describe architecture of RISC processor.
- CO5:** Able to work with suitable microprocessor / microcontroller for a specific real world application

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	M	M										
CO2	M	S										
CO3		M										
CO4	S		M									
CO5	M		M									

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Hrs

HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM

09

CPU Architecture- Bus Operations – Pipelining – Branch predication – floating point unit- Operating Modes –Paging – Multitasking – Exception and Interrupts – Instruction set – addressing modes – Programming the Pentium processor.

HIGH PERFORMANCE RISC ARCHITECTURE – ARM

09

Arcon RISC Machine – Architectural Inheritance – Core & Architectures - Registers – Pipeline - Interrupts – ARM organization - ARM processor family – Co-processors - ARM instruction set- Thumb Instruction set - Instruction cycle timings - The ARM Programmer.s model – ARM Development tools – ARM Assembly Language Programming - C programming – Optimizing ARM Assembly Code – Optimized Primitives.

ARM APPLICATION DEVELOPMENT

09

Introduction to DSP on ARM –FIR filter – IIR filter – Discrete Fourier transform – Exception handling –Interrupts – Interrupt handling schemes- Firmware and bootloader – Embedded Operating systems – Integrated Development Environment- STUDIO Libraries – Peripheral Interface – Application of ARM Processor - Caches – Memory protection Units – Memory Management units – Future ARM Technologies.

PIC MICROCONTROLLER

09

CPU Architecture – Instruction set – interrupts- Timers- I2C Interfacing –UART- A/D Converter –PWM and introduction to C-Compilers

MOTOROLA 68HC11 MICROCONTROLLERS

09

Instruction set addressing modes – operating modes- Interrupt system- RTC-Serial Communication Interface – A/D Converter PWM and UART

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Andrew N.Sloss, Dominic Symes and Chris Wright — ARM System Developer.s Guide : Designing and Optimizing System Software , First edition, Morgan Kaufmann Publishers, 2004.
2. Steve Furber, —ARM System on Chip Architecture Second Edition Addison- Wesley Professional , Aug 2000.
3. John Peatman, —Design with Microcontroller , Prentice Hall, 1998
4. Daniel Tabak , —Advanced Microprocessors , Mc Graw Hill. Inc., 1995
5. James L. Antonakos , — The Pentium Microprocessor , Pearson Education, 1997
6. Gene .H.Miller, —Micro Computer Engineering , Pearson Education , 2003
7. Barry.B.Brey,—The Intel Microprocessors Architecture, Programming and Interfacing , PHI,2002.
8. James L.Antonakos, —An Introduction to the Intel family of Microprocessors , Pearson Education, 1999.

BETE205 TELEVISION AND VIDEO ENGINEERING

L	T	P	C
3	0	0	3

Course Objectives

- 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 essentials of colour television system.
- 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:

After successful completion of this course, the students should be able to

CO1: Describe Television fundamentals –Picture Tubes, Composite Video Signal

CO2: Explain principles of TV transmission and Reception

CO3: Interpret Color Television functionality and color television picture tubes.

CO4: Distinguish between color TV standards.

CO5: Discuss advanced television technologies

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M										
CO2	M	W										
CO3	M	M	M									
CO4	W	M	M									
CO5	M		W	M								

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Hrs

FUNDAMENTALS OF TELEVISION

09

Aspect ratio - Image continuity - Number of scanning lines-Interlaced scanning-Picture Resolution - Camera tubes - Image Orthicon - Vidicon – Plumbicon - Silicon Diode Array Vidicon - Solid-state Image scanners - Monochrome picture tubes - Composite video signal-video signal dimension - horizontal sync. Composition - vertical sync. Detail functions of vertical pulse train- Scanning sequence details. Picture signal transmission –positive and negative modulation - VSB transmission - Sound signal transmission - Standard channel bandwidth.

MONOCHROME TELEVISION TRANSMITTER AND RECEIVER

09

TV transmitter -TV signal Propagation – Interference - TV Transmission Antennas - Monochrome TV receiver - RF tuner- UHF, VHF tuner- Digital tuning techniques - AFT,IF Subsystems - AGC Noise cancellation - Video and Sound inter - carrier detection - Vision IF subsystem - DC re-insertion - Video amplifier circuits-Sync operation – typical sync processing circuits-Deflection current waveforms, Deflection oscillators – Frame deflection circuits-requirements - Line deflection circuits - EHT generation – Receiver antennas.

ESSENTIALS OF COLOUR TELEVISION

09

Compatibility - Colour perception -Three colour theory - Luminance, Hue and Saturation - Colour television cameras -Values of luminance and colour difference Signals - Colour

television display tubes - Delta - gun Precision - in - line and Trinitron colour picture tubes - Purity and convergence - Purity and static and Dynamic convergence adjustments – Pincushion correction techniques - Automatic degaussing circuit - Gray scale tracking - colour signal transmission - Bandwidth - Modulation of colour difference signals - Weighting factors - Formation of chrominance signal.

COLOUR TELEVISION SYSTEMS 09

NTSC colour TV systems - SECAM system - PAL colour TV systems - Cancellation of phase errors - PAL - D Colour system - PAL coder - PAL- Decoder receiver - Chromo signal amplifier - separation of U and V signals-colour burst separation - Burst phase Discriminator-ACC amplifier-Reference Oscillator-Ident and colour killer circuits – U and V demodulators- Colour signal matrixing. Sound in TV.

ADVANCED TELEVISION SYSTEMS 09

Satellite TV technology-Cable TV-Cable Signal Sources - Cable Signal Processing, Distribution & Scrambling - DVD Players - Tele Text Signal coding and broadcast receiver-Digital television-Transmission and reception –Projection television - Flat panel display TV receivers - LCD and Plasma screen receivers - 3D TV, HD TV, LED TV.

Theory: 45 Hrs Total: 45 Hrs

REFERENCES:

1. R.R.Gulati, —Monochrome Television Practice, Principles, Technology and servicingl, New Age International (P) Publishers, Forth Edition 2006.
2. A.M Dhake, —Television and Video Engineeringl, 2nd ed., TMH, 2003
3. R.R.Gulati, Monochrome & Color Television, New Age International Publisher, Second Edition 2003.
4. R.P.Bali, —Color Televisionl, Theory and Practice, Tata McGraw-Hill, 1994

BETE206 OPERATING SYSTEMS

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

- CO1:** Illustrate the operating system concepts and its functionalities.
CO2: Apply various CPU scheduling algorithms for problems.
CO3: Outline the needs and applications of process synchronization.
CO4: Identify the issues in deadlock and memory management.
CO5: Illustrate various file and disk management strategies.

CO/PO Mapping			
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak			
COs			Programme Outcomes(POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	S	S	S									
CO3	S											
CO4	M	M										
CO5	M	M										

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

ALGORITHMS

9 Hrs

Multiple-Processor Scheduling – Synchronization – The Critical-Section Problem – Peterson’s Solution – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Monitors.

DEADLOCK AND MEMORY MANAGEMENT STRATEGIES

9 Hrs

System Model – Deadlock Characterization – Methods for Handling Deadlock – Deadlock Prevention – Dead lock Avoidance – Deadlock Detection – Recovery from Deadlock. Swapping – Contiguous Memory Allocation – Paging – Structure of the Page Table – Segmentation.

VIRTUAL MEMORY MANAGEMENT AND FILE SYSTEM

9 Hrs

Demand Paging – Copy on Write – Page Replacement – Allocation of Frames – Thrashing File Concept – Access Methods – Directory Structure – File Sharing – Protection.

