Regulation 2015

B.TECH ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM AND SYLLABUS

SEMESTER –I

Code No.	Course Title	L	T	P	C
Theory					
BEN101	English – I	3	1	0	3
BMA101	Mathematics – I	3	1	0	3
BPH101	Engineering Physics – I	3	0	0	3
BCH101	Engineering Chemistry – I	3	0	0	3
BCS101	Fundamentals of Computing and Programming	3	0	0	3
BFI 101*	Foreign / Indian Language	3	0	0	3
BME102	Engineering Graphics – C	1	0	3	3
BEE101	Basic Electrical and Electronics Engineering	2	0	0	2
Practical					
BCS1L1	Computer Practice Laboratory –I	0	0	3	1
BEE1L1	Basic Electrical and Electronics Engineering Practices Laboratory	0	0	3	1
BPC1L1	Physics and Chemistry Laboratory#	0	0	3/3	0
	NCC/NSS/ Yoga (Optional) to be conducted during week ends				

Total Number of Credits= 25

#Laboratory Classes on alternate weeks for Physics and Chemistry. The lab examinations will be held only in the second semester (including the first semester experiments also)

*Any one of the following courses:BFR201–French, BGM201–German, BJP201–Japanese,BKR201 – Korean, BCN201 – Chinese, BTM201 - Tamil

SEMESTER II

Code No.	Course Title	L	T	P	C
Theory					
BEN201	English – II	3	1	0	3
BMA201	Engineering Mathematics – II	3	1	0	3
BPH201	Engineering physics – II	3	0	0	3
BCH201	Engineering Chemistry – II	3	0	0	3
BCS201	Internet Programming	2	0	0	2
BBA201*	Personality Development	2	0	0	2
BBT202*	Biology for Engineers	2	0	0	2
BME203*	Basic Mechanical Engineering(Circuit Branches)	2	0	0	2
BCE201*	Basic Civil Engineering(Circuit Branches)	2	0	0	2
Practical					
BCS2L1	Internet Practices Lab	0	0	3	1
BCM2L1*	Basic Civil and Mechanical Engineering PracticesLaboratory(Circuit Branches)	0	0	3	1
BPC2L1	Physics and Chemistry Laboratory	0	0	3/3	1
	NCC/NSS/ Yoga (Optional) to be conducted during week ends				

Total Number of Credits = 25

*Syllabus is same as that of first semester.

SEMESTER – III

Code No.	Course Title	L	T	P	C
Theory					
BMA301	Mathematics III	3	1	0	4
BEE301	Electrical Engineering	3	0	0	3
BEC303	Electronics Circuits-I	3	0	0	3
BEC302	Principles of Digital Electronics	3	1	0	4
BEC301	Signals and Systems	3	1	0	4
BCE306	Environmental Studies	3	0	0	3
Practical					
BEE3L3	Electrical Engineering Lab	0	0	4	2
BEC3L1	Electronic Devices and Circuits Lab	0	0	4	2
BEC3L2	Digital Electronics Lab	0	0	4	2
BEC3S1	Technical Seminar-I	0	0	3	1

Total Number of Credits = 28

SEMESTER – IV

Code No.	Course Title	L	T	P	C
Theory					
BEC402	Electronic Circuits-II	3	0	0	3

BMA402	Numerical Methods	3	1	0	4
BEC405	Linear Integrated Circuits	3	1	0	4
BCS406	Object Oriented Programming and Data Structures	3	0	0	3
BEC403	Electromagnetic Fields and Waves	3	1	0	4
BEI406	Electronic Instrumentation	3	0	0	3
Practical					
BEC4L1	Electronic Circuit Design Lab	0	0	4	2
BCS4L3	Object Oriented Programming and Data Structures Lab	0	0	4	2
BEC4L2	Linear Integrated Circuits Lab	0	0	4	2

Total Number of Credits = 27

SEMESTER – V

Code No.	Course Title	L	T	P	C
Theory					
BEC505	Digital Signal Processing	3	1	0	4
BEC502	Microprocessor and Microcontroller	3	1	0	4
BEC503	Transmission Lines, Network and Waveguides	3	1	0	4
BEC504	Communication Engineering I	3	0	0	3
BEI501	Control Systems	3	0	0	3
BEC 5E1	Elective-I	3	0	0	3
Practical					
BEC5L1	Digital Signal Processing Lab	0	0	4	2
BEC5L6	Microprocessor and Microcontroller Lab	0	0	4	2
BEC5L3	Communication Engineering- I Lab	0	0	4	2
BEC5P1	Mini Project	0	0	3	1

Total Number of Credits = 28

SEMESTER – VI

Code No.	Course Title	L	T	P	C
Theory					
BEC601	Computer Communication Networks	3	0	0	3
BEC603	Antenna and Wave Propagation	3	1	0	4
BEC604	Communication Engineering II	3	0	0	3
BEC602	Microwave Engineering	3	0	0	3
BMA604	Random Processes	3	1	0	4
BEC 6E2	Elective II	3	0	0	3
Practical					
BEC6L1	Computer Communication Networks lab	0	0	4	2
BEC6L2	Microwave Engineering Lab	0	0	4	2
BEC6L3	Communication Engineering – II lab	0	0	4	2

Total Number of Credits = 26

SEMESTER – VII

Code No.	Course Title	L	T	P	C
Theory					
BBA701	Principles of Management And Professional Ethics	3	0	0	3
BEC701	Fiber Optic Communication	3	1	0	4
BEC702	Digital CMOS VLSI	3	1	0	4
BEC703	Cellular Mobile Communication	3	0	0	3
BEC7E2	Elective-III	3	0	0	3
BEC7E3	Elective-IV	3	0	0	3
Practical					
BEC7L2	Digital CMOS VLSI Lab	0	0	4	2
BEC7L3	Optical Communication Lab	0	0	4	2
BEC7L3	Optical Communication Lab	0	0	4	2

Total Number of Credits = 26

SEMESTER – VIII

Code No.	Course Title	L	T	P	C
Theory					
BEC 8E4	Elective –IV	3	0	0	3
BEC8E5	Elective-V	3	0	0	3
BEC8E6	Elective-VI	3	0	0	3
Practical					
BEC8P1	Project Work	0	0	18	6

Total Number of Credits = 15

Total Credits For The Programme =200

LIST OF ELECTIVES

Code No.	Course Title	L	T	P	C
Theory					
BEC001	Coginitive Radio	3	0	0	3
BEC002	Integrated Service Digital Network	3	0	0	3
BEC003	Satellite Communication	3	0	0	3
BEC004	Robotics and Automation	3	0	0	3
BEC005	Blue Tooth Technology	3	0	0	3
BEC006	Medical Electronics	3	0	0	3
BEC007	Digital Image Processing	3	0	0	3
BEC008	MEMS and NEMS	3	0	0	3
BEC009	Radar And Navigational Aids	3	0	0	3
BEC010	Mobile Adhoc Networks	3	0	0	3

BEC011	Remote Sensing	3	0	0	3
BEC012	Cryptography and Network Security	3	0	0	3
BEC013	Automative Electronics	3	0	0	3
BEC 014	Embedded Systems	3	0	0	3
BEC 015	Advanced Computer Architecture	3	0	0	3
BEC 016	SpeechProcessing	3	0	0	3
BEC 017	SoftComputing	3	0	0	3
BEC 018	TotalQualityManagement	3	0	0	3
BEC 019	OperationsResearch	3	0	0	3
BEC 020	Engineering EconomicsandFinancial Management	3	0	0	3
BEC 021	AdvancedDigital SignalProcessing	3	0	0	3
BEC 022	High Speed Networks	3	0	0	3
BEC 023	Real-TimeEmbedded Systems	3	0	0	3
BEC 024	Internetand JavaProgramming	3	0	0	3
BEC 025	ASIC	3	0	0	3

BEN 101 ENGLISH I 3103

CourseObjectives:

- Discover an understanding of the process of oral communication
- Originate knowledgeable audience-centered speaking
- Formulate a significant training ground for the development of student's abilities in public speaking
- Create multiple opportunities for students to practice and share their reading skill development
- Improve critical thinking and analytical skills
- Develop a milestone for leadership and group participation through communication skills

.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Formulate and practice effective reading strategy to enhance technical communication
CO2: Assess strengths in writing skills and set goals for future growth

CO3: Practice and perceive the full repertoire of listening strategies by using authentic listening tasks
CO4: Create learning situations to develop speaking skills based on sound educational and communication theories.
CO5: Masterthetechniquesofprofessionalcommunicationsothattheybecome employable aftercompletingthe course

CO/PO Mapping (S/M/Windicates strength of correlation) S-Strong, M-Medium												
Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S		S	S	S	M	S	S	S
CO2				S		S	S	S	M	S	S	S
CO3				S		S	S	S	M	S	S	S
CO4				S		S	S	S	M	S	S	S
CO5				S		S	S	S	M	S	S	S

CourseAssessmentmethods:

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

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..

BMA 101 ENGINEERING MATHEMATICS – I 3103

CourseObjectives:

- Apply matrix operations to solve the relevant real life problems in engineering.
- Formulate a mathematical model for three dimensional objects and solve the concerning problems.
- Find area and volume based on a function with one or more variables.
- To solve Functions of Several Variables.
- To understand the concepts of Multiple Integrals.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Apply matrix operations to solve the relevant real life problems in engineering.
CO2: Formulate a mathematical model for three dimensional objects and solve the concerning problems.
CO3: Find area and volume based on a function with one or more variables.
CO4: Solve Functions of Several Variables.
CO5: Understand the concepts of Multiple Integrals.

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CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S		S			S		M		S	
CO2	S	S		S			S		M		S	
CO3	S	S		S			S		M		S	
CO4	S	S		S			S		M		S	
CO5	S	S		S			S		M		S	

CourseAssessmentmethods:

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 Examinations		

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 circularcone- Equation of a cylinder- Right circular cylinder.

UNIT-III Differential Calculus **9+3**

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

UNIT-1V 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. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John Wi;ey and Sons,New York,2003.
4. Murray R.Spiegel, "Advanced Calculus", Schaum's Outline Series, First Edn, McGraw Hill Intl Book Co., New Delhi, , 1981.

BPH 101 ENGINEERING PHYSICS – I 3103

CourseObjectives:

- Make a bridge between the physics in school and engineering courses.
- Impart a sound knowledge on the basic concepts of modern sciences.
- Impart knowledge on engineering applications of ultrasonics, lasers, fundamentals of crystal physics and utility of solar energy.
- Understand Electromagnetic Theory
- Understand about crystal physics

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CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: make a bridge between the physics in school and engineering courses.
CO2: impart a sound knowledge on the basic concepts of modern sciences.
CO3: impart knowledge on engineering applications of ultrasonics, lasers, fundamentals of crystal physics and utility of solar energy.
CO4: understand Electromagnetic Theory
CO5: understand about crystal physics

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CO/PO Mapping	
(S/M/Windicates strength of correlation) S-Strong, M-Medium	
Cos	ProgrammeOutcomes(POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S		S			S	M		S	S
CO2	S	S	S		S			S	M		S	S
CO3	S	S	S		S			S	M		S	S
CO4	S	S	S		S			S	M		S	S
CO5	S	S	S		S			S	M		S	S

CourseAssessmentmethods:

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 Examinations		

UNIT-IUltrasonic's 9

Introduction – Production- Magnetostriction Effect- Magnetostriction Generator- Piezoelectric Effect- Piezo electric 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- Einstien's A &B Coefficients-Derivation-Condition for producing aaser beam- Population inversion- Pumping-Resonance cavity- Types OfLasers- 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 electromagneticwave and its quantitative deduction-group velocity- energy in electromagnetic waves- electromagnetic waves inmatters-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, HCPStructures- Polymorphism and Allotropy- Crystal defects- point, line and surface defects- Burger's vector- problems.

Total: 45 Period

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 ?Hil 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

BCH 101 ENGINEERING CHEMISTRY – I **3 1 0 3**

CourseObjectives:

- Discuss about Water Technology and different types of water treatments

- Impart knowledge about polymers and its types.
- Understand the concepts of electrochemistry
- Basics of Corrosion and Corrosion Control
- Understand Non-Conventional Energy Sources and Storage Devices

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Discuss about Water Technology and different types of water treatments
CO2: Impart knowledge about polymers and its types.
CO3: Understand the concepts of electrochemistry
CO4: Basics of Corrosion and Corrosion Control
CO5: Understand Non-Conventional Energy Sources and Storage Devices

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

CourseAssessmentmethods:

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 Examinations		

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 – HCI 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)

BCS 101 FUNDAMENTALS OF COMPUTING AND PROGRAMMING 3 0 0 3

CourseObjectives:

- Introduction to Computer
- Problem Solving and Office Automation.
- Impart knowledge on Introduction to C.
- Understand Arrays and Structures
- Understand about Introduction to C++

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: have knowledge on computers.
CO2: **S**olveProblem and work Office Automation
CO3: Work on C and write programs using C language
CO4: work on Arrays and Structures
CO5: Work on C++ and write programs using C++ language

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CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S		S			S	M		S	S
CO2	S	S	S		S			S	M		S	S
CO3	S	S	S		S			S	M		S	S
CO4	S	S	S		S			S	M		S	S
CO5	S	S	S		S			S	M		S	S

CourseAssessmentmethods:

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 Examinations		

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: 45 Periods

Text Books

1. Ashok, N.Kamthane,"Computer Programming", Pearson Education (2012).
2. Anita Goel and Ajay Mittal,"Computer Fundamentals and Programming in C", Dorling 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. PradipDey,ManasGhosh,Fundamentals of Computing and Programming in 'C' First Edition ,Oxford University Press(2009)
4. The C++ Programming Language ,4thEdition,BjarneStroustrop,Addison-Wesley Publishing Company(2013)

BBA101/BBA102 Personality Development **1 1 0 2**

CourseObjectives:

- To make students understand the concept and components of personality and thereby to apply the acquired knowledge to themselves and mould their personality.
- To impart training for positive thinking, this will keep the students in a good stead to face the challenges.
- To bring out creativity and other latent talents with proper goal setting so that self- esteem gets enhanced.
- To develop an individual style and sharpen the skills in the area of leadership, decision making, time management and conflict management.
- To sharpen the employability skills of the professional undergraduate students and aid them in landing in the desired job.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeable to

CO1: make a bridge between the personality and work environment.
CO2: impart a sound knowledge on Attitude & Motivation.
CO3: build self esteem
CO4: understand Electromagnetic Theory
CO5: understand about Employability Quotient

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CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium

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

CourseAssessmentmethods:

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 Examinations		

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 de-motivation

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

BBT102/202 BIOLOGY FOR ENGINEERS 2 0 0 2

CourseObjectives:

- To understand the fundamentals of living things, their classification, cell structure and biochemical constituents
- To apply the concept of plant, animal and microbial systems and growth in real life situations
- To comprehend genetics and the immune system
- To know the cause, symptoms, diagnosis and treatment of common diseases
- To give a basic knowledge of the applications of biological systems in relevant industries

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: make Students to have knowledge about Cells and bio molecules.
CO2: developknowledge on the basic concepts of plant system and animal system.
CO3: UnderstandGenetic and immune sytem.
CO4: classify and understand the root causehuman diseases and its origin
CO5: Understand the biological industrial application

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CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium

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

CourseAssessmentmethods:

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 Examinations		

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, hypertention, influenza, AIDS and Hepatitis

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

Transgenic plants and animals-stem cell and tissue engineering-bioreactors-biopharming-recombinant vaccines-cloning-drug discovery-biological neural networks-bioremediation-biofertilizer-biocontrol- 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

BCE 101/BCE 201 BASIC CIVIL ENGINEERING 2 0 0 2

CourseObjectives:

- Know about the types of Materials used in building construction .
- Impart a sound knowledge on Surveying.
- Impart knowledge on foundation of a building.
- Masonry and its types
- ToLearnEngineeringaspects related to dams, watersupply,and sewagedisposal

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Understand about the types of Materials used in building construction
CO2: Know about Surveying
CO3: develop knowledge on foundation of a building
CO4: Know aboutMasonry and its types
CO5: Understand Engineeringaspects related to dams, watersupply,and sewagedisposal

.

CO/PO Mapping (S/M/Windicates strength of correlation) S-Strong, M-Medium												
Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	S	S	S		S			S	M		S	S
CO2	S	S	S		S			S	M		S	S
CO3	S	S	S		S			S	M		S	S
CO4	S	S	S		S			S	M		S	S
CO5	S	S	S		S			S	M		S	S

CourseAssessmentmethods:

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 Examinations		

UNIT- I Civil Engineering Materials 8

Introduction – Civil Engineering – Materials – Stones – Bricks – Sand – Cement – Plain Concrete – Reinforced Cement Concrete – Steel Sections – Timber – Plywood – Paints – Varnishes (simple examples only)

UNIT- II Surveying 5

Surveying – objectives – classification – principles of survey-Measurement of distances – Chain survey – Determination of areas – Use of compass – Use of leveling Instrument – (simple examples only)

UNIT- III Foundation for Building 5

Bearing Capacity of Soil – Foundation – Functions – Requirement of good foundations – Types of foundations – Merits & Demerits.