IMPLEMENTING FILE SYSTEMS AND SECONDARY STORAGE STRUCTURE 9Hrs

File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management. Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management.

Case Study: Linux OS, Android OS.

Theory: 45 Hrs

Total: 45 Hrs

References:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, —Operating System Principles, John Wiley & Sons (Asia) Pvt. Ltd, Ninth Edition, 2013.
2. Andrew S. Tanenbaum, —Modern Operating Systems, Third Edition Prentice Hall of India Pvt. Ltd, 2010 (Case Study Topic).

BETE301**HIGH SPEED NETWORKS**

L	T	P	C
3	0	0	3

Course Objectives:

- Students will get an introduction about ATM and Frame relay.
- Students will be provided with an up-to-date survey of developments in High Speed Networks.
- Enable the students to know techniques involved to support real-time traffic and congestion control.
- To study integrated and differentiated services.
- Get introduced to protocols for QOS Support

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Recognize various types of High speed networks.

CO2: Analyze the congestion control techniques for ATM and TCP networks. **CO3:** Identify the traffic management schemes.

CO4: Discuss Integrated and Differentiated services.

CO5: Assess different protocols to achieve the required QOS.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M	S		M								
CO3	M	W	W									
CO4	M											
CO5	M		W	W	M							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry

4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Hrs
09

HIGH SPEED NETWORKS

Frame Relay Networks–Asynchronous transfer mode–ATM Protocol Architecture, ATM logical Connection, ATM Cell–ATM Service Categories–AAL. High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel –High speed Wireless networks – Architecture of 802.11n.

CONGESTION AND TRAFFIC MANAGEMENT **09**

Queuing Analysis –Queuing Models–Single Server Queues–Effect soft Congestion–CongestionControl–TrafficManagement–CongestionControlinPacketSwitching Networks
Frame Relay Congestion Control.

TCP AND ATM CONGESTION CONTROL **09**

TCP Flow control–TCP Congestion Control– Retransmission–Timer Management– Exponential RTO back off– KARN’s Algorithm– Window management–Performance of TCP over ATM.

INTEGRATED AND DIFFERENTIATED SERVICES **09**

Integrated Services Architecture– Approach, Components, Services Queuing Discipline, FQ,PS, BRFQ, GPS,WFQ–Random Early Detection, Differentiated Services.

PROTOCOLS FOR QOS SUPPORT **09**

RSVP–Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms– Multiprotocol Label Switching– Operations, Label Stacking, Protocol details–RTP– Protocol Architecture, Data Transfer Protocol, RTCP

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. William Stallings,—High Speed Networks and Internetl, Second Edition, Prentice Hall,2002
2. Warland&PravinVaraiya,—HighPerformanceCommunicationNetworksll,SecondEdition,Jean Harcourt Asia Pvt. Ltd.,2000

BETE302 ADVANCEDCOMPUTERARCHITECTURE

L	T	P	C
3	0	0	3

Course Objectives:

- To make students know about the Parallelism concepts in Programming
- To give the students an elaborate idea about the different memory systems and buses.
- To introduce the advanced processor architectures to the students.
- To make the students know about the importance of multiprocessor and multi-computers.
- To study about data flow computer architectures

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Demonstrate concepts of parallelism in hardware/software.

CO2: Discuss memory organization and mapping techniques.

CO3: Describe architectural features of advanced processors.

CO4: Interpret performance of different pipelined processors.

CO5: Explain data flow in arithmetic algorithms.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W										
CO2	M											
CO3	M		W									
CO4	W	S		M								
CO5	M											

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Hrs

PARALLEL COMPUTER MODELS

09

Evolution of Computer architecture, system attributes to performance, Multi processors and multi computers, Multi-vector and SIMD computers, PRAM and VLSI models-Parallelism in Programming, conditions for Parallelism-Program Partitioning and Scheduling-program flow

Mechanisms-Speed up performance laws-Amdahl's law, Gustafson's law-Memory bounded speedup Model.

MEMORY SYSTEMS AND BUSES 09

Memory hierarchy-cache and shared memory concepts-Cache memory organization-cache addressing models, Aliasing problem in cache, cache memory mapping techniques-Shared memory organization-Interleaved memory organization, Lower order interleaving, Higher order interleaving. Back plane bus systems-Bus addressing, arbitration and transaction.

ADVANCED PROCESSORS 09

Instruction set architectures-CISC and RISC scalar processors-Super scalar processors-VLIW architecture- Multivector and SIMD computers-Vector processing principles-Cray Y-MP 816 system-Inter processor communication

MULTI PROCESSOR AND MULTI COMPUTERS 09

Multiprocessor system interconnects- Cross bar switch, Multiport memory-Hot spot problem, Message passing mechanisms-Pipelined processors-Linear pipeline, on linear pipeline-Instruction pipeline design-Arithmetic pipeline design.

DATA FLOW COMPUTERS AND VLSI COMPUTATIONS 09

Data flow computer architectures-Static, Dynamic-VLSI Computing Structures-Systolic array architecture, mapping algorithms into systolic arrays, Reconfigurable processor array-VLSI matrix arithmetic processors-VLSI arithmetic models, partitioned matrix algorithms, matrix arithmetic pipelines.

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Kai Hwang,||Advanced Computer architecture Parallelism ,scalability ,Programmability||,Mc Graw Hill,N.Y, 2003
2. Kai Hwang and F.A.Briggs,||Computer architecture and parallel processor||‘ Mc Graw Hill, N.Y, 1999
3. David A. Patterson and John L. Hennessey, —Computer organization and design|| Elsevier, Fifth edition, 2014.

**BETE303 AUTOMOTIVEELECTRONICS-
EMBEDDED SOFTWARE DEVELOPER**

L	T	P	C
3	0	0	3

Course Objectives:

- To provide Automotive Electronics related domain exposure and to establish a learning platform for embedded system development environment with the application of

engineering aspects in the development life cycle of projects for automobiles.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Describe various electrical and electronic systems in automobile.

CO2: Discuss embedded system using RISC processor.

CO3: Apply concepts for Embedded System development.

CO4: Interpret different control system modules.

CO5: Explain embedded system communication protocols in automobiles

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	W	S			S					S	S	
CO2				M	M							
CO3		S		M	M						S	
CO4		S		W							W	
CO5		S	M	M								

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Hrs

AUTOMOBILE ELECTRICALS AND ELECTRONICS

08

Basic Electrical Components and their operation in an automobile - Starting systems, Charging systems – ignition systems- Electronic fuel control- Environmental legislation for pollution- Overview of vehicle electronic systems- Power train subsystem- chassis subsystem- comfort and safety subsystems.

INTRODUCTION TO EMBEDDED SYSTEMS

08

Embedded Systems definition - Components of Embedded systems – Microprocessor - Classification of Microprocessors- Microcontrollers- Memory - Peripherals. Introduction to an embedded board (TMS470 based / ARM9 based) for hands on lab sessions (RISC processor based with standard peripherals / interfaces and I/Os)

OPERATING SYSTEM IN EMBEDDED ENVIRONMENT

07

Introduction to OS - General Purpose OS, RTOS -, Kernel - Pre-emptive & Non pre-emptive, Scheduler, Interrupt - Interrupt latency and Context Switch Latency- Board Support package, Task - Multi-tasking, Task synchronization, Inter-task communication, Features of a typical embedded RTOS (μ C/OS-II)

INTEGRATED DEVELOPMENT ENVIRONMENT

08

Integrated Development Environment (IDE)-Getting Started, Hardware / Software Configuration (Boot Service, Host – Target Interaction), Booting, Reconfiguration, Managing IDE, Target Servers, Agents, Cross – Development, debugging- Introduction to an IDE for the lab board – RTOS, PC based debugger.

EMBEDDED SYSTEM IN AUTOMOTIVE APPLICATIONS

10

Engine Management systems - Diesel / Gasoline systems, Various sensors used in system - Vehicle safety systems- electronic control of braking and traction- Introduction to control elements and control methodology- Electronic transmission control- Body electronics - Infotainment systems – Navigation systems- system level tests – Software calibration using engine and vehicle dynamometers- Environmental tests for electronic control units.

EMBEDDED SYSTEM COMMUNICATION PROTOCOLS

04

Introduction to Control networking- Communication protocols in embedded systems - SPI, I²C, USB, -Vehicle communication protocols – Introduction to CAN, LIN, FLEXRAY, MOST, KWP 2000- Details of CAN

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. R. K. Jurgen, —Automotive electronics handbook|| McGraw Hill Professional, 1999
2. Paul Pop, Petru Eles, Zebo Peng —Analysis and Synthesis of Distributed Real-Time Embedded Systems|| Springer, 21-Dec-2004
3. B. Kanta Rao —Embedded Systems|| PHI Learning Pvt. Ltd.2011

BETE304

VIRTUAL INSTRUMENTATION

L	T	P	C
3	0	0	3

Course Objectives:

- To know about virtual versus traditional instruments, programming techniques
- To know about A/D and D/A converter and data acquisition.
- To know about PC buses, Instrumentation buses and network protocols.
- To design using VI software of controllers
- To know about PC operating system and instrumentation.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Define virtual instrumentation concepts.

CO2: Describe acquisition methodologies.

CO3: Compare traditional and virtual instrumentation.

CO4: Discuss operating systems required for virtual instrumentation.

CO5: Illustrate implementation methods for instrumentation.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	S	M	M	M								
CO3		M			M							
CO4		M	M		M							
CO5	S	M	M	W	M							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

INTRODUCTION**9Hrs**

Virtual Instrumentation - Definition and Flexibility - Block diagram and Architecture for Virtual Instruments versus Traditional Instruments Instrumentation -VI Programming techniques - VI, sub VI, Loop and Charts, Arrays, Clusters and Graphs, Case and Sequence Structures, Formula nodes, String and File Input / Output

DATA ACQUISITION IN VI

A/D and D/A converters, Plug-in Analog Input / Output cards – Digital Input and Output Cards, Organization of the DAQ VI system – Opto-isolation – Performing analog input and analog output – Scanning multiple analog channels – Issues involved in selection of Data acquisition cards – Data acquisition modules with serial communication – Design of digital voltmeter with transducer input –Timers and Counters.

COMMUNICATION NETWORKED MODULES**09**

Introduction to PC Buses – Local busses:- ISA, PCI, RS232, RS422 and RS485 – Interface Buses:- USB, PCMCIA, VXI, SCXI and PXI –Instrumentation Buses :- Modbus and GPIB – Networked busses – ISO/OSI Reference model, Ethernet and TCP/ IP Protocols.

REAL TIME CONTROL IN VI

09

Designs using VI Software - ON/OFF controller – Proportional controller – Modeling and basic control of level and reactor processes – Case studies on development of HMI, SCADA in VI

OPERATING SYSTEM AND HARDWARE OVERVIEW

09

PC architecture, current trends, operating system requirements, PC based instrumentation, analog and digital interfaces, PXI and SCXI main frame - modular instruments – Transducers – power, speed and timing considerations.

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. LabVIEW Graphical Programming, Gary W. Johnson, Richard Jennings 3rd edition , McGraw-Hill Professional Publishing
2. Lisa K Wells,||Lab view for Everyone||, Prentice Hall of India.
3. Barry Paton, —Sensor, transducers and Lab view||, Prentice Hall of India 2000.
4. Buchanan, W. —Computer buses||, CRC Press 2000

BETE305

REAL-TIME EMBEDDED SYSTEMS

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To explain programming concepts of PIC microcontroller
- To study the real time operating system concepts
- To explain real time operating systems, inter-task communication and an exemplary case of MUCOS – IIRTS.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Describe hardware and software architectures of Embedded Systems.

CO2: Classify the I/O interface and protocols for an embedded system

CO3: Interpret the concepts of a real time operating system

CO4: Illustrate the various tools used for building RTOS

CO5: Develop an embedded system application using microcontrollers

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W										
CO2	M	S										
CO3		M	M									
CO4		S		W								
CO5		M	M		W							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Hrs

ARCHITECTURE OF EMBEDDED SYSTEMS

09

Definition and classification- Overview of processors-Hardware units in an Embedded systems- Software embedded into a system- Exemplary Embedded systems- Embedded systems on a chip- The use of VLSI designed circuits.

DEVICES AND BUSES FOR DEVICES NETWORK

09

I/O Devices– Types and Examples–Synchronous, Iso- synchronous and Asynchronous Communications from Serial Devices – Examples of Internal Serial-Communication Devices UART and HDLC–Parallel Device Ports– Sophisticated interfacing features in DevicesPorts- Timer and Counting Devices – Serial bus communication protocols: I²C, _USB‘, _CAN‘andAdvancedI/O serial high speed buses– Parallel bus device protocols : ISA, PCI,PCI/X , ARM bus and Advanced parallel high speed buses.

EMBEDDED PROGRAMMING IN C, C++

09

C Program Elements, Macros and functions - Use of Pointers - NULL Pointers - Use of Function Calls - Multiple function calls in a Cyclic Order in the Main Function Pointers - Function Queues and Interrupt Service Routines Queues Pointers - Concepts of EMBEDDED PROGRAMMING in C++ - Objected Oriented Programming - Embedded Programming in C++ - C Program compilers - Optimization of memory codes.

REAL-TIME OPERATING SYSTEM CONCEPTS

09

Architecture of the Kernel–task and task scheduler–Interrupt Service Routines–Semaphores–Mutex– Mailboxes–Message Queues–Event Registers–Pipes–Signals–Timers–Memory Management – Priority Inversion Problem-Study of μ C/OS-II RTOS.

HARDWARE/SOFTWARE INTEGRATION

09

Compiler - Cross compiler - Emulator, Simulators - Host and target machines - Linkers/locators for embedded software - Getting embedded software into the target system and testing on host machine. Case study of Embedded systems like Digital camera, Smart card, Flight simulation and control.

Theory: 45 Hrs Total: 45 Hrs

REFERENCES:

1. RajKamal—Embedded Systems Architecture Programming and Design, 2nd Edition , TMH, 2008
2. David E.Simon —An Embedded Software Primer, Pearson Education, 4th Reprint, 2007.
3. Steve Heath, —Embedded Systems Design, 2nd Edition., Elsevier Publications, 2006.
4. Wayne Wolf, —Computers as Components; Principles of Embedded Computing System Design, Harcourt India, Morgan Kaufman Publishers, First Indian Reprint, 2005.
5. Frank Vahid and Tony Gwasrgie, —Embedded system Design, John Wiley and Sons, 2002.
6. Daniel.W Lewis,—Fundamentals of EmbeddedSoftware|PearsonEducation2001.