UNIT- IV Superstructure 7

Stone Masonry – Brick Masonry – Columns – Lintels – Beams – Roofing – Flooring – Plastering – White Washing (Simple examples only)

UNIT- V Miscellaneous Topics 5

Types of Bridges –Dam- purpose – selection of site - Types of Dams – Water Treatment & Supply sources – standards of drinking- distribution system. – Sewage Treatment (simple examples only)

TOTAL : 30 PERIODS

Text Books:

1. Raju .K.V.B, Ravichandran .P.T, “Basics of Civil Engineering”, Ayyappa Publications, Chennai, 2012.
2. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, (1st ed. 2005).
3. Dr.M.S Palanisamy, “Basic Civil Engineering” (3rd ed. 2000), TUG Publishers, New Delhi/Tata Mc Graw Hill Publication Co., New Delhi

Reference Books:

1. Rangwala .S.C,” Engineering Material”s, Charotar Publishing House, Anand, 41st Edition: 2014.
2. National Building Code of India, Part V, “Building Materials”, 2005
3. Ramesh Babu “A Textbook on Basic Civil Engineering” (1998). Anuradha Agencies, Kumbakonam.
4. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co. (P) Ltd. (1999).

BME 101 ENGINEERING GRAPHICS- E **2 0 3 4**

CourseObjectives:

- To visualize and produce two dimensional graphic representation of three dimensional objects and buildings.
- To comprehend and visualize 3D views of objects.
- To understand and generate the different curves used in engineering applications.
- To introduce the fundamental of CAD Graphics used in design.
- To visualize interior portions of object and also to draw the surfaces necessary for producing prisms, pyramids, cone, tray, duct etc

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: visualize and produce two dimensional graphic representation of three dimensional objects and buildings.
CO2: comprehend and visualize 3D views of objects.
CO3: understand and generate the different curves used in engineering applications.
CO4: introduce the fundamental of CAD Graphics used in design.
CO5: visualize interior portions of object and also to draw the surfaces necessary for producing prisms, pyramids, cone, tray, duct etc

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CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium

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

CourseAssessmentmethods:

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 Examinations		

UNIT-I Basic Curves, Projection of points and Straight lines 6+6

Conics-construction of ellipse, parabola and hyperbola by eccentricity method-construction of cycloids- 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 and trapezoidal method and traces.

UNIT-II Projections of Planes and solids 6+6

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

UNIT-III Orthographic Projections, Isometric projections & Free hand sketching 6+6

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- combination of two solid objects in simple vertical positions and miscellaneous problems Free hand sketching of orthographic & Isometric projection

UNIT-IV Projection of Sectioned solids and development of surfaces 6+6

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. Development of lateral surfaces of solids with cut-outs and holes.

UNIT-V Perspective projection, building drawing and Computer aided drafting 6+6

Perspective projection of simple solids-Prisms, Pyramids 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: 60 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

BME 103/203 BASIC MECHANICAL ENGINEERING 2 0 0 2

CourseObjectives:

- To provide basic knowledge regarding various power plants.
- To provide basic knowledge of I.C engines.
- To provide basic knowledge of Refrigeration and Air- Conditioning
- To provide basic Knowledge of basic manufacturing process.
- To provide basic knowledge of mechanical design required for engineering.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Have basic knowledge regarding various power plants.
CO2: Have basic knowledge of I.C engines
CO3: Have basic knowledge of Refrigeration and Air- Conditioning
CO4: Have knowledge of basic manufacturing process
CO5: Have knowledge of mechanical design required for engineering

.

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S		S			S	M		S	S

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

CourseAssessmentmethods:

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 Examinations		

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.

BEE 101/201 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING 2 0 0 2

CourseObjectives:

- To impart knowledge on D.C. and A.C CIRCUITS.
- Impart a sound knowledge on the basic concepts of Electrical machines.
- Impart knowledge on engineering applications basic measurement system
- Understand about semiconductor devices
- Understand about digital electronics

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Have knowledge on D.C. and A.C CIRCUITS.

CO2: Have a sound knowledge on the basic concepts of Electrical machines.

CO3: Impart knowledge on engineering applications basic measurement system
CO4: Understand about semiconductor devices
CO5: Understand about digital electronics

.

CO/PO Mapping (S/M/Windicates strength of correlation) S-Strong, M-Medium												
Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S		S			S	M		S	
CO2	S	S	S		S			S	M		S	
CO3	S	S	S		S			S	M		S	
CO4	S	S	S		S			S	M		S	
CO5	S	S	S		S			S	M		S	

CourseAssessmentmethods:

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 Examinations		

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 MEASURMENT 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 & FullAdder – 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
3. Jacob Millman and Christos C-Halkias, "Electronic Devices and Circuits", Tata McGraw Hill

REFERENCE BOOKS:

1. Edminister J.A. "Theory and problems of Electric Circuits" Schaum's Outline Series. McGraw Hill Book Compay, 2nd Edition, 1983.
2. Hyatt W.H and Kemmerlay J.E. "Engineering Circuit Analysis", McGraw Hill Internatinal Editions, 1993.
3. D. P. Kothari and I. J. Nagrath "Electric machines" Tata McGraw-Hill Education, 2004
4. Millman and Halkias, "Integrated Electronics", Tata McGraw Hill Edition, 2004.

BCS 1L1/BCS 2L2 COMPUTER PRACTICE LABORATORY I **0 0 2 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 andgenerate thedifferent 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.	Lab Records	**1.**	Student exit survey
2.	Observation Books	**2.**	Faculty Survey
3.	Viva voce	**3.**	Industry
4.	Model Exam	**4.**	Alumni
5.	End Semester Exam		

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 Sheeet **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
Structures and Unions
Functions

D) Simple C++ Programming **11**

13. Classes and Objects

14. Constructor and Destructor

BCM1L1/ BCM2L1BASIC CIVIL & MECHANICAL ENGINEERING PRACTICES LABORATORY **0 0 2 1**

CourseObjectives:

- To provide hands on exercises in common plumbing and carpentry works associated with residential and industrial buildings.
- To expose the students regarding pipe connection for pumps & turbines and to study the joint used in roofs, doors, windows and furnitures.
- To provide hands on exercise on basic welding, machining and sheet metal works.
- To provide exposure regarding smithy, foundry operations and in latest welding operations such as TIG, MIG, CO2, spot welding etc.,
- To expose the students regarding the construction and working of centrifugal pump, air-conditioner and lathe.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Have hands on exercises in common plumbing and carpentry works associated with residential and industrial buildings.

CO2: work on pipe connection for pumps & turbines and to study the joint used in roofs, doors, windows and furniture.

CO3: Have hands on exercise on basic welding, machining and sheet metal works.

CO4: Have exposure regarding smithy, foundry operations and in latest welding operations such as TIG, MIG, CO2, spot welding etc.,

CO5: Have exposure regarding the construction and working of centrifugal pump, air-conditioner and lathe

.

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S		S			S	M		S	
CO2	S	S	S		S			S	M		S	
CO3	S	S	S		S			S	M		S	
CO4	S	S	S		S			S	M		S	
CO5	S	S	S		S			S	M		S	

CourseAssessmentmethods:

DIRECT		INDIRECT	
1.	Lab Records	**1.**	Student exit survey
2.	Observation book	**2.**	Faculty Survey
3.	Viva Voce	**3.**	Industry
4.	Model Examination	**4.**	Alumni
5.	End Semester Exams		

I. CIVIL ENGINEERING PRACTICE Buildings:

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

Plumbing Works:

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

Carpentry using Hand tools and Power tools:

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

II MECHANICAL ENGINEERING PRACTICE

Welding: Preparation of butt joints, lap joints and tee joints by arc welding.

Basic Machining: a) Simple Turning and Taper turning b) Drilling Practice

Sheet Metal Work:

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

Machine assembly practice:

a) Assembling, dismantling and Study of centrifugal pump
b) Assembling, dismantling and Study of air conditioner

c) Assembling, dismantling and Study of lathe.

Moulding:

Moulding operations like mould preparation for gear and step cone pulley etc.,

Fitting:

FittingExercises – Preparation of square fitting and vee – fitting models.

Demonstration:

a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.

b) Gas welding.

TOTAL: 45 PERIODS

REFERENCES:

1. K. Jeyachandran, S. Nararajan & S, Balasubramanian, "A Primer on Engineering Practices Laboratory" ,Anuradha Publications, (2007).
2. T.Jeyapoovan, M. Saravanapandian & S. Pranitha, "Engineering Practices Lab Manual",Vikas Publishing House Pvt. Ltd. (2006)
3. H. S. Bawa, "Workshop Practice",Tata McGraw – Hill Publishing Company Limited, (2007).
4. A. Rajendra Prasad & P. M. M. S Sarma, "Workshop Practice", Sree Sai Publication, (2002).
5. P. Kannaiah & K.L. Narayana, "Manual on Workshop Practice", Scitech Publication, (1999).

BEE1L1 Basic Electrical Engineering Lab **0 0 2/2 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 andno-load.

CO4: Know the working concept of different types of induction motor and analyze the

operatingbehavior 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.	Lab Records	**1.**	Student exit survey
2.	Observation Books	**2.**	Faculty Survey
3.	Viva Voce	**3.**	Industry
4.	Model Exam	**4.**	Alumni
5.	End Semester Exam		

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 in circuit RLC
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, OR, NOT, NAND, EX-OR).
5. Implementation of half adder circuit using logic gates.

BEN 201 ENGLISH II **3 1 0 3**

CourseObjectives:

- Discover an understanding of the process of Orientation
- Originate knowledgeable audience-centered speaking
- Formulate a significant training ground for the development of student's thinking abilities in public speaking
- Create multiple opportunities for students to practice and share their writing skill development
- Improve critical thinking and analytical skills
- Develop a milestone for leadership and group participation through communication skills

CourseOutcomes:
Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Formulate and practice effective reading strategy to enhance technical communication
CO2: Assess strengths in writing skills and set goals for future growth
CO3: Practice and perceive the full repertoire of listening strategies by using authentic listening tasks
CO4: Create learning situations to develop speaking skills based on sound educational and communication theories.
CO5: Masterthetechniquesofprofessionalcommunicationsothattheybecome employable aftercompletingthe course

.

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S		S			S	M		S	S
CO2	S	S	S		S			S	M		S	S
CO3	S	S	S		S			S	M		S	S
CO4	S	S	S		S			S	M		S	S
CO5	S	S	S		S			S	M		S	S

CourseAssessmentmethods:

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 Examinations		

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:

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, New Delhi, 2010.

BMA 201 - ENGINEERING MATHEMATICS – II 3 0 0 3

CourseObjectives:

- Solve differential equations, simultaneous linear equations, and some special types of linear equations related to engineering.
- Deal with applications in a variety of fields namely fluid flow, heat flow, solid mechanics, electrostatics, etc.
- Find intensity of degree of relationship between two variables and also bring out regression equations.
- Solve Complex integration
- Solve Statistics

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Solve differential equations, simultaneous linear equations, and some special types of linear equations related to engineering.

CO2: Deal with applications in a variety of fields namely fluid flow, heat flow, solid mechanics, electrostatics, etc.

CO3: Find intensity of degree of relationship between two variables and also bring out regression equations.

CO4: Solve Complex integration

CO5: Solve Statistics

.

CO/PO Mapping (S/M/Windicates strength of correlation) S-Strong, M-Medium												
Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	S	S	S		S			S	M		S	
CO2	S	S	S		S			S	M		S	
CO3	S	S	S		S			S	M		S	
CO4	S	S	S		S			S	M		S	
CO5	S	S	S		S			S	M		S	

CourseAssessmentmethods:

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 Examinations		

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 ploes on boundaries).

UNIT V Statistics **9+3**

Mean, Median, Mode – Moments – Skewness and Kurtosis – Correlation – Rank Correlation – Regression –Chisquare 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) Lltd,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 **3 0 0 3**

CourseObjectives:

- Make a bridge between the physics in school and engineering courses.
- Impart a sound knowledge on the basic concepts of modern sciences.
- Toexposethestudentstomultipleareasofscienceofengineeringmaterialswhichhavedirect relevance to differentEngineeringapplications
- To understand the concepts and applications of conducting, Semiconducting, magnetic & dielectric materials
- To understand the concepts ofopticalproperties

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Make a bridge between the physics in school and engineering courses.
CO2: Impart a sound knowledge on the basic concepts of modern sciences.
CO3: exposethestudentstomultipleareasofscienceofengineeringmaterialswhichhavedirect relevance to differentEngineeringapplications
CO4: understand theconceptsandapplicationsofconducting, Semiconducting, magnetic&dielectric materials as wellas theiropticalproperties.
CO5: understand theconcepts ofopticalproperties

CO/PO Mapping (S/M/Windicates strength of correlation) S-Strong, M-Medium												
Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S		S			S	M		S	S
CO2	S	S	S		S			S	M		S	S
CO3	S	S	S		S			S	M		S	S
CO4	S	S	S		S			S	M		S	S
CO5	S	S	S		S			S	M		S	S

CourseAssessmentmethods:

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 Examinations		

UNIT – I Conducting Materials **9**

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, SQUIID, 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 Classius – 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. Charless Kittel ‘introduction to solid state physics’, john wiley & sons, 7th edition, singpore (2007).

REFERENCE BOOKS

1. Material science by r.suresh, v. jayakumar – lakshmi publications; arapakkam (2006).
2. Material science by Dr. P. K. Palanisamy – Scietech 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 3 0 0 3

CourseObjectives:

- To make the students to have asound knowledge with industrialapplications ofsurfacechemistry
- To impartknowledge aboutthe IndustrialimportanceofPhaseruleandalloys
- To make the students to beconversantwithAnalyticaltechniquesand their importance
- To have anidea and knowledge aboutthe Chemistry ofFuels and
- To make themstudyto have adeep knowledge inChemistryofengineeringmaterials

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: make the students to have asound knowledge with industrialapplications ofsurfacechemistry
CO2: impartknowledge aboutthe IndustrialimportanceofPhaseruleandalloys
CO3: make the students to beconversantwithAnalyticaltechniquesand their importance
CO4: have anidea and knowledge aboutthe Chemistry ofFuels and
CO5: make themstudyto have adeep knowledge inChemistryofengineeringmaterials

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CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S		S			S	M		S	S
CO2	S	S	S		S			S	M		S	S
CO3	S	S	S		S			S	M		S	S
CO4	S	S	S		S			S	M		S	S
CO5	S	S	S		S			S	M		S	S

CourseAssessmentmethods:

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 Examinations		

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 – Frendlich 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 ofCoal –- 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, oilyness) 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).

BCS201 INTERNET PROGRAMMING 2 0 0 2

CourseObjectives:

- To make the students to understand the concepts of Internet Programming and its related programming, Scripting languages and applications.
- To make the students to understand the concepts of Web Design Basics
- To make the students to understand the concepts of Dynamic HTML
- To make the students to understand the concepts of Client and Server Side Programming
- To make the students to understand the concepts of Internet Applications

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: To make the students to understand the concepts of Internet Programming and its related programming, Scripting languages and applications.

CO2: To make the students to understand the concepts of Web Design Basics
CO3: To make the students to understand the concepts of Dynamic HTML
CO4: To make the students to understand the concepts of Client and Server Side Programming
CO5: To make the students to understand the concepts of Internet Applications

.

CO/PO Mapping (S/M/Windicates strength of correlation) S-Strong, M-Medium												
Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S		S			S	M		S	
CO2	S	S	S		S			S	M		S	
CO3	S	S	S		S			S	M		S	
CO4	S	S	S		S			S	M		S	
CO5	S	S	S		S			S	M		S	

CourseAssessmentmethods:

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 Examinations		

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

BME 203 ENGINEERING MECHANICS 3 1 0 3

CourseObjectives:

- The vectorialand scalarrepresentation of forces and moments
- Static equilibriumofparticlesandrigidbodiesin two dimensions
- Physicalpropertiesofsurfaces and solids
- Effectoffriction onequilibriumand theirapplication
- Principle ofworkandenergy
- Thelaws and kinematicsofmotion ofparticles andrigid bodies

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Understand the vectorialand scalarrepresentation of forces and moments

CO2: Understand the Static equilibriumofparticlesandrigidbodiesin two dimensions

CO3: Understand the physicalpropertiesofsurfaces and solids

CO4: Understand the effectoffriction onequilibriumand theirapplication

CO5: Understand the principle ofworkandenergy and thelaws and kinematicsofmotion ofparticles andrigid bodies

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S		S			S	M		S	
CO2	S	S	S		S			S	M		S	
CO3	S	S	S		S			S	M		S	
CO4	S	S	S		S			S	M		S	
CO5	S	S	S		S			S	M		S	

CourseAssessmentmethods:

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 Examinations		

UNIT – I Basics and Statics Of Particles 12

Introduction - Units and Dimensions - Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations on forces - Coplanar Forces – Resolution and Composition of forces – Resultant of several concurrent forces - Equilibrium of a forces – Forces in space - Equilibrium of particle in space - Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT – II Equilibrium of Rigid Bodies 10

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem - Equilibrium of Rigid bodies in two dimensions - Equilibrium of Rigid bodies in three dimensions.