BETE306

Internet and Java Programming

L	T	P	C
3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the basic concepts of Internet and HTML

CO2: Interpret the need of various OOPS concept and apply it for developing application using java

CO3: Apply the concepts of packages, interfaces, string handling in java to write simple applications and to handle the exceptions

CO4: Explain the concepts of threads and various inbuilt packages.

CO5: Design and develop applications using applets to handle events.

CO/PO Mapping			
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak			
COs			Programme Outcomes(POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W										
CO2	M	M			M							
CO3	M	M			M							
CO4	M	W										
CO5	M	M			M							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Basics of Internet and HTML	Hrs 09
Introduction to Internet-Internet technology and Protocol(Overview)-Internet connectivity- WWW-HTML :Basic Tags-Tables-List-Forms-Internet and Web Security	
Java Fundamentals-I	09
Java Fundamentals – Control Structures – Classes – Methods - Garbage Collection - Inheritance	
Java Fundamentals-II	09
Packages and Interfaces – Exception Handling - String Handling – java.lang.package: Primitive type Wrapper classes.	
Java Advanced Features	09
Multithreading: Thread model - Life Cycle – Synchronization - Inter-thread Communication – I/O Package: File class – Stream classes – Util package: Collection Interfaces – Collection classes.	
Java Applets	09
Applet class – Event Handling: Event classes - Event Listener Interfaces - Adapter classes - AWT package: Windows, Graphics and Text – Layout Managers	
Theory: 45 Hrs	Total: 45 Hrs

REFERENCES:

1. Isrd Group ,|| Internet Technology And Web Design||,Tata McGraw Hill,2011
2. Herbert Schildt, —The Complete Reference– Javal, Tata McGraw Hill, Ninth edition,2014
3. Deitel and Deitel, —Java: How to Program||, Ninth Edition, Prentice Hall, Tenth Edition,2014
4. Bruce Eckel , ||Thinking in Javal||, Fourth Edition, Pearson Education, 2006
5. Cay S. Horstmann, Gary Cornell,||Core Java, Volume I—Fundamentals||, Eighth Edition, Sun Microsystems, 2011.

BETE401

SPEECH PROCESSING

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the models for speech production
- To develop time domain techniques for estimating speech parameters
- To develop frequency domain techniques for estimating speech parameters
- To introduce a predictive technique for speech compression
- To understand speech recognition, synthesis and speaker identification.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Identify nature of speech generation and modeling

CO2: Classify different methods for speech processing

CO3: Apply mathematical tools to module speech

CO4: Infer different speech coding techniques.

CO5: Estimate various speech parameters with appropriate techniques

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S										
CO2		S	M	M								
CO3		M	M	S	S							
CO4	M		S	S								
CO5	M		S	S								

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey

2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

NATURE OF SPEECH SIGNAL 09

Speech production mechanism, Classification of speech, sounds, nature of speech signal, models of speech production. Speech signal processing: purpose of speech processing, digital models for speech signal, Digital processing of speech signals, Significance, short time analysis.

TIME DOMAIN METHODS FOR SPEECH PROCESSING 09

Time domain parameters of speech, methods for extracting the parameters, Zero crossings, Auto correlation function, pitch estimation.

FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING 09

Short time Fourier analysis, filter bank analysis, spectrographic analysis, Format extraction, pitch extraction, Analysis - synthesis systems.

LINEAR PREDICTIVE CODING OF SPEECH 09

Formulation of linear prediction problem in time domain, solution of normal equations, Interpretation of linear prediction in auto correlation and spectral domains.

SPEECH ANALYSIS AND SYNTHESIS 09

Cepstral analysis of speech, formant and pitch estimation, Applications of speech processing - Speech recognition, Speech synthesis and speaker verification.

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. L.R. Rabiner and R.E Schafer, —Digital processing of speech signals, Prentice Hall, 1993
2. L.R. Rabiner and Biling Hwang Juang, —Fundamentals of Speech recognition, Pearson Education, 2003
3. J.L Flanagan, —Speech Analysis Synthesis and Perception - 2nd Edition - Springer Verlag, 1972.
4. I.H.Witten, —Principles of Computer Speech, Academic press, 1983.
5. Thomas F. Quateri, —Discrete-Time Speech Processing – Principles and Practicel, Pearson Education, 2004.

L	T	P	C
3	0	0	3

Course Objectives:

- 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 procedures.
- To study the image segmentation and representation techniques.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Review the fundamental concepts of a digital image processing system

CO2: Analyze images in the frequency domain using various transforms

CO3: Evaluate the techniques for image enhancement and image restoration.

CO4: Categorize various compression techniques.

CO5: Interpret Image compression standards

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		M									
CO2	S	M	M	S								
CO3	M		S	M								
CO4	S	M	S									
CO5	M		M	S								

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

DIGITAL IMAGE FUNDAMENTALS**09**

Elements of visual perception – Image sensing and acquisition –Image sampling and

quantization – Color images – RGB model - Basic relationship between pixels – Basic gray level transformations– Histogram – Equalization and Specification.

IMAGE TRANSFORMS 09

Basics of 1D and 2D image transforms - Separable Transforms -One dimensional Fourier Transform - DFT – Two dimensional Fourier Transform-Discrete Cosine Transform - Walsh–Hadamard Transform – Wavelet transform– Haar transform – Properties.

IMAGE SEGMENTATION AND REPRESENTATION 09

Detection of discontinuities - Point, Line and Edge detection – Gradient operators Edge linking – Graph theoretic technique – Thresholding - global and adaptive – Region-based segmentation–Boundary representation –chain codes–Polygonal approximation–Signatures–skeletons – Boundary segments– Boundary descriptors: Shape numbers–Fourier descriptors–Regional descriptors–topological descriptors.

IMAGE ENHANCEMENT AND RESTORATION 09

Image Enhancement: Spatial Domain Methods – Image subtraction– Image averaging– Spatial filtering - Smoothing, Sharpening filters–First and Second Derivatives–Frequency Domain Methods – Filtering - Smoothing and Sharpening filters–Butterworth and Gaussian.

Image Restoration: Model of Image Degradation/ Restoration process – Linear, position-invariant degradation – Estimating the degradation function – Inverse filtering- Wiener filtering– Unconstrained restoration.

IMAGE COMPRESSION 09

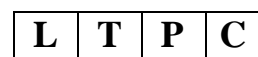
Introduction to image compression– Lossy and Lossless compression – Sequential and Progressive Compression – Rate/Distortion optimization - Parameters of compression - Huffman coding – Run Length Coding– Predictive coding – DPCM - Transform, coding - Vector quantization-Image compression standards: JPEG, JPEG2000.

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. R. C. Gonzalez, R. E. Woods, —Digital Image Processing, Prentice-Hall, 2nd Edition, 2008
2. Anil K. Jain, —Fundamentals of Digital Image Processing, Prentice Hall, 7th edition, 1989
3. David Salomon, —Data Compression, Springer Verlag New York Inc., 4th Edition, 2006
4. Dr. S. Jayaraman, — Digital Image Processing, Tata McGraw-Hill, 2009.
5. William K Pratt, —Digital Image Processing, John Wiley and Sons, 2007, 4th Edition.
6. Dr. Sridhar —Digital Image Processing, OUP India, 2011



Course Objectives:

- To become familiar with various Soft Computing Techniques
- To introduce different evolutionary and swarm algorithms
- To bring in the ideas of fuzzy sets, fuzzy logic and use of heuristics

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: List various soft computing techniques.