UNIT – III Properties of Surfaces and Solids 10

Determination of areas – First moment of area and the Centroid of standard sections – T section, I section, Composite figures, Hollow section – second moments of plane area – Rectangle, triangle, circle - T section, I section, Hollow section – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia – Basic concept of Mass moment of inertia.

UNIT – IV Friction 10

Frictional force – Laws of Coloumb friction – Cone of friction – Angle of repose – Simple contact friction – Sliding of blocks – Wedge friction - Ladder friction – Screw Jack – Belt friction - Rolling resistance.

UNIT – V Dynamics Of Particles 10

Displacements, Velocity and acceleration, their relationship – Relative motion – Relative acceleration – Curvilinear motion of particles – Newton's law – work energy equation – impulse and Momentum – Impact of elastic bodies.

Total: 52 Periods

Text books

1. Beer, F.P and Johnson Jr. E.R, "Vector Mechanics for Engineers: Vol. 1 Statics and vol. 2 Dynamics", McGraw-Hill International Edition, 2013.
2. Rajasekaran, S, Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt., Ltd., 2011.

REFERENCES :

1. Kumar, K. L Kumar, V., Engineering Mechanics, Tata McGraw – Hill, New Delhi, 2010
2. Palanichamy, M.S., Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw - Hill, 2013
3. Timoshenko, and Young, Engineering Mechanics, Tata McGraw-Hill, New Delhi, 2013.
4. Irving H. Shames, Engineering Mechanics – Statics and Dynamics, IV Edition – Pearson Education Asia Pvt., Ltd., 2006.

BCS 2L1 INTERNET PRACTICE **0 0 2 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.	Lab Records	**1.**	Student exit survey
2.	Observation Books	**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.

   a) Changing Background Color b) Simple Calculator

5. **Web Design:**
   Inserting External Media in the Web Page.
   a) Forms and Links
   b) Frames with Links and Lists

To export a Dream weaver Document as XML File, checking entries, working in frames, windows control, the java script URL.

BPC 2L1 PHYSICS AND CHEMISTRY LABORATORY 0 0 2/2 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.	Lab Records	**1.**	Student exit survey
2.	Observation Books	**2.**	Faculty Survey
3.	Viva Voce	**3.**	Industry
4	Model Exam	**4.**	Alumni
5.	End Semester Exam		

I - LIST OF EXPERIMENTS – PHYSICS

1. Determination of resistivity of high resistance alloys and temperature coefficient
2. Study of Hall effect – Hall coefficient determination
3. Determination of electrical conductivity of good conductors
4. Study of magnetic hysteresis and energy product
5. Determination of Band gap of a semiconductor
6. Determination of Dispersive power of a prism – Spectrometer

II- LIST OF EXPERIMENTS – CHEMISTRY

1. Conducto metric titration (Simple acid base)
2. Conducto metric titration (Mixture of weak and strong acids)
3. Conducto metric titration using BaCl 2 vs Na 2 SO4
4. Potentiometric Titration (Fe2+ / KMnO4 or K2 Cr 2 O 7)
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper Sulphate)
7. Estimation of Ferric iron by spectrophotometer.

BFR 101 / 201 FRENCH **3 0 0 3**

CourseObjectives:

1. Contributes significantly to the development of an individual's intelligence.
2. Language gives us access and insights into another culture. It is a fundamental truth that cultures define themselves through languages.
3. Since language is a symbol of culture, the curriculum for all the languages reflects this spirit.
4. Introduce the basics of the language to beginners
5. To develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Contributes significantly to the development of an individual's intelligence.
CO2: Know the fundamental truth that cultures define themselves through languages.
CO3: Understand the Importance of language as a symbol of culture, the curriculum for all the languages reflects this spirit.
CO 4: Understand the basics of the language to beginners
CO5: Develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts

CO/PO Mapping (S/M/Windicates strength of correlation) S-Strong, M-Medium												
Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S		S	S	S	M	S	S	S
CO2				S		S	S	S	M	S	S	S
CO3				S		S	S	S	M	S	S	S
CO4				S		S	S	S	M	S	S	S
CO5				S		S	S	S	M	S	S	S

CourseAssessmentmethods:

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 Examinations		

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:

Course Material: Synchronie I – Méthode de Français

K. Madanagobalane -Samita Publications, Chennai, 2007

BGM 101/ 201 GERMAN **3 0 0 3**

CourseObjectives:

1. Contributes significantly to the development of an individual's intelligence.
2. Language gives us access and insights into another culture. It is a fundamental truth that cultures define themselves through languages.
3. Since language is a symbol of culture, the curriculum for all the languages reflects this spirit.
4. Introduce the basics of the language to beginners
5. To develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Contributes significantly to the development of an individual's intelligence.
CO2: Know the fundamental truth that cultures define themselves through languages.
CO3: Understand the Importance of language as a symbol of culture, the curriculum for all the languages reflects this spirit.
CO 4: Understand the basics of the language to beginners
CO5: Develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.

CO/PO Mapping (S/M/Windicates strength of correlation) S-Strong, M-Medium												
Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S		S	S	S	M	S	S	S
CO2				S		S	S	S	M	S	S	S
CO3				S		S	S	S	M	S	S	S
CO4				S		S	S	S	M	S	S	S
CO5				S		S	S	S	M	S	S	S

CourseAssessmentmethods:

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 Examinations		

UNIT I **9**

Welcome: Introduction to the Language, Spelling and Pronunciation (The alphabets and numbers)Greetings, ordering, requesting, saying thank you - Grammar – the article “the”, conjugation of verbs

UNIT II **9**

Shopping - Grammar – adjectives, endings before nouns, practice. Self introduction

UNIT III **9**

Addresses, Occupations, Studies - Grammar - ‘to be’, the definite/indefinite articles, individualtraining

UNIT IV **9**

Leisure Time, Sports, Hobbies - Grammar – position of a verb in a main clause , oral practice

UNIT V **9**

At a Restaurant, Food and Drink - Grammar – the personal pronoun in the Nominative andAccusative, Narrating an event

TOTAL 45 hours

Resources:

Sprachkurs Deutsch 1 (Verlag Diesterweg), New Delhi Learning Centre

BJP 101/201 JAPANESE **3 0 0 3**

CourseObjectives:

1. Contributes significantly to the development of an individual's intelligence.
2. Language gives us access and insights into another culture. It is a fundamental truth that cultures define themselves through languages.
3. Since language is a symbol of culture, the curriculum for all the languages reflects this spirit.
4. Introduce the basics of the language to beginners
5. To develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Contributes significantly to the development of an individual's intelligence.

CO2: Know the fundamental truth that cultures define themselves through languages.

CO3: Understand the Importance of language as a symbol of culture, the curriculum for all the languages reflects this spirit.

CO 4: Understand the basics of the language to beginners

CO5: Develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.

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CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S		S	S	S	M	S	S	S
CO2				S		S	S	S	M	S	S	S
CO3				S		S	S	S	M	S	S	S
CO4				S		S	S	S	M	S	S	S
CO5				S		S	S	S	M	S	S	S

CourseAssessmentmethods:

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 Examinations		

UNIT I **9**

Introduction-history and origin of Japanese language-Japan and its cultural heritage-Self introduction-counting numbers (1-100)-time-conversation with the use of audio devices, grammar– usage of particles wa, no, mo and ka

UNIT II **9**

Greetings, seasons, days of the week and months of the year-numbers (up to 99,999)-grammar– usage of kore, sore, are, kono, sono, ano, koko and kochira, arimasu and imasu-i-ending and na-ending adjectives-use of audio and drills for practice

UNIT III **9**

Asking the price–associated vocabulary-usage of particles ni, ga and ne- use of audio and drills for practice-Introduction to basic Kanji characters- use of audio and drills for practice

UNIT IV **9**

Family relationships- colours-Kanji (numbers) and festivals of Japan-religion-Japanese art and culture-ikebana, origami-introduction to hiragana- use of audio and drills for practice

UNIT V **9**

Vocobulary associated with directions-asking way-particles – e, de, mo, koko, soko, asoko, doko, nani, mae, ushiro, ue, shita- use of audio and drills for practice-introduction to katakana

Total: 45 Periods

Text books

1. Japanese hiragana and katakana for beginners, Timothy G. Stout, 2011
2. Genki I: An integrated course in elementary Japanese, Eri Banno and Yuko Ikeda, 2011

Reference Books

1. Japanese Reader collection Volume I, Yumi Boutwell and Clay Boutwell, Kotoba books, 2013
2. Living language Japanese Complete edition begineers through advanced course, Living language, 2012

BKR 101/201 KOREAN **3 0 0 3**

CourseObjectives:

1. Contributes significantly to the development of an individual's intelligence.
2. Language gives us access and insights into another culture. It is a fundamental truth that cultures define themselves through languages.
3. Since language is a symbol of culture, the curriculum for all the languages reflects this spirit.
4. Introduce the basics of the language to beginners
5. To develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.

CourseOutcomes:
Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Contributes significantly to the development of an individual's intelligence.
CO2: Know the fundamental truth that cultures define themselves through languages.
CO3: Understand the Importance of language as a symbol of culture, the curriculum for all the languages reflects this spirit.
CO 4: Understand the basics of the language to beginners
CO5: Develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S		S	S	S	M	S	S	S
CO2				S		S	S	S	M	S	S	S
CO3				S		S	S	S	M	S	S	S
CO4				S		S	S	S	M	S	S	S
CO5				S		S	S	S	M	S	S	S

CourseAssessmentmethods:

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 Examinations		

UNIT I **9**

Asking/giving reasons for studying Korean, making plans for the holiday, writing letters, describing past travel experiences and future travel plans, shopping in a grocery store, shopping in electronics store, storytelling Grammar: would like to (do), want to (do), construct future tense.

UNIT II **9**

Asking about feelings, asking about problems and giving advice, brief introductions - Grammar: Noun modifier, please try doing (something), irregular adjective/verb

UNIT III **9**

Asking about hobbies, asking about abilities (sports), job requirements, Ordering things for delivery, ordering a meal at a restaurant - Grammar: Sentence ending for the honorific form, please do something for me, have tried (something),

UNIT IV **9**

Asking about evening plans, making plans with others, making preparations - Asking about rooms, describing your room to your classmates, describing your house. Grammar: to know/not know how to do something, must (do), have to (do), should,

UNIT V **9**

Describing your plans and giving reasons, cancelling appointments. Grammar: Shall we~? / Should we~?, with, and, irregular verbs/adjective, so, because, cannot, intend to, plan to, or hope to, (more) than, the most, tag question/is n't it? ,will (do)

Total: 45 Periods

Course Material:

Korean for Non-Native Speakers (Student Book 1B)

Korean Language Education Center, Sogang University

BCN 101/201 CHINESE **3 0 0 3**

CourseObjectives:

1. Contributes significantly to the development of an individual's intelligence.
2. Language gives us access and insights into another culture. It is a fundamental truth that cultures define themselves through languages.
3. Since language is a symbol of culture, the curriculum for all the languages reflects this spirit.
4. Introduce the basics of the language to beginners
5. To develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Contributes significantly to the development of an individual's intelligence.
CO2: Know the fundamental truth that cultures define themselves through languages.
CO3: Understand the Importance of language as a symbol of culture, the curriculum for all the languages reflects this spirit.
CO 4: Understand the basics of the language to beginners
CO5: Develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S		S	S	S	M	S	S	S
CO2				S		S	S	S	M	S	S	S
CO3				S		S	S	S	M	S	S	S
CO4				S		S	S	S	M	S	S	S
CO5				S		S	S	S	M	S	S	S

CourseAssessmentmethods:

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 Examinations		

UNIT-1 **9**

History, Origins, Old and middle Chinese, Rise of northern dialects

UNIT-II **9**

Influences 3 Varieties of Chinese. 1.Classification 2.Standard Chinese and diglossia 3.Nomenclature

UNIT-III **9**

Chinese characters, Homophones, Phonology

UNIT-IV **9**

Tones, Phonetic transcriptions, Romanization, Other phonetic transcriptions

UNIT-V **9**

Grammar and morphology, Vocabulary, Loanwords, Modern borrowings and loanwords

Total: 45 Periods

REFERENCES:

1. Hannas, William C. (1997), *Asia's Orthographic Dilemma*, University of Hawaii Press, ISBN978-0-8248-1892-0.
2. Qiu, Xigui (2000), *Chinese Writing*, trans. Gilbert Louis Mattos and Jerry Norman, Society for the Study of Early China and Institute of East Asian Studies, University of California, Berkeley, ISBN978-1-55729-071-7.
3. Ramsey, S. Robert (1987), *The Languages of China*, Princeton University Press, ISBN978-0-691-01468-5.
4. Schuessler, Axel (2007), *ABC Etymological Dictionary of Old Chinese*, Honolulu: University of Hawaii Press, ISBN978-0-8248-2975-9.
5. R. L. G. "Language borrowing Why so little Chinese in English?" *The Economist*. June 6, 2013.

BMA 301 ENGINEERING MATHEMATICS - III L T P C

3 1 0 4

Course Objective:

- To equip students with adequate knowledge of Mathematics.
- To formulate problems in Engineering, and solve them analytically.

Course Outcomes:

At the end of this course, students shall be able to

CO1:Solve PDE of second and higher order with constant coefficients.
CO2:Expand given functions by using the concept of Fourier series.
CO3:Solve many of the Engineering models of Heat equations and Wave equations which are PDEswith boundary conditions.
CO4:Solve many problems in Automobile, Medicine, Electronic Engineering which are differentialequations of linear or non-linear.
CO5:Solve differential equations by Laplace transforms.

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

CourseAssessmentmethods:

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 Examinations		

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: 60 Periods

Text Books:

1. Kreyszig, E."Advanced Engineering Mathematics"8th Edition, John Wiley and Sons, (Asia) Pvt., Ltd, Singapore, 2000. [Units I, II, & V]
2. Monty J.Strauss, Gerald L.Bradley, and Karl L.Smith. "Calculus" 3rd Edn.[Prentice Hall] University Bookstore, New Delhi. [Units III & IV]

References:

1. Narayanan, S.ManicavachangamPillay, T.K.Ramanaiah, G."Advanced mathematics for Engineering Students", Volume2 and 3(2nd Edition), S.Viswanathan (printers & publishers Pte, Ltd.,) 1992.
2. M.K "Engineering Mathematics" Volumes3-A&B, 13th Edition National Publishing
3. Company, Chennai, 1998.
4. Grewal, B.S.,"Higher Engineering Mathematics" (35thEdition), Khanna Publishers, Delhi2000
5. George B. Thomas and Ross L.Finney. "Calculus and Analytical Geometry" 9th Edn. Narosa
6. Indian Student Edition, New Delhi.
7. Dennis G.Zill and Warren S.Wright. "Advanced Engineering Mathematics". 3rd Edn. Jones & Bartlett Publishers, UK. 1992.

BEE307 ELECTRICAL ENGINEERING L T P C

3 0 0 3

Course Objectives:

•To impart knowledge on the Constructional details, principle of operation,performance, starters and testing of D.C machines.

•Constructional details, principle of operation and performance of Transformers.

•Constructional details, principle of operation and performance of Induction motors.

•Constructional details, principle of operation and performance of alternators and special machines.

•Power system transmission and distribution.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Outlinethe basicsof electrical machinesand analyzethe characteristics of DC machines.

CO2: Understandand implement speed control techniques forpractical applications.

CO3: Describetheworkingoftransformerandassessitsregulationandefficiencyonloadand no-load.

CO4: Knowtheworkingconceptofdifferent typesofinductionmotorandanalyzetheoperating behavior ofinduction motor usingits performanceindices.

CO5: Explain the basics ofsynchronous machinesand interpret performance characteristics.

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

CourseAssessmentmethods:

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 Examinations		

UNIT I CIRCUITS AND TRANSFORMERS 9

Introduction to AC Circuits- Power measurement in AC single phase circuit, Two watt meter method,

Principle of operation of Transformers, Equivalent circuit, Voltage regulation, Efficiency.

UNIT II DC MOTORS 9

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

UNIT III SINGLE PHASE INDUCTION MOTORS 9

Construction, Types, Principle of operation of 1 phase induction motors, Equivalent circuit,

Starting and Speed control.

UNIT IV SYNCHRONOUS MACHINES 9

Construction of synchronous machines, Types, Induced EMF, Voltage regulation of round rotor alternators.

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 : 45 Period

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.

BEC303 ELECTRONIC CIRCUITS I L T P C

3 0 0 3

CourseObjective:

- Develop the fundamentalknowledge about theneed forbiasingandits various methods.
- Analyzethe small signalequivalents circuits andhigh frequencyanalysisofBiPolar Junction Transistor and Field Effect Transistor.
- Examinethe characteristics of multistageamplifiers and to understand the design of amplifier circuits.
- Classifyandcomparethetypes of small Signal and Largesignalamplifier.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Discuss the concepts of various biasingmethods forBJT.

CO2: Analyzethe BJT configurations and BJT amplifiers usingsmall signal model.

CO3: Analyzethe FETBiasingconcepts, FETand MOSFET amplifiersmallsignal analysis

CO4: Analyzethe frequencyresponse of BJT, FET and multistageamplifiers

CO5: Explain the classification and performanceoflargesignal amplifiers.

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

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

CourseAssessmentmethods:

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 Examinations		

UNIT I BASIC STABILITY AND DEVICE STABILIZATION 9

Biasing circuits for BJT, DC and AC Load lines, Stability factor analysis, Temperature compensation methods, biasing circuits for FET's and MOSFET's.

UNIT II SMALL SIGNAL LOW FREQUENCY ANALYSIS AND DESIGN 9

Transistor, FET and MOSFET Amplifiers, Equivalent circuit, input and output characteristics, calculation of midband gain, input and output impedance of various amplifiers, cascode amplifier, Darlington Bootstrapping, Differential amplifier, CMRR measurement, Use of current source in Emitter.

UNIT III LARGE SIGNAL AMPLIFIERS 9

Class A, AB, B, C and D type of operation, efficiency of Class A amplifier with resistive and transformer coupled load, efficiency of Class B, Complementry Symmetry amplifiers, MOSFET Power amplifiers, Thermal stability of Power amplifiers, heat sink design.

UNIT IV FREQUENCY RESPONSE OF AMPLIFIERS AND ANALYSIS USING SPICE 9

High frequency equivalent circuits for BJT and FET amplifiers, Calculation of Lower and Higher cutoff frequencies, Bode plot of frequency response, relation bandwidth and rise time, Compensation to improve the low frequency and high frequency response of amplifiers, HF amplifiers, Video amplifiers, Optocouplers, BJT modeling, The sinusoidal and Pulse source modeling, Analysis of CE Amplifier using SPICE.

UNIT V RECTIFIERS AND POWER SUPPLIES 9

Half Wave Rectifier - Full Wave Rectifier – Bridge Rectifier – Performance of Rectifiers – Filters – Types of Filters – L, C, LC, π Filters – Ripple Factor Calculation for C, L, LC and π Filter – Regulators – Shunt and SeriesVoltage Regulator – IC Regulator – SMPS – Power Control using SCR.

Total:45 Periods

Text Books:

1. Donald .A. Neamen, Electronic Circuit Analysis and Design –2nd Edition,Tata Mc Graw Hill, 2009.
2. Millman.J. and Halkias C.C, “Integrated Electronics”, Mc Graw Hill, 2001.

References:

1. Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", 6th Edition, Oxford University Press, 2010.
2 David A., "Bell Electronic Devices and Circuits", Oxford Higher Education Press,5th Editon, 2010
3. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", Tata Mc Graw Hill,2007.
4. Paul Gray, Hurst, Lewis, Meyer "Analysis and Design of Analog Integrated Circuits", 4th edition John Willey & Sons 2005

BEC302 PRINCIPLES OF DIGITAL ELECTRONICS L T P C

3 1 0 4

Course Objectives:

- To manipulate across various number system.
- To compute binary arithmetic operations.
- To design combinational and sequential circuits using gates.
- To introduce the concept of memories and programmable logic devices
- To design asynchronous and synchronous sequential circuits.

Course Outcomes:

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

CO1: Recall the different number systems and demonstrate the simplification of Boolean expressions using Boolean algebra & K-Map method.

CO2: Analyze the Combinational building blocks.

CO3: Analyze the sequential building blocks.

CO4: Develop a state diagram and simplify the given sequential logic.

CO5: To illustrate the concept of synchronous and asynchronous sequential circuits.

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

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

CourseAssessmentmethods:

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 Examinations		

UNIT I BASIC CONCEPTS ,BOOLEAN ALGEBRA AND LOGIC GATES 12

Number systems - Binary, Octal, Decimal, Hexadecimal, conversion from one to another, complement arithmetic, Boolean theorems of Boolean algebra, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map, Quine-McCluskeymethodofminimization **.**NAND-NOR implementation of Logic gates,Multilevel gate implementation,Multi output gate implementation,TTL and CMOS logic and their characteristics,Tristate gates.

UNITII COMBINATIONAL CIRCUITS 12

Problem formulation and design of combinational circuits, Half Adder ,Full adder,HalfSubtractor, Full Subtractor, Carry Look Ahead adder, BCD adder, Fast adder,Serial adder/subtractor,BinaryMultiplier,Binary Divider, Encoder ,Decoder, Mux / Demux, Code-converters, Parity Generators, Comparators.

UNIT III SEQUENTIAL CIRCUIT 12

Latches,Flipflops - SR, JK, T, D, Master/Slave FF, Triggering of FF,Realization of one flip flop using other flip flops Analysis of clocked sequential circuits - their design, State minimization, State assignment, Circuit implementation, Registers-Shift registers, AsynchronousUp/DowncounterSynchronousUp/Down counters, Modulo–ncounter, Ringcounter ,Shiftcounters ,Sequencegenerators.

UNIT IV MEMORY DEVICES 12

Classification of memories – ROM ,ROM organization - PROM , EPROM ,EEPROM , EAPROM, RAM – RAM organization – Write operation , Read operation , Memory cycle, Timing wave forms , Memory decoding , memory expansion , Static RAM Cell, Dynamic RAM cell ,Programmable Logic Devices – Programmable Logic Array (PLA) and Programmable Array Logic (PAL) ,Field Programmable Gate Arrays (FPGA) ,Implementation using ROM, PLA, and PAL.

UNIT V SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS 12

Synchronous Sequential Circuits: General Model – Classification – Design – Use ofAlgorithmic State Machine – Analysis of Synchronous Sequential Circuits.

Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits – Design of Hazard Free Switching circuits.

Total : 60 Periods

TEXT BOOK:

1. M. Morris Mano, “Digital Design”, 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / PearsonEducation (Singapore) Pvt. Ltd., New Delhi, 2003.
2. William I. Fletcher, " An Engineering Approach to Digital Design ", Prentice-Hall of India, 1980.

REFERENCES:

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

BEC301 SIGNALS AND SYSTEMS L T P C

3 1 0 4

CourseObjective:

- Tointroducetheconceptsandtechniquesassociatedwiththeunderstandingofsignals and systems.
- To familiarize the concepts of transform based continuous time and discrete time analysisof signals and systems
- To provide fundamental knowledge about samplingprocess
- Toprovideafoundationtothecourseslikecommunication,digitalsignalprocessing, control systems,instrumentation, and so on, that deal with signaland system concepts directlyor indirectly

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Understanddifferenttypesofsignals-continuousanddiscrete,oddandeven,periodicand aperiodic etc.

CO2: Analyzecontinuoustimesignalsandsystemsbyusingappropriatemathematicaltools like Fourier Transform.

CO3: Analyzesampling process and samplingofdiscrete timesignals.

CO4: Analyzediscretetimesignalsandsystemsbyusingappropriatemathematicaltoolslike Fourier Transform.

CO5: Utilizestandard signals suchas sine, ramp, exponential to characterizesystems

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

CourseAssessmentmethods:

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 Examinations		

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 singals, CT systems and DT systems, Classification of systems - Linear Time invariant Systems.

UNIT II ANALYSIS OF C.T. SINGALS 12

Fourier series analysis, Spectrum of C.T. singals, 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 :60 Periods

TEXT BOOK:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson, 2007.

REFERENCES:

1. B. P. Lathi, "Principles of Linear Systems and Signals", Second Edition, Oxford, 2009.
2. R.E.Zeimer, W.H.Tranter and R.D.Fannin, "Signals & Systems - Continuous and Discrete", Pearson, 2007.
3. John Alan Stuller, "An Introduction to Signals and Systems", Thomson, 2007

BCE 306 ENVIRONMENTAL STUDIES L T P C 3 0 0 3

CourseObjectives:

- To understand what constitutes the environment, what areprecious resources in the environment.
- Ways of conservation ofresources.
- The role ofahuman beingin maintaininga cleanenvironment and usefulenvironment forthe futuregenerations.
- How to maintain ecological balance.
- Preservebio-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/Windicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	M		M	S		S			M	
CO2	S	M	S	S	M	S	S		S			
CO3	S	S		M				M			M	
CO4	S	M	S	M	S	S	M		M			
CO5	M		M		M		M	S	M			
CO6							S				S	

CourseAssessmentmethods:

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 Examinations		

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

a) Forest resources: use and over exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people.

b) Water resources: use and over utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c) Mineral resources: use and over exploitation, environmental effects of extracting and using mineral resources, case studies.
d) Food resources: world food problems- changes caused by agriculture and over grazing, effects of modern agriculture, fertilizer- pesticide problems, water logging, Salinity, Case studies
e) Energy Resource: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy source, Case studies.
f) 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 SYSTEMS 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
    a. Forest ecosystem
    b. Grassland ecosystem
    c. Desert ecosystem
    d. 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 :-
  a. Air Pollution
  b. Water Pollution
  c. Soil Pollution
  d. Marine Pollution
  e. Noise Pollution
  f. Thermal Pollution
  g. 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 protectrion 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 / AIDS
- Women and Child welfare
- Role of information technology in environment and human health
- Case studies

FIELD WORK 6

- Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain
- Visit to a local polluted site-urban/Rural/Industrial/Agricultural
- Study of common Plants,insects,birds
- Study of simple ecosystems-pond, river,hill slopes,etc.(Field Work Equal to 5 lecture hours)

Total:45 Periods

Text Books:

1. Gilbert M.Masters, "Introductionto Environmental EngineeringandScience", 2nd Edition, PearsonEducation, 2004.

2.BennyJoseph,„Environmental ScienceandEngineering",TataMc Graw-Hill,NewDelhi,2006.

References:

1.R.K.Trivedi,"HandbookofEnvironmentalLaws,Rules,Guidelines,CompliancesandStandard",Vol.I andII,Enviro Media.

2.Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai,2001.

3.Dharmendra S. Sengar, "Environmental law",PrenticeHall ofIndia PVT LTD, NewDelhi,2007.

4.Rajagopalan,R, "Environmental Studies-FromCrisis toCure", Oxford University Press 2005

BEE3L3 ELECTRICAL ENGINEERING LAB L T P C

0 0 4 2

CourseObjectives:

- To understand the performanceofelectricalgenerators, motorsand transformers by conductingdifferent tests.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Experimentally verify the performance characteristics of generators, motors and Transformers

CO2: Choose an electricmachine forparticularapplication.

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

CourseAssessmentmethods:

DIRECT		**INDIRECT**	
1	Lab Records	**1.**	Student exit survey
2	Observation book	**2.**	Faculty Survey
3	Viva Voce	**3.**	Industry
4	Model Examination	**4.**	Alumni
5	End Semester Exams		

LIST OF EXPERIMENTS

1.Swinburne's Test.

2.Speed control of DC Shunt motor

3.Load Test on DC shunt generator

4.OCC and Load Test on DC shunt generator

5.OC and SC tests on Transformers

6.Load Test on Transformer.

7.Regulation of alternator by EMF and MMF methods.

8.Equivalent circuit of single-phase induction motor.

9.Study of DC and AC motor starters.

10.Speed control of DC Compound motor

11.Load Test on DC Compound motor

BEC3L1 ELECTRONIC DEVICES AND CIRCUITS LA B L T P C

0 0 4 2

CourseObjective:

- To be exposed tothecharacteristicsofbasicelectronicdevices
- To be exposed to FET and BJT
- To befamiliarwith power amplifiers and differential amplifiers.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Learn the characteristics of basic electronic devices.
CO2: Design of power amplifiers.

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

COs	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	M		S				M		S	M
CO2		S	M		M				M		S	

Course Assessment methods:

DIRECT		INDIRECT	
1	Lab Records	**1.**	Student exit survey
2	Observation book	**2.**	Faculty Survey
3	Viva Voce	**3.**	Industry
4	Model Examination	**4.**	Alumni
5	End Semester Exams		

LIST OF EXPERIMENTS:

1. CE Transistor Characteristics
2. UJT Characteristics
3. FET Characteristics
4. SCR Characteristics
5. Power Supplies
6. Frequency Response of CE, CB and CC Amplifiers with self bias, fixed bias and Collector to Base feedback bias.
7. Source Follower with gate resistance, Bootstrapped.
8. Class A and Class B Power amplifiers
9. Differential Amplifiers, CMRR measurements
10. Spice Simulation of Common Emitter and Common Source amplifiers

BEC3L2 DIGITAL ELECTRONICS LAB L T P C
0 0 4 2

Course Objectives:

- To know the concepts of Combinational circuits.
- To understand the concepts of flipflops.
- To understand the concepts of registers and counters.

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 andverifytheirfunctionalities.
- **CO3:**Applythedesign procedures to design basicsequential circuits.
- **CO4:**Determinethe appropriateness of the choiceof theICs used in agiven digital circuit.
- **CO5:**Demonstrate skills to test andtrouble shoot adigital circuit.

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

Course Assessment methods:

DIRECT		**INDIRECT**	
1	Lab Records	**1.**	Student exit survey
2	Observation book	**2.**	Faculty Survey
3	Viva Voce	**3.**	Industry
4	Model Examination	**4.**	Alumni
5	End Semester Exams		

List of Experiments

1.Study of logic gates.
2. Design and implementation of adders and subtractors using logic gates.
3. Design and implementation of encoder and decoder using logic gates.
4. Design and implementation of multiplexer and demultiplexer using logic gates .
5. Design and implementation of 2-bit magnitude comparator using logic gates,
6. Design and implementation of 16-bit odd/even parity checker.
7. Design and implementation of Flipflops using logic gates .
8. Design and implementation of code converters using logic gates.
9. Design and implementation of counters.
10. Design and Implementation of shift registers.

BEC402 ELECTRONIC CIRCUITS II L T P C
3 0 0 3

CourseObjectives:

- Analyze themethods 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, multivibrators and time base generators.
- Construction ofpower supplies.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Classifythe various types offeedbackamplifiers and analyzethem.

CO2: Design the various types of RCandLC oscillators.

CO3: Understand thebasicprinciples ofdifferent types of tuned amplifiersand learn the neutralization techniques.

CO4: Describethe operation ofmultivibrator circuits, time basegenerators, waveshaping circuits andtheir applications

CO5: Discuss theworkingandcharacteristics ofregulated power supplyand SMPS.

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

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

UNIT I FEEDBACK AMPLIFIERS 9

Types of feedback, Effect of feedback on noise, distortion, gain, input and output impedance of the amplifiers, Analysis of Voltage and Current feedback amplifiers.

UNIT II OSCILLATORS 9

Negative Resistance Oscillator, Barhausen Criterion for oscillation in feedback oscillator, Mechanism for start of oscillation and stabilization of amplitude, Analysis of RC Oscillators using Cascade connection of Lowpass and Highpass filters, Wein Phase shift and twin-T network, Analysis of LC Oscillators, Colpitts, Hartley, Clapp, Franklin, Armstrong and Miller Oscillator, Frequency range of RC and LC Oscillator, Frequency range of RC and LC Oscillator, Quartz Crystal Construction Electrical equivalent circuit of Crystal, Crystal Oscillator circuits, use of Logic Gates as linear amplifiers, osciallator and clock generator circuits using logic gate amplifiers.

UNIT III TUNED AMPLIFIERS 9

Coil losses, unloaded and loaded Q of tank circuits, Analysis of single tuned amplifier, Double tuned, staggertuned amplifiers, instability of tuned amplifiers, stabilization techniques, Narrow band neutralization using coil, Broad banding using Hazeltine neutralization, Class C tuned amplifiers and their applications. Efficiencyof Class C tuned Amplifier.

UNIT IV MULTIVIBRATOR CIRCUITS 9

Collector coupled and Complementary collector coupled astable multivibrators, Emitter coupled astable multivibrator, monostable and bistable multivibrator using similar and complementary transistors, triggering methods, storage delay and calculation of switching times, speed up capacitors, Schmitt trigger circuits.