CO2: Discuss basics of supervised and unsupervised learning for adaptive networks.

CO3: Interpret Fuzzy rules, reasoning and models.

CO4: Analyze neuro-fuzzy inference systems for classification and regression.

CO5: Outline the basics of genetic algorithm.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M			M	M			M			M
CO2	S	M			M	M			M			M
CO3	S	S			M	M			M			M
CO4	S	S			M	M			M			M
CO5	S	M			M	M			M			M

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Introduction - Soft computing constituents – From conventional AI to computational intelligence – Evolutionary computation – Neuro-Fuzzy and soft computing characteristics

GENETIC ALGORITHMS **09**

Introduction to Genetic Algorithm (GA) – Goals of optimization – Simple GA – Simulation – Important similarities - Applications of GA – Rise of GA - GA application of historical interest – Improvements in basic technique - DeJong and function optimization

NEURAL NETWORKS **09**

Adaptive networks – Back propagation for feed forward networks – Batch learning – Pattern by pattern learning - Supervised learning neural networks – Radial basis function networks – Unsupervised learning neural networks – Competitive learning network – Kohonen self organising networks- Hebbian learning

FUZZY LOGIC **09**

Fuzzy sets – Set theoretic operations – Fuzzy rules and fuzzy reasoning – Extension principle and fuzzy relation – Fuzzy If-then rules - Fuzzy inference systems – Mamdani fuzzy models – Sugeno fuzzy models – Tsukamoto fuzzy models

NEURO-FUZZY MODELING **09**

Adaptive neuro-fuzzy Inference systems – Classification and regression trees – Decision trees – CART algorithm for tree induction - Data clustering algorithms

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun and Eiji Mizutani, —Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, New Delhi: Prentice-Hall of India, 2003.
2. David E. Goldberg, —Genetic Algorithms in Search, Optimization and Machine Learning, Singapore: Addison Wesley, 2001.
3. James A. Freeman and David M. Skapura, —Neural Networks Algorithms, Applications and Programming Techniques, New Delhi: Pearson Education, 2003.
4. Mitchell Melanie, —An Introduction to Genetic Algorithms, New Delhi: Prentice Hall, 1998.
5. George J. Klir and Bo Yuan, —Fuzzy Sets and Fuzzy Logic-Theory and Applications, New Delhi: PHI 1995.
6. Jacek M. Zurada, Introduction to Artificial Neural Systems, Boston: PWS Publishers, 1992.

L	T	P	C
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Course Objectives:

- To study the various parts of robots and fields of robotics.
- To study the various kinematics and inverse kinematics of robots.
- To study the Euler, Lagrangian formulation of Robot dynamics.
- To study the trajectory planning for robot.
- To study the control of robots for some specific applications.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Explain the basic concepts of working of robot

CO2: Analyze the function of sensors in the robot

CO3: Write program to use a robot for a typical application

CO4: Use Robots in different applications.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	W									
CO2	M	M	W									
CO3		S	M									
CO4			M	M								

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

**Hrs
09**

BASIC CONCEPTS

Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom – Asimov.s laws of robotics – dynamic stabilization of robots.

POWER SOURCES AND SENSORS**09**

Hydraulic, pneumatic and electric drives – determination of HP of motor and gearing ratio – variable speed arrangements – path determination – micro machines in robotics – machine vision – ranging – laser – acoustic – magnetic, fiber optic and tactile sensors.

MANIPULATORS, ACTUATORS AND GRIPPERS**09**

Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations.

KINEMATICS AND PATH PLANNING**09**

Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill Climbing Techniques – robot programming languages

CASE STUDIES**09**

Mutple robots – machine interface – robots in manufacturing and non- manufacturing applications – robot cell design – selection of robot.

Theory: 45 Hrs**Total: 45 Hrs****REFERENCES:**

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., —Industrial Robotics, Mc Graw-Hill Singapore, 1996.
2. Ghosh, —Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.
3. Deb. S.R.,—Robotics Technology and flexible Automation, John Wiley, USA 1992.
4. Klafter R.D., Chimielewski T.A., Negin M., —Robotic Engineering – An integrated approach, Prentice Hall of India, New Delhi, 1994.
5. Mc Kerrow P.J. —Introduction to Robotics, Addison Wesley, USA, 1991.
6. Issac Asimov —Robot, Ballantine Books, New York, 1986.
7. Barry Leatham - Jones, "Elements of industrial Robotics" PITMAN Publishing, 1987.
8. Mikell P.Groover, Mitchell Weiss, Roger N.Nagel Nicholas G.Odrey, "Industrial Robotics Technology, Programming and Applications ", McGraw Hill Book Company

BETE405**ASIC DESIGN**

L	T	P	C
3	0	0	3

Course Objectives:

- To acquire knowledge about different types of ASICs design.
- To study about various types of Programmable ASICs architectures and interconnects.
- To comprehend the low power design techniques and methodologies.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Recognize need for programmable devices.

CO2: Describe architecture of programmable devices.

CO3: Explain programmable methodologies.

CO4: Recall IC fabrication techniques vis-à-vis CMOS switch.

CO5: Relate design and implementation flow for PLDs.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M									
CO2	M	M	M									
CO3		M	M									
CO4	S		M									
CO5		M	M									

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

INTRODUCTION TO ASICS, CMOS LOGIC, ASIC LIBRARY DESIGN 09

Types of ASICs - Design flow – CMOS transistors- CMOS Design rules –Combinational logic Cell Sequential logic cell - Transistor as Resistors - Transistor parasitic capacitance – Logical effort - Library cell design – Library architecture.

PROGRAMMABLE ASICS, PROGRAMMABLE ASIC LOGIC CELLS 09 AND PROGRAMMABLE ASIC I/O CELLS

Anti fuse - Static RAM - EPROM and EEPROM technology - PREP benchmarks - Actel ACT - Xilinx LCA –Altera FLEX - Altera MAX DC & AC inputs and outputs - Xilinx I/O blocks.

PROGRAMMABLE ASIC INTERCONNECT, PROGRAMMABLE ASIC DESIGN SOFTWARE AND LOW LEVEL DESIGN 09

Entry: Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Altera MAX 9000 - Altera FLEX –Design systems - Logic Synthesis - Half gate ASIC -Low level design language - PLA tools EDIF- CFI design representation.

SILICON ON CHIP DESIGN 09

Voice over IP SOC - Intellectual Property – SOC Design challenges- Methodology and design- FPGA to ASIC conversion – Design for integration-SOC verification-Set top box SOC.

PHYSICAL AND LOW POWER DESIGN 09

Over view of physical design flow- tips and guideline for physical design- modern physical design techniques- power dissipation-low power design techniques and methodologies-low power design tools- tips and guideline for low power design.

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. M.J.S. Smith, —Application Specific Integrated Circuits, Pearson Education, 2008
2. Wayne Wolf, —FPGA-Based System Design, Prentice Hall PTR, 2009.
3. Farzad Nekoogar and Faranak Nekoogar, —From ASICs to SOCs: A Practical Approach, Prentice Hall PTR, 2003.