UNIT V BLOCK OSCILLATORS AND TIMEBASE GENERATORS 9

Monostable and Astable Blocking Oscillators using Emitter based timing, frequency control using core saturation, pushpull operation of astable blocking oscillator i.e., inverters, pulse transformers, RC and RL wave shaping circuits, UJT sawtooth generators, Linearization using constant current circuit, Bootstrap and Miller saw tooth generators, current timebase generators. Triggered blocking oscillator –Time base circuits - Voltage-Time base circuit, Current-Time base circuit– Linearization through adjustment of driving waveform.

Total:45 Periods

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TextBook:

1.RobertL.BoylestadandLouisNasheresky,"ElectronicDevices and CircuitTheory", 10th Edition, PearsonEducation/ PHI,2008

2.David A.Bell,"Electronic Devices and Circuits", FifthEdition, Oxford University Press,200

3.SedraandSmith, "Micro ElectronicCircuits";Sixth Edition, Oxford University Press,2011.

References:

1.MillmanJ.andTaub H., "Pulse Digital and SwitchingWaveforms", TMH,2000.

2.Millmanand Halkias. C., Integrated Electronics, TMH,20

BMA 402 **NUMERICAL METHODS** **L T P C**
3 1 0 4

Course Objectives:

- To train the students with Mathematical techniques to solve problems in Engineering with numerical data.
- To train the students to Predict the system dynamicbehavior throughsolution of ODEs modelingthe system
- To solve PDE models representingspatial andtemporal variations in physical systems through numerical methods.
- To train the students to havethenecessaryproficiencyof usingMATLAB forobtainingthe abovesolutions

CourseOutcomes:

CO1: Solve aset of algebraic equations representingsteadystatemodels formed in engineering problems

CO2: Fitsmooth curvesforthe discrete dataconnected to each other or touse interpolation methods over thesedatatables

CO3: Find thetrend information from discrete data set through numericaldifferentiation and summaryinformation through numerical integration

CO4: Predict the system dynamicbehaviour throughsolution of ODEs modelingthe system

CO5: Solve PDE models representingspatial andtemporal variations in physical systems through numerical methods.

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

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

UNIT-1 : Solution of equations and Eigen value problems 12

Iterative method, Newton–Raphson methods for single variable- Solutions of linear system by Gaussian, Gauss-Jordan, Jacobian and Gauss-Siedel 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 Divided Difference Formula, Lagrange's Interpolation-Forward and Backward Difference Formula-Stirling's and 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 Equations 12

Single Step methods, Taylors Series, Euler and Modified Euler, Runge-Kutta methods of first and second order Differential equations, Multi Step methods, Milne and Adam's-Bashforth predictor and corrector 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 : 60 Periods

TEXT BOOKS:

1. Sastry.SS "Introductory Numerical Methods" PHI, 2010[Units I to III]

2. Jain K.K. Iyengar, S.R.K and Jain, R.K. "Numerical Methods for Scientific and Engineering Computation" 3rd edition, New Age International Publications and Co. 1993.[Units IV & V]

References

1. Grewal, B.S. "Higher Engineering Mathematics (36th edition)" Khanna Publication Delhi 2001.
2. Curtis F.Gerald. "Applied Numerical Analysis" 7th Edn. Pearson Education, Chennai-600113. 2007

3.Dennis G.Zill and Warren S.Wright. "Advanced Engineering Mathematics". 3rd Edn. Jones & Bartlett Publishers, UK. 1992

BEC405 LINEAR INTEGRATED CIRCUITS L T P C

3 1 0 4

Course Objectives:

- To study the circuit configuration for linear integrated circuits and its related parameters
- To understand the basic concepts of operational amplifier and its various applications
- To understand the basics of PLL and its practical applications.
- To know about analog multlipliers
- To know about various analog switches and different A/D and D/A convertors.
- To understand the concepts of switched capacitor filters,Voltage regulator and various amplifiers.

Course Outcomes:

On the completion of the course students will

CO1:Learn about the basic concepts for the circuit configuration for the design of linear integrated circuits and develops skill to solve engineering problems

CO2:Develop skills to design simple circuits using OP-AMP.

CO3:Gain knowledge about various multiplier circuits, modulators and demodulators and about PLL.

CO4:Learn about various techniques to develop A/D and D/A convertors.

CO5:Develop skills to develop simple filter circuits and various amplifiers and can solve problems related to it.

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

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

UNIT I CIRCUIT CONFIGURATION FOR LINEAR ICS 12

Current sources, Analysis of difference amplifiers with active loads, supply and temperature independent biasing, Band gap references, Monolithic IC operational amplifiers, specifications, frequency compensation, slew rate and methods of improving slew rate.

UNITII APPLICATIONS OF OPERATIONAL AMPLIFIER 12

Integrator Voltage to Current convertor, Instrumentation amplifier, Sine wave Oscillators, Low pass and band pass filters, comparator, Multivibrator and Schmitt trigger, Triangle wave generator, Precision rectifier, Log and Antilog amplifiers, Non-linear Linear and Nonlinear Circuits using operational amplifiers and their analysis, Inverting and Non inverting Amplifiers, Differentiator function generator.

UNIT III ANALOG MULTIPLIER AND PLL 12

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications ,Voltage controlled Oscillator, Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators. Frequency synthesizers, Compander ICs.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTOR 12

Analog switches, High speed sample and hold circuits and sample and hold IC's, Types of D/A converter Current driven DAC, Switches for DAC, A/D converter, Flash, Single slope, Dual slope, Successive approximation, DM and ADM, Voltage to Time and Voltage to frequency converters.

UNIT V SPECIAL FUNCTION IC **12**

Timers, Voltage regulators - linear and switched mode types, Switched capacitor filter, Frequency to Voltage converters, Tuned amplifiers, Power amplifiers and Isolation Amplifiers, Video amplifiers, Fiber optics ICs and Opto couplers, Sources fo Noises, Op Amp noise analysis and Low noise OP-Amps.

Total : 60 Periods

TEXTBOOKS:

1. D.RoyChoudhry,Shail Jain,"LinearIntegratedCircuits", NewAgeInternational Pvt.Ltd.,2000.
2. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", 3rdEdition, Tata Mc Graw-Hill, 2007.

REFERENCES:

1.RamakantA. Gayakwad, "OP-AMP and LinearICs",4thEdition, Prentice Hall /PearsonEducation,2001.

2.RobertF.Coughlin,FrederickF.Driscoll,"OperationalAmplifiersandLinearIntegratedCircuits", Sixth Edition,PHI,2001.

3.B.S.Sonde, "Systemdesignusing IntegratedCircuits" ,2ndEdition, NewAgePub, 2001

4.Grayand Meyer,"Analysisand Design ofAnalogIntegratedCircuits",WileyInternational,2005.

5.MichaelJacob,"ApplicationsandDesignwithAnalogIntegratedCircuits",PrenticeHallofIndia,1996.

6.WilliamD.Stanley,"OperationalAmplifierswithLinearIntegratedCircuits",PearsonEducation,2004.

7.S.Salivahanan&V.S.Kanchana Bhaskaran, "Linear IntegratedCircuits",TMH,2008.

BCS406 OBJECT ORIENTEDPROGRAMMING L T P C
3 0 0 3

AND DATA STRUCTURES

Course Objective:

- To develop solutions to agiven problems using class objectconcepts.
- To understand the concepts offloading, inheritanceand polymorphism
- To learn the basic data structuresand its operations.
    - To makeuse of basicdata structures to solve problems.
    - To understand thevarious searching and sortingalgorithms.

CourseOutcomes:

Aftersuccessful completionofthis course, thestudents should beable to

CO1: Develop solutions to agiven problems using class objectconcepts.
CO2:Illustrate overloading, inheritanceand polymorphismconcepts with example.
CO3: Explain the basic data structuresand its operations.
CO4: Makeuse of basicdata structures to solve problems.
CO5: Outlinevarious searching and sortingalgorithms.

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

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

CourseAssessmentmethods:

	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 Examinations		

UNIT I DATAABSTRACTION&OVERLOADING 12

OverviewofC++–Structures–ClassScopeandAccessingClassMembers –Reference Variables– Initialization–Constructors–Destructors–MemberFunctionsandClasses– Friend Function – Dynamic Memory Allocation – Static Class Members –Overloading: Function overloading and OperatorOverloading.

UNIT II INHERITANCE&POLYMORPHISM 12

BaseClassesand DerivedClasses–ProtectedMembers–Overriding –Public,Protectedand PrivateInheritance –Constructors and Destructors in derived Classes–ImplicitDerived– Class ObjectToBase–ClassObjectConversion–Virtualfunctions–This Pointer–AbstractBase Classes

andConcrete Classes– Virtual Destructors– DynamicBinding.

UNIT III LINEARDATASTRUCTURES 12

AbstractDataTypes(ADTs)–ListADT–array-basedimplementation–linked list implementation–singlylinked lists–Polynomial Manipulation-Stack ADT – QueueADT

UNIT IV NON-LINEARDATASTRUCTURES 12

Trees–BinaryTrees–Binarytreerepresentationandtraversals–TheSearchTreeADT–Graphanditsrepresentations–GraphTraversals–Breadth-firstsearch–Depth-firstsearch– Bi-connectivity.

UNIT V SORTINGANDSEARCHING

12Sortingalgorithms:Insertion sort-Quick sort -Mergesort-Searching:Linear search –Binary Search .

Total: 60 Periods

References:

1. Deitel and Deitel,–C++,HowTo Program‖,FifthEdition, PearsonEducation, 2005.
2. BhushanTrivedi,–Programming withANSIC++,AStep-By-Stepapproach‖, OxfordUniversityPress, 2010.
3. Goodrich, Michael T., Roberto Tamassia,DavidMount, –Data Structuresand Algorithms in C++‖, 7th Edition, Wiley. 2004.
4. Thomas H. Cormen, CharlesE. Leiserson, RonaldL. Rivest andClifford Stein, "Introduction to Algorithms", Second Edition, McGraw Hill, 2002.
5. BjarneStroustrup,–TheC++ProgrammingLanguage‖,3rdEdition,Pearson Education,2007.
7. EllisHorowitz,SartajSahniandDineshMehta,–Fundamentals ofDataStructures inC++‖, GalgotiaPublications, 2007.

OtherReferences:

1. http://users.cis.fiu.edu/~weiss/
2. www.youtube.com/watch?v=x3aC8F1X8ao
3. http://catalogue.pearsoned.co.uk/educator/product/Solutions-Manual-for-Data-Structures-and-Algorithm-Analysis-in-C-International-Editions-4E

BEC403	ELECTROMAGNETIC FIELDS AND WAVES	L	T	P	C
		3	1	0	4

Course Objectives:

To understand and gain complete knowledge about

- Theorem, Laws, Principle & Applications of Static Electromagnetic Fields
- Various Laws of Static Magnetic Field
- Various relation & parameters of Electric Field in Dielectrics
- Magnetic Field with different structure in Ferromagnetic Materials
- Time Varying Electric And Magnetic Fields

Course Outcomes:

At the completion of the course, Students will be able

CO1:To understand the Theorem, Laws, Principle and their related problems over Static Electromagnetic Fields

CO2:To learn the basic laws in Static Magnetic Field and able to find various parameters with the related problems

CO3:To know how the Electric Field is applied in Dielectrics with various equations and applications

CO4:To understand how the Magnetic field works with Ferromagnetic Materials

CO5:To analyse how the Time is Varying in both Electric And Magnetic Fields with various Derivation

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

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

CourseAssessmentmethods:

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 Examinations		

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 Magenetic field intensity, Magnetomotive force, Field cells and permeability, Vector potential, Field computation and problems.

UNIT III ELECTRIC FIELD IN DIELECTRICS12

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 MATERIALS12

Magnetic materials, Magnetic dipoles, Loops and Solenoids, Magnetization, Inductance, Energy in and 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 in-consistency, Boundary relation, Poynting Vector, Comparision of field and circuit theory, Circuit Application ofPointing Vector.

TOTAL: 60 Periods

TextBooks:

1. WilliamHHaytand JrJohnA Buck, “Engineering Electromagnetics”,TataMcGraw-Hill PublishingCompanyLtd, NewDelhi, 2008
2. Sadiku MH,“PrinciplesofElectromagnetics”, OxfordUniversity PressInc, NewDelhi,2009
3. David KCheng, “Field andWaveElectromagnetics”, PearsonEducationInc,Delhi,2004

References:

1.JohnDKrausandDanielAFleisch,“ElectromagneticswithApplications”,McGrawHill BookCo,2005

2. KarlELongmanandSavaVSavov,“FundamentalsofElectromagnetics”,PrenticeHallofIndia, NewDelhi,2006

3. AshutoshPramanic,“Electromagnetism”, PrenticeHall ofIndia,NewDelhi,2006

BEI406 ELECTRONIC INSTRUMENTATION 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/Windicates strength of correlation) S-Strong, M-Medium, W-Weak												
Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	M	M							
CO2	S	M	M		M						M	M
CO3		S	S	S	S							
CO4		S		M								M
CO5	S		S		M							

CourseAssessmentmethods:

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 Examinations		

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 INSTRUMENT 9

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

UNIT IVDATA 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, Isolation and safety standards of Electronic equipments, Case studies in Instrumentation.

TOTAL NO. OF PERIODS: 45

Text Books:

1. W.D.Cooper & A.D.Helfrick, "Modern Electronic Instrumentation and Measurement Techniques", 5th Edition, PHI, 2002.

References:

1. H.S.Kalsi, "Electronic Instrumentation", Tata Mc Graw-Hill Education, 2004.
2. J.B.Gupta, "Measurements and Instrumentation", S K Kataria & Sons, Delhi, 2003.

BEC4L1 ELECTRONIC CIRCUIT DESIGN LAB 0 0 3 2

Course Objectives:

- Togain handsonexperience indesigningelectroniccircuits.
- Tolearn simulation softwareusedin circuitdesign.
- To learnthefundamental principles ofamplifiercircuits
- To learnthefundamental principles ofOscillatorcircuits
- Tolearn the operation of multivibrators.

Course Outcomes:

Atthe end of the course, the student shouldbe ableto:

- Analyse thecharacteristicsofamplifiers and oscillators
- Simulateamplifiersusing Spice

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S		S	M							
CO2	S	M		M	M							M
CO3	M		S	S								
CO4	M	S		M								M
CO5	S		S		M							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Lab Records	**1.**	Student exit survey
2.	Observation book	**2.**	Faculty Survey
3.	Viva Voce	**3.**	Industry
4.	Model Examination	**4.**	Alumni
5.	End Semester Exams		

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

SIMULATION USINGSPICE:

11.Frequencyresponseof CE amplifierwith Emitterresistance.

12.DC responseofCS amplifier

13.Frequencyresponseof Cascodeamplifier.

14.TransferCharacteristics ofClass B PowerAmplifier

BEC4L2 LINEAR INTEGRATED CIRCUITS LAB L T P C

3 1 0 4

Course Objectives:

- Tounderstandthebasicsoflinearintegratedcircuitsand available ICs
- Tounderstandcharacteristicsofoperational amplifier.
- Toapplyoperational amplifiers in linearandnonlinearapplications.
- Toacquirethebasicknowledge ofspecialfunction
- Touse SPICE softwareforcircuitdesign

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Design and analyzethe various op-amp and555 timer applications.

CO2: Distinguish various active filters.

CO3: Analyse the performance of oscillators and multivibrators using SPICE.

CO4: RelateSchmitttrigger, comparator and PLL for real time applications

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

Course Assessment methods:

DIRECT		**INDIRECT**	
1.	Lab Records	**1.**	Student exit survey
2.	Observation book	**2.**	Faculty Survey
3.	Viva voce	**3.**	Industry
4.	Model Examination	**4.**	Alumni
5.	End Semester Exams		

LIST OF EXPERIMENTS:

1. Inverting and noninverting amplifier
2. Integrator , differentiator
3. Summer,subtractor using op-amp
4. Triangular wave generator using op-amp
5. RC Phase shift Oscillator using op-amp
6. Schmitt trigger using Op-amp
7. Active low pass and high pass filters.
8. Astable Multivibrator using 555 timer
9. Monostable multivibrator using 555 timer
10. Schmitt trigger using 555 timer
11. Voltage controlled Oscillator.
12. PLL characteristics.
13. Study of SMPS.

SIMULATION USINGSPICE

14. Simulation of Experiments , 4, 5, 6 ,7 and 8..
15. CMOS Inverter, NAND and NOR

BCS 4L3 OBJECT ORIENTEDPROGRAMMING AND DATA STRUCTURES LABORATORY

L T P C
0 0 4 2

Course Objective:

- To learn various object oriented conceptsthrough simpleprograms.
- To understand the concepts of searchingand sortingalgorithms.

CourseOutcomes:

Aftersuccessful completionofthis course, thestudents should beable to

CO1:Implement various object oriented conceptsthrough simpleprograms.
CO2:Implement different datastructures usingC++.
CO3: Applythe differentdata structuresforimplementingsolutions to practical problems.
CO4: Demonstrate searchingand sortingalgorithms.

CO/PO Mapping

(S/M/Windicates strength ofcorrelation) S-Strong, M-Medium, W-Weak

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

CourseAssessmentmethods:

DIRECT		INDIRECT	
1.	Lab Records	**1.**	Student exit survey
2.	Observation book	**2.**	Faculty Survey
3.	Viva Voce	**3.**	Industry
4.	Model Examination	**4.**	Alumni
5.	End Semester Exams		

LIST OF EXPERIMENTS:

Programs forC++ Concepts

- Constructors and destructors
- Static data member
- Function overloading
- Operator overloading
- Inheritance

Data Structures

1. List
   - Arrayimplementation
   - Linked list implementation
   - Polynomial operations
2. Stack
   - Arrayimplementation
   - Linked list implementation
   - Applications
3. Queue
   - Arrayimplementation
   - Linked list implementation
4. BinarySearch tree
5. Sorting
   - Quick sort
   - Mergesort
6. Searching
   - Linear search
   - Binarysearch

BEC505 DIGITAL SIGNAL PROCESSING L T P C

3 1 0 4

Course Objectives:

- To study about discrete time systems and to learn about FFT algorithms.
- To study the design techniques for FIR digital filters
- To study the design techniques for IIR digital filters
- To study the finite word length effects in signal processing
- To study the properties of random signal,Multirate digital signal processing and about QMF filters.

Course Outcomes:

Upon completion of the course, students will be able to

- apply DFT for the analysis of digital signals & systems
- design FIR filters
- design IIR filters
- characterize finite Word length effect on filters
- design the Multirate Filters

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

CourseAssessmentmethods:

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 Examinations		

UNIT I DISCRETE – TIME SIGNALS AND SYSTEMS : 12

mpling 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 – Overlap add and Save methods-Difference equation representation – DFS, DTFT, DFT – FFT computations using DIT and DIF algorithms.

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

Total: 60 Periods

TEXTBOOK:

1 . JohnG.Proakis&DimitrisG.Manolakis,"DigitalSignalProcessing–Principles, Algorithms&Applications",FourthEdition,PearsonEducation/Prentice Hall,2007.

REFERENCES:

1. SanjitK.Mitra,"DigitalSignalProcessing–AComputerBasedApproach",TataMcGrawHill, 2007.

2. A.V.Oppenheim, R.W. Schafer andJ.R. Buck, "Discrete-Time Signal Processing", 8th Indian Reprint,Pearson,2004.

BEC502 MICROPROCESSOR AND MICROCONTROLLER L T P C

3 1 0 4

CourseObjectives:

- StudytheArchitecture & programming of8086 microprocessor.
- Study the programming concepts of ARM & PIC
- Learn thedesignaspects ofI/O and Memory Interfacingcircuits.
- Studyabout communication and bus interfacing.
- StudytheArchitectureof8051 / ARM microcontroller.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Design and implement programs on 8086,ARM, PIC.

CO2: DesignI/O circuits.

CO3: Design Memory Interfacing circuits.

CO4: Design and implement 8051 microcontroller based systems.

CO5: Describethe architectureand instruction setof ARM microcontroller

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

CourseAssessmentmethods:

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 Examinations		

UNITI MICROPROCESSOR 8086 12

Register Organization -Architecture-Signals-Memory Organization-Bus Operation-I/O Addressing-Minimum Mode-Maximum Mode-Timing Diagram-Interrupts - Service Routines – I/O and Memory Interfacing concepts.

UNIT II PROGRAMMING OF 8086 15

Addressing Modes-Instruction format-Instruction set-Assembly language programs in 8086. RISC architecture – introduction to ARM Programming register configuration and instruction set - introduction to PIC Programming register configuration and instruction set – sample program.

UNIT III-INTERFACING DEVICES 12

Programmable Peripheral Interface (8255) - Programmable Interval Timer (8254) - Programmable Interrupt Controller (8259A) - Programmable DMA Controller (8257) - Programmable Communication Interface (8251A) – Programmable Keyboard and Display Controller (8279).

UNITIV-MICROCONTROLLER-8051 12

Register Set-Architecture of 8051 microcontroller- I/O and memory addressing-Interrupts-Instruction set- Addressing modes. Timer-Serial Communication-Interrupts Programming-Interfacing to External Memory-Interfacing to ADC, LCD, DAC, Keyboard and stepper motor.

UNIT-V-SYSTEM DESIGN USING MICRO PROCESSOR & MICROCONTROLLER 12

Case studies – Traffic light control, washing machine control, RTC Interfacing using I2C Standard- Motor Control- Relay, PWM, DC & Stepper Motor. **Total: 60Periods**

TEXT BOOKS.

1. Muhammad Ali Mazidi and Janice Gillispie Mazidi, "The 8051 -Microcontroller and Embedded systems", 7th Edition, Pearson Education, 2004.
2. Doughlas.V.Hall, “Microprocessor and Interfacing : Programming and Hardware”, Revised 2nd edition, McGraw Hill, 1992
3. Steve Furber, “ARM System On Chip Architecture”, Second Edition,Pearson Education, 2000.
4. K. Ray and K. M. Bhurchandi, "Advanced Microprocessors and Peripherals – Architectures, Programming and Interfacing", Tata McGraw Hill, 2002 Reprint
5. Design with PIC microcontroller by John B Peatman.

REFERENCES

1. Kenneth.J.Ayala, “8051 Microcontroller Architecture, Programming and Applications”, 3rd edition, Thomson, 2007.
2. nuvoTon Cortex M0 (Nu-LB-NUC100/140) Driver and Processor Reference Manual; www.nuvoton.com

BEC503 TRANSMISSION LINES NETWORKS AND WAVEGUIDES L T P C
3 1 0 4

Course Objectives:

- Tointroducethe varioustypesoftransmissionlines andto discussthelosses associated.
- Togive thoroughunderstandingaboutimpedancetransformationandmatching.
- TousetheSmithchartinproblemsolving.
- To impart knowledge onfilter theoriesand waveguide theories

Course Outcomes:

Upon completion of the course, students will be able to:

CO1: Discussthe fundamental concepts ofwavepropagation in TransmissionLinesand Wave Guides

CO2: Analyzethe line parametersand various losses in transmission lines.

CO3: Applysmith chart forlineparameter and impedance calculations

CO4: Evaluatethecharacteristics of parallel plane and rectangular wave guides.

CO5: Evaluatethecharacteristics ofCircularwaveguides andresonators.

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S		S	M							
CO2	S	M		M	M							M
CO3	M		S	S								
CO4	M	S		M								M
CO5	S		S		M							

CourseAssessmentmethods:

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 Examinations		

UNITI TIME VARRYINGFIELDSAND MAXWELL'S EQUTIONS 12

Motional Electromotive Force, General Expression for motional EMF, Faraday‟s Law of Induction, Displacement current, Maxwell‟s equation in the point or differential form, Maxwell‟s equations in Integral form, Maxwell‟s equations from Gauss‟s Law, Maxwell‟s equations and Boundary conditions, Poynting‟s theorem, Time harmonic (sinusoidal) fields, Maxwell‟s equations in phasor form.

UNITII TRANSMISSION LINES 12

Need for Transmission Lines, Types of Transmission lines, Characterization in terms of primary and secondary constants, Characteristic impedance, General wave equation, Loss less propagation, Propagation constant, Wave reflection at discontinuities, Voltage standing wave ratio, Transmission line of finite length, The Smith Chart, Smith Chart calculations for lossy lines, Impedance matching by Quarter wave transformer, Single and double stub matching.

UNIT III THE UNIFORM PLANE WAVE 12

Wave propagation in free space, Wave propagation in dielectrics, Forward and Backward Travelling Wave, Poynting Theorem and Wave Power, Energy of the Radiated wave, Propagation in good conductors and good dielectrics, Skin effect, Wave polarization, Linearly, Elliptically and Circularly polarized waves,

UNIT IV TRANSMISSION AND REFLECTION OF PLANE WAVES AT BOUNDARIES 12

Normal incidence of Uniform Plane waves: Conductor-Conductor interface, Dielectric-Dielectric interface, Dielectric-perfect Conductor interface, Dielectric-Conductor interface. Oblique incidence on a plane boundary for perpendicular polarization, Dielectric-Dielectric interface, Dielectric-Conductor interface.

UNIT V WAVE GUIDES AND CAVITY RESONATORS 12

General Wave behaviours along uniform Guiding structures, Transverse Electromagnetic waves, Transverse Magnetic waves, Transverse Electric waves, TM and TE waves between parallel plates, TM and TE waves in Rectangular wave guides, Bessel‟s differential equation and Bessel function, TM and TE waves in Circular wave guides, Rectangular and circular cavity Resonators.

Total : 60 Periods

TextBook:

1. John D Ryder, “Networkslinesandfields”, Prentice Hall ofIndia, NewDelhi, 2005

References:

1. WilliamHHaytand JrJohnA Buck, “Engineering Electromagnetics”TataMcGraw-Hill PublishingCompanyLtd, NewDelhi, 2008
2. David KCheng, “Field andWaveElectromagnetics”, PearsonEducationInc,Delhi,2004
3. JohnDKrausandDanielAFleisch,“ElectromagneticswithApplications”,McGrawHillBookCo,2005
4. GSN Raju, “Electromagnetic FieldTheoryandTransmissionLines”,PearsonEducation, 2005
5. Bhag Singh Guru and HR Hiziroglu, “Electromagnetic Field Theory Fundamentals”, Vikas PublishingHouse, NewDelhi,2001.
6. N.Narayana Rao, “ ElementsofEngineeringElectromagnetics”6th edition PrenticeHall,2004

BEC504 COMMUNICATION ENGINEERING I L T P C
3 0 0 3

CourseObjectives:

- Analog modulation and demodulation techniques.
- Acquiring mathematical understanding of Analog Communication Systems.
- Understanding the trade-offs (in terms of bandwidth, power, and complexity requirements)
- Performance evaluation of communication systems in the presence of noise.
- Design of practical communication system at the block diagram level under certain constraints and requirements.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Students will have knowledge of basic mathematical concepts and from a block-diagram system approach.

CO2: It will allow thinking in the two "domains" of communications, the time domain and the frequency domain.

CO3: Toevaluate communication systems in the presence of noise.

CO4: They will have knowledge of basic types of analog modulation (AM, FM, and PM) from mathematical description.

CO5: Tounderstand trade-offs (in terms of bandwidth, power, and complexity requirements)

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

CourseAssessmentmethods:

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 Examinations		

UNIT I-AMPLITUDE MODULATION SYSTEMS 10

Need for modulation, Amplitude Modulation System, Single Tone & Multiple Tone Amplitude Modulation, Power Relation, Generation of Amplitude Modulation – Linear Modulation –

Collector Modulation method Non-linear Modulation – Square law Modulator, Product Modulator, Switching Modulator - Demodulation of Amplitude Modulation – Envelope Detector,Coherent Detector, VSB, Performance comparison of various Amplitude Modulation System.

UNIT II-ANGLE MODULATION SYSTEMS 10

Frequency Modulation, Types of Frequency Modulation, Generation of NBFM, WBFM, Transmission BW of FM Signal, Phase Modulation. Relationship between PM & FM, Comparison, Generation of FM Direct Method, Indirect method, Demodulation of FM - FM Discriminators.

UNIT III-RADIO RECEIVERS 6

Introduction – Functions & Classification of Radio Receivers, Tuned Radio Frequency (TRF) Receiver, Superheterodyne Receiver – Basic Elements, Receiver Characteristics, Frequency Mixers, AGC Characteristics

UNIT IV-NOISE THEORY 9

Noise, Types of noise, White Noise, Addition of Noise due to several sources in series and parallel, Generalized Nyquist Theorem for Thermal Noise,Calculation of Thermal Noise for a Single Noise Source, RC Circuits & Multiple Noise sources. Equivalent Noise Bandwidth, Signal to Noise Ratio, Noise-Figure, Noise Temperature, Calculation of Noise Figure, Noise FigureDetermination for Cascaded Stages of Amplifiers

UNIT V-PERFORMANCE OF COMMUNICATION SYSTEM 10

Receiver Model, Noise in DSB-SC Receivers, Noise in SSB-SC Receivers, Noise in AM receiver (Using Envelope Detection), Noise in FM Receivers, FM Threshold Effect, Threshold Improvement through Pre-Emphasis and De-Emphasis, Noise in PM system – Comparison of Noise performance in PM and FM, Link budget analysis for radio channels.

TEXT BOOKS

1. John G. Proakis & Masoud Salehi, *"Communication System Engineering",* 2nd Edition, 2002.
2. R.P. Singh & S.D. Sapre, *"Communication Systems: Analog & Digital",* 3rd Edition, Tata McGraw-Hill, 2012.

REFERENCES

1. Sanjay Sharma, "*Communication Systems, Analog & Digital*", S.K. Kataria & Sons, 5th Edition, 2009.
2. Dennis Reddy & John Coolen, *"Electronic Communications",* 4th Edition, Prentice Hall, 2008.

BEI501 CONTROL SYSTEMS L T P C
3 1 0 4

Course Objectives:

- To understand the open loop and closed loop (feedback) systems and the basics of control system modeling.
- To understand time domain analysis of control systems required for stability analysis.
- To understand frequency domain analysis of control systems required for stability analysis
- To understand the compensation technique that can be used to stabilize control systems

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Outline the development of mathematical models to represent systems and their representation bytransferfunctions

CO2: Discuss thetransient and steadystateresponse of control systems

CO3: Practicefrequencydomain plots (Bode andPolar)

CO4: Analyzeperformanceof control systems

CO5:Design compensation networks

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

CourseAssessmentmethods:

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 Examinations		

UNIT I CONTROL SYSTEM MODELLING: 12

System concept. Differential equations. Transfer functions. Introduction to model based design-Modelling of electric systems, Translational and rotational mechanical systems, simple Electro -

mechanical systems. Block diagram representation of systems. Block Diagram reduction methods. Closed loop transfer function, determination of Signal flow graphs. Mason's gain formula. Examples.

UNIT II TIME RESPONSE ANALYSIS: 12

First Order Systems. Impulse and Step Response analysis. Second Order system Analysis. Steady state error. Error Coefficients and Generalized error series. Principle of PI, PD and PID Compensation. Servo Motor, Synchros & Stepper Motor-analysis using Matlab.

UNIT III STABILITY IN TIME DOMAIN: 12

Stability Analysis. Routh - Hurwitz Criterion. Root locus Method. Construction of root, locus diagrams. Stability Study. Application of root locus diagram-analysis using Matlab.

UNIT IV STABILITY IN FREQUENCY DOMAIN 12

Frequency response analysis. Frequency domain specifications . Polar plot, Bode's Plot, Magnitude - Phase plot, Constant M and N Circles. Nichol's Chart Nyquist Stability Criterion. Relative Stability - gain Margin and Phase margin, determination from Polar plot, Bode's Plot and Magnitude – Phase Plot. Use of Nichol's Chart in system analysis to determine relative stability, Bandwidth, Resonance peak and resonance frequency- Analysis using Matlab.

UNIT VCOMPENSATION TECHNIQUES: 12

Cascade and feedback compensation. Lag, Lead and Lag- lead Compensation. Design of Cascade Compensators - Using Bode's Plot.

Total :60 Periods

TEXTBOOK:

1. J.Nagrath $_{th}$ andM.Gopal, "Control SystemEngineering", NewAgeInternational Publishers,5 Edition,2007.

REFERENCES:

1. Benjamin.C.Kuo, "Automaticcontrol systems", Prentice Hall ofIndia, 7thEdition,1995.
2. M.Gopal,"Control System– Principles and Design",TataMcGrawHill, 2ndEdition,2002.
3. Schaum"sOutlineSeries, "FeedbackandControlSystems" Tata McGraw-Hill,2007.
4. John J.D"Azzo &ConstantineH.Houpis, "LinearControl System Analysisand Design"",Tata McGraw-Hill,Inc., 1995.