BETE406

NETWORK SECURITY AND CRYPTOGRAPHY

L	T	P	C
3	0	0	3

Course Objectives:

- To know about various encryption techniques.
- To understand the concept of Public key cryptography.
- To study about message authentication and hash functions
- To impart knowledge on Network security
- To learn the basic concepts of system level security

Course Outcomes:

After successful completion of this course, the students should be able to

- CO1:** Classify the symmetric encryption techniques.
- CO2:** Illustrate various Public key cryptographic techniques.
- CO3:** Evaluate the authentication and hash algorithms.
- CO4:** Discuss authentication applications
- CO5:** Summarize the intrusion detection and its solutions to overcome the attacks.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S				M							
CO2	S	S			M							
CO3	S			W	M							
CO4	M											
CO5	M											

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

SYMMETRIC CRYPTOGRAPHY 08

OSI Security Architecture – Classical Encryption techniques – Block Cipher Principles– Data Encryption Standard–Block Cipher Design Principles –AES Cipher– Stream Cipher–RC4– Placement of Encryption Function

PUBLIC KEY CRYPTOGRAPHY 11

Introduction to Number Theory –Public Key Cryptography and RSA - Key Management – Diffie-Hellman key Exchange – Elliptic Curve Arithmetic and Cryptography

AUTHENTICATION AND HASH FUNCTION 10

Authentication requirements – Authentication functions – Message Authentication Codes– Hash Functions–Security of Hash Functions and MACs– Secure Hash Algorithm - HMAC- Digital Signatures –Digital Signature Standard

NETWORK SECURITY 08

Authentication Applications: Kerberos – X.509 Authentication Service– ElectronicMailSecurity– PGP–S/MIME–IPSecurity–Case study:Secure Electronic Transaction

SYSTEMLEVELSECURITY

08

Intrusiondetection – password management – Viruses and related Threats –Virus Counter measures– Firewall Design Principles

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. William Stallings, —Cryptography andNetworkSecurity Principles and Practicel,Prentice Hall of India, S i x t h Edition,2014.
2. BehrouzA.Foruzan,—CryptographyandNetwork Securityll, SecondEdition Tata McGraw-Hill,2010.
3. AtulKahate,—CryptographyandNetworkSecurityll,TataMcGraw-Hill,reprint,2008
4. BruceSchneier,—AppliedCryptographyll,2ndEditionJohnWiley&SonsInc,reprint2008
5. Charles B. P fleeger, Shari Lawrence P fleeger, — Security in Computing, Third Edition,Pearson Education, 2003

BETE407

TELECOMMUNICATION SWITCHING NETWORKS

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the concepts of SONET/SDH multiplexing.
- To introduce the concepts of space switching, time switching and combination switching.
- To introduce the need for network synchronization and study synchronization issues.
- To study the outline network control and management issues.
- To introduce the concept of Traffic Engineering

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Describe different multiplexing techniques.

CO2: Express the concepts of Digital Switching.

CO3: Review the performance analysis of network traffic.

CO4: Outline the ISDN architecture and Digital Loop Carrier Systems.

CO5: Analyze the Characteristics of a network.

CO/PO Mapping	
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak	
COs	Programme Outcomes(POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	S	W										
CO3	S											
CO4	M											
CO5		S		M								

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

MULTIPLEXING

09

Transmission Systems – FDM – TDM – SONET/SDH: SONET Multiplexing Overview – SONET Frame Formats – SONET Operations – Administration and Maintenance – Payload Framing and Frequency Justification – Virtual Tributaries – DS3 Payload Mapping – E4 Payload Mapping –SONET Optical Standards – SONET Networks- SONET Rings: Unidirectional Path-Switched Ring – Bidirectional Line – Switched Ring.

DIGITAL SWITCHING

09

Switching Functions – Space Division Switching – Time Division Switching – two dimensional Switching: STS Switching – TST Switching –4 ESS Toll Switch – Digital Cross-Connect Systems – Digital Switching in an Analog Environment – Elements of SS7 signaling..

NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT

09

Timing: Timing Recovery – Phase Locked Loop – Clock Instability –Jitter Measurements – Systematic Jitter – Timing Inaccuracies: Slips – Asynchronous Multiplexing – Network Synchronization – Network Control – Network Management

DIGITAL SUBSCRIBER ACCESS

09

ISDN: ISDN Basic Rate Access Architecture – ISDN U Interface – ISDN D Channel Protocol – High-Data-Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line –VDSL– Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems – Integrated Digital Loop Carrier Systems – Next-Generation Digital Loop Carrier – Fiber in the Loop – Hybrid Fiber Coax Systems –Voice band Modems: PCM Modems – Local Microwave Distribution Service – Digital Satellite Services.

TRAFFIC ANALYSIS

09

Introduction to traffic and queuing Theory, Network Traffic Load and Parameters, Grade of Service Blocking Probability, Incoming traffic and service time characterization, Delay system: Exponential service Times- Constant Service Times- Finite Queues.

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Bellamy John- —Digital Telephony, 3rd edition, John Wily & Sons- Inc, 2000
2. Thiagarajan Viswanathan, —Telecommunication switching systems and Network, PHI- 1992, Twenty - Sixth Reprint, 2006.
3. D N Krishna Kumar- —Telecommunication & Switching, Sanguine Technical Publishers- Bangalore-2008
4. J.E.Flood, —Telecommunication switching, Traffic and Networks, Pearson Education Ltd, New Delhi, 2001.
5. Syed R Ali —Digital switching systems, McGraw-Hill, New York 1998.
6. R.A.Thomson, —Telephone switching Systems, Artech House Publishers, 2000.

BETE501

MOBILE COMMUNICATION

L	T	P	C
3	0	0	3

Course Objectives :

- To understand the basic cellular system concepts.
- To have an insight into the various propagation models and the speech coders used in mobile communication.
- To have knowledge of the mobile system specifications.
- To understand the multiple access techniques and interference reduction techniques in mobile communication.
- To gain knowledge of the various cellular mobile standards.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Discuss cellular radio concepts

CO2: Identify various propagation effects

CO3: Analyze various methodologies to improve the cellular capacity.

CO4: Classify multiple access techniques in mobile communication.

CO5: Outline cellular mobile communication standards

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	S			S						
CO2	S	M										
CO3	M	S	M									
CO4		M	M									
CO5		M						S				

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS 09

Introduction to wireless and cellular communications, Evolution of mobile communications, trends in cellular radio and personal communications. Cellular Concept: Frequency reuse, channel assignment, Handoff, Interference and System capacity, Trunking and Grade of Service, Improving coverage and capacity in cellular systems.

RADIO PROPAGATION AND SPEECH CODERS 09

Link budget design, Propagation models, Small scale Multipath propagation, Impulse response model, Small scale multipath measurements, parameters of mobile multipath channels, Types of small scale fading, Statistical models for multipath fading channels. Speech coders for mobile communications – Selection of speech coder - Linear predictive coders, CELP, RELP, GSM Codec.

SYSTEM SPECIFICATIONS 09

Power, Modulation, Signaling format, Call processing, Cell coverage for signal and traffic, Cell site and Mobile antennas, Frequency management and channel assignment, operational techniques and technologies, cellular switching equipment, Mobile telephone switching office.

MULTIPLE ACCESS TECHNIQUES AND INTERFERENCE 09

Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Capacity of Cellular CDMA and

SDMA. Interference: Real-time co-channel interference - Measurements, Reduction of co-channel interference, Diversity receiver, Non co-channel interference, near-end and far-end interference, crosstalk

CELLULAR STANDARDS

09

AMPS, ETACS, GSM, GPRS, EDGE, IS-95, CDMA2000, WCDMA, UMTS, Concept of Cognitive Radio, SDR

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. William C. Y. Lee —Mobile Cellular Telecommunications— -Second Edition- McGraw-Hill International, 1998.
2. T.S.Rappaport, —Wireless Communications: Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint 2003.
3. Jochen Schiller, —Mobile Communications, Prentice Hall of India, Second Edition, 2003.
4. R. Blake, —Wireless Communication Technology, Thomson Delmar, 2003.

BETE502

SATELLITE COMMUNICATION

L	T	P	C
3	0	0	3

Course Objectives:

- To enable the student to become familiar with satellites and satellite services.
- Study of satellite orbits and launching.
- Study of earth segment and space segment components
- Study of satellite access by various users.
- Study of DTH and compression standards

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Define orbital mechanics and launch methodologies

CO2: Describe satellite subsystems

CO3: Design link power budget for satellites

CO4: Compare competitive satellite services

CO5: Explain satellite access techniques

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	M			S								
CO2	M	S	M									
CO3	S	M	M	W								
CO4	W	M		M								
CO5	M	M	S									

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

SATELLITE ORBITS

09

Kepler’s Laws, Newton’s law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility – eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion

SPACE SEGMENT AND SATELLITE LINK DESIGN

09

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command. Satellite uplink and downlink Analysis and Design, link budget, E/N calculation-performance impairments-system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations- System Reliability and design lifetime.

SATELLITE ACCESS

09

Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication, compression – encryption.

EARTH SEGMENT

09

Earth Station Technology-- Terrestrial Interface, Transmitter and Receiver, Antenna Systems TVRO, MATV, CATV, Test Equipment Measurements on G/T, C/No, EIRP, Antenna Gain. Case study: Design an Uplink and Downlink for a typical satellite

SATELLITE APPLICATIONS

09

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- Worldspace services, Business TV(BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Dennis Roddy, ‘Satellite Communication’, McGraw Hill International, 4th Edition, 2006.
2. Timothy Pratt, Charles Bostian & Jeremy Allmuti, "Satellite Communications", John Wiley & Sons. Second edition 2008
3. N.Agarwal, ‘Design of Geosynchronous Space Craft’, Prentice Hall, 1986.
4. Bruce R. Elbert, ‘The Satellite Communication Applications’ Hand Book, Artech House Boston London, second edition 2004
5. Tri T. Ha, ‘Digital Satellite Communication’, II edition, 1990
6. Emanuel Fthenakis, ‘Manual of Satellite Communications’, McGraw Hill Book Co., 1984
7. Robert G. Winch, ‘Telecommunication Transmission Systems’, McGraw-Hill Book Co., second edition 1998.

BETE503

RADAR AND NAVIGATIONAL AIDS

L	T	P	C
3	0	0	3

Course Objectives:

- To derive and discuss the Range equation and the nature of detection
- To detect moving targets and cluster.
- To understand tracking radars, principles of navigation and landing aids as related to navigation

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Analyze various types of radar equipment.

CO2: Describe operation of Moving Target Indicator and pulse Doppler radar

CO3: Analyze features of Radar transmitters and receivers

CO4: Distinguish different navigation systems

CO5: Compare Navigation aids for direction finding and range of travel of aircrafts

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S										
CO2	M	S										

CO3			W									
CO4	M	S										
CO5	M	S										

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

INTRODUCTION TO RADAR

09

Basic Radar –The simple form of the Radar Equation- Radar Block Diagram- Radar Frequencies –Applications of Radar – The Origins of Radar -The Radar equation- Introduction-Detection of Signals in Noise- Receiver Noise and the Signal-to-Noise Ratio- Probability Density Functions- Probabilities of Detection and False Alarm- Integration of Radar Pulses-Radar Cross Section of Targets- Radar cross Section Fluctuations- Transmitter Power-Pulse Repetition Frequency- Antenna Parameters-System losses – Other Radar Equation Considerations

MTI AND PULSE DOPPLER RADAR

09

Introduction to Doppler and MTI Radar- Delay –Line Cancellers- Staggered Pulse Repetition Frequencies –Doppler Filter Banks - Digital MTI Processing - Moving Target Detector - Limitations to MTI Performance - MTI from a Moving Platform (AMIT) - Pulse Doppler Radar– Other Doppler Radar Topics- Tracking with Radar –Monopulse Tracking –Conical Scan and Sequential Lobing - Limitations to Tracking Accuracy - Low-Angle Tracking - Tracking in Range - Other Tracking Radar Topics -Comparison of Trackers - Automatic Tracking with Surveillance Radars (ADT).

DETECTION OF SIGNAL

09

Detection of Signals in Noise –Introduction – Matched –Filter Receiver –Detection Criteria – Detectors –Automatic Detector - Integrators - Constant-False-Alarm Rate Receivers - The Radar operator - Signal Management - Propagation Radar Waves - Atmospheric Refraction - Standard propagation - Nonstandard Propagation - The Radar Antenna - Reflector Antennas - Electronically Steered Phased Array Antennas - Phase Shifters - Frequency-Scan Arrays Radar Transmitters- Introduction –Linear Beam Power Tubes - Solid State RF Power Sources - Magnetron - Crossed Field Amplifiers - Other RF Power Sources - Other aspects of Radar Transmitter.Radar Receivers - The Radar Receiver - Receiver noise Figure - Superheterodyne

Receiver - Duplexers and Receiver Protectors- Radar Displays

METHODS OF NAVIGATION

09

Introduction -Radio Direction Finding - The Loop Antenna - Loop Input Circuits - An Aural Null Direction Finder - The Goniometer - Errors in Direction Finding - Adcock Direction Finders - Direction Finding at Very High Frequencies - Automatic Direction Finders - The Commutated Aerial Direction Finder - Range and Accuracy of Direction Finders Radio Ranges - The LF/MF Four course Radio Range - VHF Omni Directional Range(VOR) - VOR Receiving Equipment - Range and Accuracy of VOR - Recent Developments. Hyperbolic Systems of Navigation (Loran and Decca) - Loran-A - Loran-A Equipment - Range and precision of Standard Loran - Loran-C The Decca Navigation System - Decca Receivers - Range and Accuracy of Decca - The Omega System

DME and TACAN

09

Distance Measuring Equipment - Operation of DME - TACAN - TACAN Equipment Aids to Approach and Landing - Instrument Landing System - Ground Controlled Approach System - Microwave Landing System (MLS) Doppler Navigation - The Doppler Effect - Beam Configurations -Doppler Frequency Equations - Track Stabilization - Doppler Spectrum - Components of the Doppler Navigation System - Doppler range Equation - Accuracy of Doppler Navigation Systems. Inertial Navigation - Principles of Operation - Navigation Over the Earth - Components of an Inertial Navigation System - Earth Coordinate Mechanization - Strapped-Down Systems - Accuracy of Inertial Navigation Systems. Satellite Navigation System - The Transit System - Navstar Global Positioning System (GPS)

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Merrill I. Skolnik , " Introduction to Radar Systems", Tata McGraw-Hill (3rd Edition) 2003.
2. Myron Kyton and W.R.Fried ||Avionics Naviagtion systems — , John wiley & sons, (2nd Edition) 1997
3. Albert Helfrick.D,||Principles of Avionics||, Avionics communications Inc,2004
4. N.S.Nagaraja, ||Elements of Electronic Navigation Systems, || 2nd Edition, Tata McGraw-Hill, -2000
5. Peyton Z. Peebles:, "Radar Principles", John wiley, 2004
6. J.C Toomay, " Principles of Radar", 2nd Edition –Prentice Hall India, 2004

BETE504

RF MEMS

L	T	P	C
3	0	0	3

Course Objectives:

- Acquire basic knowledge about application of MEMS in RF communications.
- Study about MEMS physical modeling and reconfigurable elements.
- Understand MEMS phase shifters and Filters

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Understand the fabrication methodology used in MEMS

CO2: Construct and analyze the various models of MEMS

CO3: Use the reconfigurable design implementation in MEMS

CO4:Apply different types of filters and phase shifters in MEMS

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S										
CO2	S	M										
CO3	S	M										
CO4	S	M		W								
CO5												

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

INTRODUCTION TO MEMS

08

Development of micro electronics - Region of Nanostructures - Miniaturization, Typical products, Micro sensors, Micro actuation, MEMS with micro actuators, Microaccelerometers and Micro fluidics, MEMS materials, Micro fabrication(Silicon micromachining-semiconductors and insulators - Microsystems fabrication techniques - Silicon MEMS fabrication technology - Single crystal reactive etching and metallization process).