BEC5L1 DIGITAL SIGNAL PROCESSING LABORATORY L T P C
0 0 4 2

Course Objectives:

The student should be made to:

- To implement Linear and Circular Convolution
- To implement FIR and IIR filters
- To study the architecture of DSP processor

Course Outcomes:

Students will be able to

- Experiment concepts of DSPand its applications usingMATLABSoftware
- Develop digital filters usingMATLAB
- Demonstrate their abilities towards DSP processor based implementation of DSP systems

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S		S	M							
CO2	S	M		M	M							M
CO3	M		S	S								
CO4	M	S		M								M
CO5	S		S		M							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Lab Records	**1.**	Student exit survey
2.	Observation book	**2.**	Faculty Survey
3.	Viva Voce	**3.**	Industry
4.	Model Examination	**4.**	Alumni
5.	End Semester Exams		

LIST OF EXPERIMENTS:

1.Waveform generation
2.Sampling and its effect on aliasing
3.Linear and circular convolution
4.DFT computation

5.Fast Fourier transforms

6. FIR Filters Implementation
7. IIR Filters Implementation
8. Quantisation Noise.
9. Multirate Signal Processing
10 DSP processor implementation.

BEC5L6 MICROPROCESSORS AND MICROCONTROLLER LAB L T P C

0 0 4 2

Course Objectives:

The studentshould bemadeto:

- StudytheArchitectureof 8085&8086 microprocessor.
- LearnthedesignaspectsofI/OandMemoryInterfacingcircuits.
- StudytheArchitecture of8051microcontroller.

Course Outcomes:

At the end of the course, the student should be able to:

CO1: Design and implement programs on 8085 and 8086 microprocessor.

CO2: Design interfacing circuits with 8085/8086.

CO3: Design and implement 8051 microcontroller based systems

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	M		M							M
CO2	S	M		M	M							M
CO3	M		S									
CO4	M	S		M								M
CO5		S	S		M							

Course Assessment methods:

DIRECT		INDIRECT	
1.	Lab Records	**1.**	Student exit survey
2.	Observation book	**2.**	Faculty Survey
3.	Viva voce	**3.**	Industry
4.	Model Examination	**4.**	Alumni
5.	End Semester Exams		

LIST OF EXPERIMENTS

1. Programming with 8085 – 8-bit/16-bit addition/subtraction
2. Programming with 8085 – 8-bit/16-bit multiplication/ division using repeated addition/subtraction.
3. Programming with 8085 – 8-bit/16-bit Ascending/Descending order
4. Programming with 8085 – 8-bit/16-bit Largest/smallest number
5. Programming with 8085- code conversion, decimal arithmetic, bit manipulations.
6. Programming with 8085 – matrix multiplication, floating point operations.
7. Programming with 8086 – String manipulation, search, find and replace, copy operations, sorting.
8. Interfacing with 8085/8086 – 8255, 8253.
9. Interfacing with 8085/8086 – 8279, 8251.
10. 8051 Microcontroller based experiments – Simple assembly language programs
11. 8051 Microcontroller based experiments – simple control applications.

BEC5L3 COMMUNICATION ENGINEERING LAB-I L T P C
0 0 4 2

CourseObjectives:

- To practice the basic theories of analog communication system.
- To provide hands-on experience to the students, so that they are able to apply theoretical concepts in practice.
- To use computer simulation tools such as P-SPICE, or Matlab to carry out design experiments as it is a key analysis tool of engineering design.
- To give a specific design problem to the students, which after completion they will verify usingthe simulation software or hardware implementation.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Students will have practical knowledge about theories of analog communication

CO2: Students will have practical knowledge about simulation software

CO3: Design and implement

CO4: Execute hardware implementation

CO5: They will have knowledge of basic types of analog modulation (AM, FM, and PM) from mathematical description

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

Course Assessment methods:

DIRECT		**INDIRECT**	
1.	Lab Records	**1.**	Student exit survey
2.	Observation book	**2.**	Faculty Survey
3.	Viva Voce	**3.**	Industry
4.	Model Examination	**4.**	Alumni
5.	End Semester Exams		

LISTOFEXPERIMENTS

1. AM modulator and Demodulator.
2. DSB-SC modulator and Demodulator.
3. SSB modulator and Demodulator.
4. FM modulator and Demodulator.

5. PAM modulator and Demodulator.
6. TDM Multiplexer and Demultiplexer.
7. FDM Multiplexer and Demultiplexer.
8. Pre emphasis and De-emphasis in FM.
9. Simulation experiments using P-SPICE and Matlab.
   i) AM modulator with AWGN noise in Matlab.
   ii) Pre-emphasis and De-emphasis in FM usingP-SPICE**.**

RESOURCESREQUIRED

1. AM Kit
2. TDM Kit

BEC5P1 Mini Project **L T P C**

0 0 3 1

CourseObjectives:

- Develop hardwaresolutions forsimple applications.
- Learn to workin a team.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Applyknowledgeofbasic science andengineeringto electronics and communication engineeringproblems.

CO2: Identify, formulatesimple problem statements and find solutions.

CO3: Implement the hardware and test.

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	M		M							M
CO2	S	M		M	M							M
CO3	M		S									
CO4	M	S		M								M
CO5		S	S		M							

CourseAssessmentmethods:

DIRECT		INDIRECT	
1.	Review 1	**1.**	Student exit survey
2.	Review 2	**2.**	Faculty Survey
3.	Viva Voce	**3.**	Industry
4.	End Semester Exams	**4.**	Alumni

BEC601 COMPUTER COMMUNICATION NETWORKS L T P C
3 0 0 3

CourseObjectives:

- To makethe students to understand the different layers ofISO /OSImodel and TCP/IP NetworkIEEE standards.
- To understandIPaddressingmethods and QOS parameters.
- To knowthe functions and congestion control mechanismof TCP.
- To know about application layer and networksecurity.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto CO1: Explain the networks, topologies andlayersofOSImodel,comparewith TCP/IPmodel.
CO2: Classifyerrorcontrol and flow control techniquesand typesofLANtechnologies.
CO3: Analyzedifferent routingalgorithms and methods to improveQOS.
CO4: Summarizethe transport layer protocols andcongestioncontrols methods.
CO5: Describevariousapplication layer servicesand cryptographic techniques.

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

COs	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012
CO1	M		S									
CO2	M	M										
CO3	M		S	S								
CO4	S	M			M						M	M
CO5	M	M	S									

CourseAssessmentmethods:

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 Examinations		

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).

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).

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.

WIDE AREA NETWORKS: 9

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

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 : 45 Periods

Text Books :

1. Behrouz A.Fehrouzan, *"Data communication & Networking"*, Mc-Graw Hill, 4th Edition, 2007.
2. Andrew S.Tanenbaum, *"Computer Networks"*, Pearson EducationIndia, 3rd Edition, 2010**.**

References:

1. William Stallings, *"Data & Computer Communication",* Pearson Education India, 8th Edition, 2007.
2. Rarnier Handel, N.Huber, Schroder, *"ATM Networks Concepts, Protocols Applications'',* Addison Welsey, 3rd Edition, 2009

BEC603 ANTENNA AND WAVE PROPAGATION L T P C
Course Objectives 3 1 0 4

- To study the concepts of antenna characteristics and its radiation pattern.
- To understand various antenna arrays and different techniques involved in the measurement of its parameters.
- To know about small antennas-Working principle and its parameters
- To know about special antennas-Working principle and its application.
- To understand the wavepropagation in atmosphere.

Course Outcomes:

Upon the completion of the course

- **CO1:**Definevarious antenna parameters
- **CO2:**Analyze radiationpatterns of antennas
- **CO3:**Evaluateantennasforgiven specifications
- **CO4:**Illustrate techniques for antennaparametermeasurements
- **CO5:**Discuss radio wavepropagation

CO/PO Mapping
(S/M/Windicates strength of correlation) S-Strong, M-

Cos	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M		S							
CO2	S	S	M	M	S							
CO3	S	S	M	M	S							S
CO4	S	S			S							
CO5	S	S	M	M	S							M

CourseAssessmentmethods:

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 Examinations		

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.Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial array

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. Numerical tool for antenna analysis

UNIT IV SPECIAL ANTENNAS: 12

Yagi uda Antenna, Tumstile antenna, Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic. Modern antennas- Reconfigurable antenna, Active antenna, Dielectric antennas, rhombic antenna, Horn antenna, Reflector antennas and their feed systems, Micro strip antenna, Impedance and antenna measurements;

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.Duct propagation, Critical frequency and Space propagation,

Total: 60 Periods

Text Books

1. John D Kraus, Ronald J Marhefka, Ahmad S Khan, *"Antenna and Wave Propagation"*, Tata McGraw Hill, 4th Edition, 2010.

2. R.L.Yadava, *"Antennas and Wave Propagation"*, PHI, 2011

References

1. Constantine A.Balanis, *"Antenna Theory: Analysis and Design"*, Third Edition, John Wiley and Sons, 2012.
2. G.S.N. Raju, *"Antennas and wave propagation"*, 1st Edition Pearson Education, 2012.
3. Robert S. Elliott, *"Antenna Theory and Design"*, John Wiley and Sons, Revised Edition, 2007.

BEC604 COMMUNICATION ENGINEERING II **L T P C**

Course Objectives: **3 0 0 3**

To learn and understand
•The process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals and digital modulation systems.
•Baseband and passband transmission systems.
•M-ary signaling and spread spectrum Techniques.

Course Outcomes:
Upon the completion of the course
CO1: Students will learn about the basic concepts of Sampling, basic concepts of baseband transmission of binary data
CO2: They gain knowledge about basics of digital modulation techniques.
CO3: They can understand the concepts of spread spectrum digital communication system
CO4: To provide in-depth analysis of noiseperformancein various receivers.
CO5: To understand the basicconcepts of analogpulsemodulation techniques.

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

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

CourseAssessmentmethods:

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 Examinations		

UNIT I-SAMPLING AND QUANTIZATION 9

Sampling Process – Aliasing – Instantaneous sampling – Natural Sampling –Flat Sampling – Quantization of signals – sampling and quantizing effects –channel effects – SNR for quantization pulses – data formatting techniques –Time division multiplexing.

UNIT II-DIGITAL MODULATION 9

PCM Systems – Noise Considerations in PCM system – Overall Signal-tonoise ratio for PCM system – Threshold effect – Channel Capacity – Virtues,Limitations & Modification of PCM system – PCM Signal Multiplexing – Differential PCM – Delta Modulation – Noise Considerations in Delta Modulation – SNR Calculations – Comparison of PCM, DPCM & DM.

UNIT III-BASE BAND PULSE TRANSMISSION 9

Maximum likelihood receiver structure – Matched filter receiver – Probability error of the Matched filter – Intersymbol interference – Nyquist criterion for distortionless baseband transmission – Correlative coding – Eye pattern.

UNIT IV-PASS BAND DATA TRANSMISSION 9

Pass Band Transmission Model – Generation, Detection, Signal Space Diagram, Probability of Error for BFSK, BPSK, QPSK, DPSK, and Schemes – Comparison.

UNITV-M-ARY SIGNALING AND INTRODUCTION TO SPREAD SPECTRUM TECHNIQUES 9

M-ary signaling, vectoral view of MPSK and MFSK signaling, symbol error performance of M-ary systems –Introduction – Discrete Sequence Spread Spectrum technique – Use of Spread Spectrum with CDMA-Ranging Using Discrete Sequence Spread Spectrum – Frequency Hopping Spread Spectrum –Generation & Characteristics of PN Sequence.

Total : 45 Periods

TEXT BOOKS

1. Bernard Sklar, *"Digital Communication, Fundamentals and Application",* Pearson Education Asia, 2nd Edition, 2001.

2. Simon Haykin, *"Communication Systems"*, John Wiley & Sons, 4th Edition, 2000.

3. Taub & Schilling, *"Principle of Communication Systems",* 2nd Edition, 2003.

References:

1. John G. Proakis, "Digital Communication", McGraw Hill Inc, 5th Edition, 2008.

2. Singh, R.P. & Sapre, S.D, "Communication Systems: Analog &Digital", Tata McGraw-Hill, 5th reprint

BEC602 MICROWAVE ENGINEERING L T P C

Course Objectives: 3 0 0 3

To understand and gain complete knowledge about

- Microwave parameters
- Passive microwave components such as waveguides ,isolators etc.
- Microwave vacuum tube devices such as Klystron and Magnetron
- Microwave solid state devices such as diodes ,amplifiers and oscillators
- Microwave measurements

Course outcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Demonstrate the ability to identify formulate and solve microwave network related problems

CO2: Understand the need for the different microwave components and their specifications

CO3: Understand the working principles of different microwave sources

CO4: Demonstrate the ability to identify microwave active devices along with their applications.

CO5: Identifythemeasurementtechniquesfordifferentparameterslike VSWR,impedance,frequency, power ofmicrowavesources and loads.

CO/PO Mapping

(S/M/Windicates strength ofcorrelation) S-Strong, M-Medium, W-Weak

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

CourseAssessmentmethods:

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 Examinations		

UNIT I MICROWAVE NETWORK THEORY 7

Introduction –Microwave frequency range, applications of microwaves.– Scattering matrix representation of multi port network -properties of S-parameters – S matrix of a two port network with mismatched load – Z and ABCD parameters-Comparison between [S] - [Z] and [Y] matrices

UNIT II MICROWAVE PASSIVE DEVICES 10

Coaxial cables-connectors and adapters – Wave guides- Matched terminations –Rectangular to circular wave guide transition–Wave guide corners – Bends and twists – Windows –Attenuators – Phase shifters – Wave guide tees– E plane tee – H plane tee – Magic tee – Isolators – Circulators –Directional couplers – scattering matrix derivation for all components .

UNIT III MICROWAVE VACCUM TUBE DEVICES 10

Introduction – Two cavity klystron amplifier – Mechanism and mode of operation –Power output and efficiency -Applications – Reflex klystron oscillator – Mechanism and mode of operation-Power output – Efficiency – Mode curve –Applications – TWT amplifier – Principle of operation-gain and applications – Magnetron oscillator – Hull cut-off voltage mechanism of operation– Power output and efficiency –Applications – Numerical problems.

UNIT IV MICROWAVE SEMICONDUCTOR DEVICES AND CIRCUITS 9

Principles of tunnel diodes - Varactor and Step recovery diodes – Transferred Electron Devices - Gunn diode- Avalanche Transit time devices- IMPATT and TRAPATT Devices- Parametric Amplifiers – Introduction to Micro strip Lines, & Monolithic Microwave Integrated circuits-Materials, MMIC Fabrication Techniques.

UNIT V MICROWAVE MEASUREMENTS 9

Introduction – Slotted line carriage — 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.

Total: 45 Periods

Text Books:

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

References:

1R.E. Collin, *"Foundations for Microwave Engineering",* 2nd edition, Tata McGraw Hill, 2006..

2. Samuel Y. Liao, "*Microwave Devices and Circuits",* 3rd edition,Pearson education, 2011 reprint

BMA604 RANDOM PROCESSES **L T P C**

Course Objectives: **3 1 0 4**

- To impart adequate knowledge about probability concepts,
- To make students understand Moment Generating Functions,
- To make students understand Discrete and Continuous Random variables, Random Processes and their applications in Electronic Transmissions.

Course Outcomes:

CO1: After completing this course students would be able to apply concepts of Probability to solve problems in Electronic Engineering.
CO2: Find functional relationship between random inputs and outputs with the use of Random Process Techniques.
CO3: Find the linearity in Birth and Death Processes with the use of Poisson processes.
CO4: Fitsmooth curvesforthe discrete dataconnected to each other or touse interpolation methods over thesedatatables
CO5: Find thetrend information from discrete data set through numericaldifferentiation and summaryinformation through random process

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

COs	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012
CO1	S	M	S	M	S			S	M		S	
CO2	S	M	S	M	S			S	M		S	
CO3	S	M	S	M	S			S	M		S	
CO4	S	M	S	M	S			S	M		S	
CO5	S	M	S	M	S			S	M		S	

CourseAssessmentmethods:

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 Examinations		

UNIT I PROBABILITY AND RANDOM VARIABLES 12

Probability concepts, Bayes' theorem, Random variables. Moments, Moment Generating function, Binomial, Poisson, Geometric, Exponential, and Normal distributions. Univariate Transformation of random variable.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 12

Marginal and conditional distributions, Covariance, Correlation and regression, Transformation of random variables, Central limit theorem-Lindberg and Liapounouff Theorems(applications).

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.

UNIT V SPECTRAL DENSITIES 12

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

Total: 60 Periods

Text Books:

1. S.C.Gupta & V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, New Delhi , 2003.
2. O Flynn M., " Probability, Random Variables and Random Processes", Harperand RowPublishers, 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 ", Wiley India Pvt Ltd, New Delhi.
3. Douglas C.Montgomory, George C.Runger, and Norma F.Hubele. "Engineering Statistcs" 4th Edn. Wiley India Pvt Ltd., New Delhi. 2007.
4. Ronald E.Walpole. "Probability and Statistics for Engineers and Scientists". 9th Edn. 2014. Pearson Education, Chennai-600113.

BEC6L1 COMPUTER COMMUNICATION NETWORKS LAB L T P C
0 0 4 2

CourseObjectives:

- To understand the workingprincipleof variouscommunication protocols.
- Toanalyzethevarious routingalgorithms.
- To knowthe concept ofdata transfer between nodes.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Analyzeperformanceof various communication protocols.
CO2: Compare routingalgorithms.
CO3: Practicepacket /file transmission between nodes.