MEMS PHYSICAL MODELING **11**

Physical and practical aspects of RF circuit design: Impedance mismatch effects in RF MEMSRF/Microwave substrate properties: Micro machined – enhanced elements, MEM switches, Resonators. MEMS modeling.

RECONFIGURABLE ELEMENTS **10**

Reconfigurable circuit elements: Resonator MEMS Switch Tunable CPW resonator, MEMS micro switch array, Reconfigurable antenna

MEMS PHASE SHIFTERS **08**

MEMS Phase Shifters: Types of Phase shifters, Switched delay line phase shifters. Distributed MEMS phase shifters.

MEMS FILTERS **08**

RF MEMS Filters: Modeling of mechanical Filters and resonators, Micro machined filters for millimeterwave applications. SAW filters

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Tai Ran Hsu, —MEMS & Micro systems Design and Manufacture, Tata McGraw hill, New Delhi, 2002.
2. H.J. Delos Santos, RF MEMS circuit Design for Wireless Communications, Artech House, 2002.
3. G.M. Rebeiz, RF MEMS Theory, Design and Technology, John Wiley, 2003
4. Vijay.K. Varadan et al, RF MEMS and their Applications, Wiley-India, 2011

BETE505

NANO ELECTRONICS

L	T	P	C
3	0	0	3

Course Objectives:

- To impart a transition from the bulk 3-dimensional materials to quantum confined systems.
- Able to classify the different nanomaterials depending on the properties.
- Can visualize the 1-D, 2-D, 3-D phenomena using the characterization techniques.
- Knowledge about the upcoming technology based materials, devices and their characteristics.

Course Outcomes:

After successful completion of this course, the students should be able to

CO1: Relate thermodynamic concepts of nanoparticles.

CO2: Discuss properties of nanoparticles.

CO3: Interpret applications of nanosystems.

CO4: Illustrate characterization techniques used in nanosystem.

CO5: Compare physical & chemical synthesis procedures of nanosystems.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	W										
CO2	S											
CO3	M	M										
CO4	M	M		S								
CO5	M			M								

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

Hrs

INTRODUCTION TO QUANTUM MECHANICS

08

Limitation of classical physics – plank's quantum hypothesis – Einstein's photoelectric effect – wave nature of particle – The uncertainty principle - Schrödinger's time dependent and independent wave equations – particle in a box

NANOMATERIALS AND ITS PROPERTIES

11

1D-2D-3D materials - Quantum wells, wires and Dots – Size and dimensionality effects, Carbon nanotubes (CNTs)- Single walled carbon nanotubes (SWNTs), Multiwalled carbon nanotubes (MWNTs), Graphenes, fullerenes- Structure and Properties, Metal/oxide nanoparticles, Nanorods, Nanowires, Nanotubes, and Nanofibers, Semiconductor Quantum Dots- Excitons, Magnetic Nanoparticles.

CHARACTERISATION TECHNIQUES

10

X – Ray diffraction – Scanning electron microscopy – Transmission electron microscopy – Atomic force microscopy – Scanning tunneling microscopy

NANOELECTRONICS

08

Basics of Nanoelectronics – capabilities of Nanoelectronics – Physical fundamentals of nanoelectronics – Basics of information theory – the tools for micro and nano fabrication – Basics of lithographic techniques for nanoelectronics - Quantum electron devices – from classical to quantum physics: upcoming electronic devices – Electrons in mesoscopic structure – short channel MOS transistor – split gate transistor – Electron wave transistor – Electron spin transistor – Quantum cellular automate – Quantum dot array

NANOELECTRONIC DEVICES

08

Principles of Single Electron Transistor (SET) – SET circuit design – comparison between FET and SET circuit design. Nanoelectronics with tunneling devices and superconducting devices – tunneling element technology - RTD: circuit design – Defect tolerant circuits - Molecular electronics – elementary circuits – flux quantum devices

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Karl Goser et.al, —Nanoelectronics and Nanosystems: From Transistors to Molecular and Quantum devices, Springer, 2005.
2. Mick Wilson, Kamali Kannangara, Geoff smith, —Nanotechnology: Basic Science and Emerging Technologies, Overseas press, 2005
3. Charles P.Poole Jr and. Frank J.Owens, —Introduction to Nanotechnology, Wiley Interscience, 2003.
4. Nan yao, zhong lin wang, Hand book of microscopy for nanotechnology, Kluwer Academic Publishers, 2005
5. G. Cao, —Nanostructures and Nanomaterials: Synthesis, Properties and Applications, Imperial College Press, 2004

BETE506

WIRELESS NETWORKS

L	T	P	C
3	0	0	3

Course Objectives:

- To study about Wireless networks, protocol stack and standards.
- To study about fundamentals of 3G Services, its protocols and applications.
- To study about evolution of 4G Networks, its architecture and applications.

Course Outcomes:

After successful completion of this course, the students should be able to

- CO1:** Conversant with the latest 3G/4G and WiMAX networks and its architecture.
- CO2:** Design and implement wireless network environment for any application using latest wireless protocols and standards.
- CO3:** Implement different type of applications for smart phones and mobile devices with latest network strategies.

CO/PO Mapping												
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M	W								
CO2	M	M	S	M								
CO3		M	M	M								

Course Assessment methods:

DIRECT		INDIRECT	
1.	Internal Test	1.	Student Exit Survey
2.	Assignment	2.	Faculty Survey
3.	Seminar	3.	Industry
4.	Quiz	4.	Alumni
5.	Online Test		
6.	End Semester Exam		

WIRELESS LAN

09

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

MOBILE NETWORK LAYER

09

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6- Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing, Destination Sequence distance vector, Dynamic source routing

MOBILE TRANSPORT LAYER

09

TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility - Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks.

WIRELESS WIDE AREA NETWORK

09

Overview of UTM S Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol.

4G NETWORKS

09

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, OFDM-MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.

Theory: 45 Hrs

Total: 45 Hrs

REFERENCES:

1. Jochen Schiller, ‖Mobile Communications‗, Second Edition, Pearson Education 2012.(Unit I,II,III)
2. Vijay Garg , —Wireless Communications and networking‗, First Edition, Elsevier 2007.(Unit IV,V)
3. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband‗, Second Edition, Academic Press, 2008.
4. Anurag Kumar, D.Manjunath, Joy kuri, —Wireless Networking‗, First Edition, Elsevier 2011.
5. Simon Haykin , Michael Moher, David Koilpillai, —Modern Wireless Communications‗, First Edition, Pearson Education 2013