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

COs	ProgrammeOutcomes(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		

CourseAssessmentmethods:

DIRECT		INDIRECT	
1	Lab Records	**1.**	Student exit survey
2	Observation book	**2.**	Faculty Survey
3	Viva Voce	**3.**	Industry
4	Model Examination	**4.**	Alumni
5	End Semester Exams		

LISTOFEXPERIMENTS

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

BEC6L2 MICROWAVE ENGINEERING LAB L T P C

Course Objectives: 0 0 4 2

The student should be made to

- Know about the behavior of microwave components.
- Understand the radiation pattern of horn antenna.
- Practice microwave measurement procedures

Course Oucomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Demonstrate thecharacteristics of Microwavesources.and directional couplers
CO2: Test the characteristics of microwave components.
CO3: Analyse the radiation pattern of antenna
CO4: Measure parameters related to microwave devices.

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

COs	ProgrammeOutcomesPOs											
	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			

CourseAssessmentmethods:

DIRECT		**INDIRECT**	
1	Lab Records	**1.**	Student exit survey
2	Observation book	**2.**	Faculty Survey
3	Viva Voce	**3.**	Industry
4	Model Examination	**4.**	Alumni
5	End Semester Exams		

LIST OF EXPERIMENTS:

1. Study of microwave components
2. Characteristics of reflex klystron oscillator
3. Characteristics of gunn diode oscillator
4. Radiation pattern of horn antenna
5. Measurement of Antenna gain
6. Frequency and wavelength measurement
7. Impedance measurement by slotted line method

8. VSWR and Reflection Co-efficient measurement
9. Characteristics of E Plane/ H Plane Tee.
10. Characteristics of Magic Tee.
11. Characteristics of Directional coupler.

BEC6L3 COMMUNICATION ENGINEERING II LAB L T P C
0 0 4 2

OBJECTIVES:

- To demonstrate digital communication concepts using hands-on experience and using simulation environments such as PSPICE /Multisim, or Matlab/Simulink, or LabVIEW.
- To use commercial, modular systems which have some distinct advantages over bread boarding to examine more complex communication topics and to deliver a hands-on laboratory experience.

OUTCOME:

CO1: Tounderstandlineartimeinvariantsystemwithrandominputs,andoptimumreceiverfor AWGN channel.
CO2: To understand the Discrete channel models and itsproperties
CO3: To understand the Continuous channel models andits properties
CO4: Execute hardware implementation
CO5: They will have knowledge of basic types of digital modulation (ASK, FSK, and PSK) from mathematical description

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

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

CourseAssessmentmethods:

DIRECT		INDIRECT	
1	Lab Records	**1.**	Student exit survey
2	Observation book	**2.**	Faculty Survey
3	Viva voce	**3.**	Industry
4	Model Examination	**4.**	Alumni
5	End Semester Exams		

LIST OF EXPERIMENTS

.1. FSK Modulation and Demodulation.

2. PSK Modulation and Demodulation.

3. QPSK Modulation and Demodulation.

4. DPSK Modulation and Demodulation.

5. PAM Modulation and Demodulation.

6. PWM Modulation and Demodulation.

7. PPM Modulation and Demodulation.

8. Pulse Code Modulation and Demodulation.

9. Delta Modulation and Demodulation.

10. Differential Pulse Code Modulation and Demodulation.

11. Data formatting.

12. BER comparison of different modulation schemes in AWGN channel in MATLAB , Simulink.

RESOURCESREQUIRED

1. PSK
2. PCM Kit
3. Delta modulation kit
4. Line coding and Decoding kit
5. FSK kit
6. PAM,PWM,PPM kit
7. Delta demodulation kit
8. Sampling kit

BBA701 PRINCIPLES OF MANAGEMENT AND PROFESSIONAL ETHICS L T P C

CourseObjectives: 3 0 0 3

- Tocreate anawareness on EngineeringEthics andits use in ones profession
- To instill moral values,social values and loyalty
- To provide an insight into ones professional rights andaviewof professional ethics in the globalcontext

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Understand the ethicaltheories andconcepts

CO2: Understanding anengineer's work in the context of its impact on society

CO3: Understandand analyzetheconcepts of safetyand risk

CO4: Understand theprofessional responsibilities and rights ofEngineers

CO5: Understand the concepts of ethics in theglobal context

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

COs	ProgrammeOutcomes(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			

CourseAssessmentmethods:

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 Examinations		

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 – 2 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 – 3 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 – 4 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 – 5 PROFESSIONAL ETHICS 9

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

Total: 45 Periods

Text Books:

1.Principles of Management - L.M.Prasad, Sultan chand & Sons.
2.Organisational Behaviour - L.M.Prasad , Sultan chand & Sons.
3. Management Today Principles & Pracitce - Gene Burton & Manab thakur,

References:

1. Organisational Behaviour - Stephen Robbins, Prentice Hall India.
2. Organisational Behaviour - Fred Luthans, Fred Luthans, Tata McGraw Hill
3. Management Principles - Koontz & Weirich, Tata McGraw Hill Publications

BEC 701 FIBRE OPTIC COMMUNICATION L T P C
3 1 0 4

CourseObjectives:

- To learn thebasic elements of optical fiber transmission link, fiber modes configurations and structures.
- To understand the differentkind of losses, signal distortion, SM fibers.

- To learn thevarious optical sources, materials and fiber splicing.
- To learn the fiber opticalreceivers and noiseperformancein photo detector.
- To learn link budget, WDM, solitons and SONET/SDHnetwork.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Demonstratean understandingof optical fiber communication link,structure, propagation and transmission properties of an opticalfiber.

CO2: Estimatethe losses andanalyzethe propagation characteristicsof an optical signal in different types of fibers

CO3: Describethe principles ofoptical sources and power launching-couplingmethods.

CO4: Comparethe characteristics of fiber optic receivers.

CO5: Design afiber optic link based onbudgets and assess the different techniques to improve the capacityof the system.

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

COs	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012
CO1	S	S	M									
CO2		S										
CO3	S	M										
CO4	S	M										
CO5	S				M							

CourseAssessmentmethods:

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 Examinations		

INTRODUCTION TO OPTICAL FIBER 12

Evolution of fiber Optic system – Element of an Optical Fiber Transmission link – Ray Optics – Optical Fiber Modes and Configurations – Mode theory of Circular Wave guides – Overview of Modes – Key Modal concepts – Linearly Polarized Modes – Single Mode Fibers – Graded Index fiber structure.

SIGNAL DEGRADATION IN OPTICAL FIBER **12**

Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides – Information Capacity determination – Group Delay – Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers – Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers – Mode Coupling – Design Optimization of SM fibers – RI profile and cut-off wavelength.

FIBER OPTICAL SOURCES **12**

Direct and indirect Band gap materials – LED structures – Light source materials – Quantum efficiency and LED power, Modulation of a LED, Laser Diodes – Modes and Threshold condition – Rate equations – External Quantum efficiency – Resonant frequencies – Laser Diodes structures and radiation patterns – Single Mode lasers – Modulation of Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers.

FIBER OPTICAL RECEIVERS **12**

PIN and APD diodes – Photo detector noise, SNR, Detector Response time, Avalanche multiplication Noise – Comparison of Photo detectors – Fundamental Receiver Operation – pre-amplifiers - Error Sources – Receiver Configuration – Probability of Error – The Quantum Limit.

DIGITAL TRANMISSION SYSTEM **12**

Point-to-Point links – System considerations – Fiber Splicing and connectors – Link Power budget – Rise-time budget – Noise Effects on System Performance – Operational Principals of WDM, Solutions.

Total : 60 Periods

REFERENCES:

1. Gerd Keiser, –Optical Fiber Communications‖Tata McGraw– Hill education privateLimited,NewDelhi,fifthEdition,2008,Reprint2009.
2. J.Senior,–OpticalCommunication, PrinciplesandPractice‖, Prentice Hall of India, third Edition,2004.
3. J.Gower,–OpticalCommunicationSystem‖,PrenticeHall ofIndia,2001
4. Yarvi.A.‖QuantumEletronics‖,JohnWiley4thedition,1995

BEC702 DIGITAL CMOS VLSI **L T P C**

3 1 0 4

Course Objectives:

• In this course, the basics of MOS transistor their electrical properties and their design process are analysed.

• To learn about various CMOS logic styles.

• To learn about various adders and multipliers design in VLSI and about the design styles of FPGA.

• To develop an understanding about testing of CMOS circuits.

• To learn about various modeling in HDL

Course Outcomes:

CO1: Students will be able to gain knowledge about Mos Transistors and CMOS logic in detail.

CO2: About the implementation of various adders and multipliers in VLSI technology.

CO3: About the design styles of FPGA and about testing of CMOS circuits.

CO4: About the design of digital logic systems, using Verilog.

CO5: Identify the various IC fabrication methods.

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

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

UNIT I INTRODUCTION TO MOS TRANSISTOR 12

MOS Fabrication**,** Enhancement mode and Depletion mode MOSFET, ,Threshold voltage derivation – body effect – Drain current Vs voltage derivation – channel length modulation - CMOS technologies, CMOS Fabrication: n-well – p-well – twin tub –DC transfer characteristics-

UNIT II MOS CIRCUITS DESIGN PROCESS AND CMOS LOGIC GATES 12

MOS Layers, Stick Diagram, Layout Diagram, Propagation Delays, CMOS Static Logic Transmission Gate Logic, Tri-State Logic , Pass Transistor Logic , Dynamic CMOS Logic , Domino CMOS Logic,., Differential Cascade Voltage Switch (DCVS) Logic, Scaling of MOS Circuits.

UNIT III VLSI IMPLEMENTATION STRATEGIES 12

Introduction – Design of Adders: carry look ahead-carry select-carry save.Design of multipliers: Array – Braun array – Baugh-Wooley Array.Introduction to FPGA – Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures.

UNIT IV CMOS TESTING

12

Need for testing- Testers, Text fixtures and test programs- Logic verification- Silicon debug principles- Manufacturing test – Design for testability – Boundary scan

UNIT V SPECIFICATION USING VERILOG HDL 12

Basic concepts- identifiers- gate primitives, gate delays, operators, timing controls, procedural assignments conditional statements, Data flow and RTL, structural gate levelswitch level modeling, Design hierarchies, Behavioral and RTL modeling, Test benches, Design of decoder, equality detector, comparator, priorityencoder, half adder, full adder, Ripple carry adder, D latch and D flip flop

Total: 60 Periods

Text Books:

1. Weste and Harris: CMOS VLSI DESIGN (Third edition) Pearson Education, 2005
2. Uyemura J.P: Introduction to VLSI circuits and systems, Wiley 2002.

References:

1 D.A Pucknell & K.Eshraghian Basic VLSI Design, Third edition, PHI,2003
2.Wayne Wolf, Modern VLSI design, Pearson Education, 2003
3 M.J.S.Smith: Application specific integrated circuits, Pearson Education,1997
4 J.Bhasker: Verilog HDL primer, BS publication,2001
5 Ciletti Advanced Digital Design with the Verilog HDL, Prentice Hall of India, 2003

BEC703 CELLULAR MOBILE COMMUNICATION

L	T	P	C
3	0	0	3

CourseObjectives:

- To understand the basiccellularsystemconcepts.
- To have an insight into thevariouspropagation models and the speech coders used in mobile communication.
- To haveknowledgeof themobile system specifications.
- To understand the multiple access techniquesandinterferencereduction techniques in mobile communication.
- Togain knowledgeof thevarious cellularmobile standards.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Discuss cellularradio concepts

CO2: Identifyvarious propagation effects

CO3: Analyze various methodologies to improvethecellularcapacity.

CO4: Classifymultiple access techniques in mobile communication.

CO5: Outline cellularmobile communication standards.

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

UNIT I INTRODUCTION TO WIRELESS MOBILE COMMUNICATION 9

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 9

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 9

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 9

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 9

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

Total: 45 Periods

Text Books:

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.

BEC7L2 DIGITAL CMOS VLSI LAB L T P C

0 0 4 2

Course Objectives:

- To learn Hardware Descriptive Language(Verilog/VHDL)
- To learn the fundamental principles of VLSI circuit design in digital domain
- To familiarise implementation of logical modules on FPGAs

Course Outcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Demonstratea clear Understandingin hardwaredesign languageVerilogHDL.

CO2: ModeladigitalcircuitusinghardwaredescriptionlanguageVerilogHDLandvalidateits functionality.

CO3: Design and implement asub system on a FPGAboard

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

CourseAssessmentmethods:

DIRECT		INDIRECT	
1.	Lab Records	**1.**	Student exit survey
2.	Observation book	**2.**	Faculty Survey
3.	Model Examination	**3.**	Industry
4.	End Semester Exams	**4.**	Alumni

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 Boolean expressions
5. Design and implementation of simple logic circuits
6. Design and implementation of MUX & DEMUX – 4x1 and 8x1
7. Encoder and decoder – 2x4 and 3x8
8. Magnitude comparator
9. Code converters
10. Design and implementation of counters
11. Design and implementation of flipflops
12. FPGA implementation of ADC
13. FPGA implementation of traffic light controller

REQUIREMENTS

HARDWARE

1. FPGA Trainer kit
2. ADC module
3. Traffic light interfacing module

SOFTWARE

1. XILINX 10.1
2. Modelsim

BEC7L3 OPTICAL COMMUNICATION LAB

L	T	P	C
0	**0**	**4**	**2**

CourseObjectives:

- To studythe performanceparameters of optical source and detector.
- To become familiar with differentmodes.
- To study fiber losses and loss mechanism the operation of optical detectors – PIN photodiode, avalanche photodiode
- To study the numerical aperture of the fiber
- To study the light propagation of the fiber

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Couple light in and out of fibers and connect them

CO2: Measure loss and dispersion in fibers

CO3: Measure the performance of analog and digital fiber links

CO4: Relate an integrated view of engineering by explaining the fundamental analogies between electrical and optical communication systems

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	ProgrammeOutcomes(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			

CourseAssessmentmethods:

DIRECT		**INDIRECT**	
1.	Lab Records	**1.**	Student exit survey
2.	Observation book	**2.**	Faculty Survey
3.	Viva Voce	**3.**	Industry
4.	Model Examination	**4.**	Alumni
5.	End Semester Exams		

List of Experiments:

1. V-I and P-I characteristics of LED
2. V-I and P-I characteristics of Photodiode
3. Setting up an analog link using plastic fiber cable
4. Settingup a digital linkusing plastic fiber cable
5. Amplitude Modulation and Demodulation
6. Frequency modulation and Demodulation
7. Numerical Aperture for a Plastic Fiber

8. Pulse width modulation and Demodulation
9. Pulse position modulation and Demodulation
10. Time Division Multiplexing(TDM)
11. Finding V-number for a glass fiber(Multimode / single mode fiber)
12. Numerical Aperture for optical glass fiber(Multimode / single mode)
13. Coupling loss in optical glass fiber(multimode / single mode fiber)
14. Bit Error Rate Measurement
15. Study of Pulse Broadening

Resourcesrequired:

1. Optical Communication Kit
2. CRO
3. FG

BEC7L3 ELECTRONICS SYSTEM DESIGN LAB L T P C
0 0 4 2

Course Objectives:

- To understand the design procedure of different power supplies.
- To know to design transreceiver and voltage regulator.
- To understand the working of Microprocessor and DSP based system design.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Design different forms of power supply.
CO2: Design Voltage regulators and AM/FM transreceiver.
CO3: Know the design procedure ofInstrumentation amplifier and Digital Indicator.
CO4: Learn CAD based PCB layout design.
CO5: Understand the working of modems and timers.

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

COs	ProgrammeOutcomes(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		

CourseAssessmentmethods:

DIRECT		INDIRECT	
1.	Lab Records	**1.**	Student exit survey
2.	Observation book	**2.**	Faculty Survey
3.	Viva Voce	**3.**	Industry
4.	Model Examination	**4.**	Alumni
5.	End Semester Exams		

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.

BEC8P1 PROJECT WORK L T P C

0 0 18 6

CourseObjectives:

- Learn to workas a member ofaproject team.
- Understand project management tasks.
- Develop a hardware/softwaresolution for a real-time, industryrelevant problem.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Applyknowledgeofbasic science andengineeringto electronics and communication engineeringproblems

CO2: Recognizethe real world applications and to solvewith core engineeringknowledge.

CO3: Analyze and workon multidisciplinarytasks

CO4: Chooselatest tools, software and equipmentto solve real world problems

CO5: Identify, formulate, and model engineering equipment

CO/PO Mapping (S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012
CO1	S	S	S		S			S	M		S	
CO2	S	S	S		S			S	M		S	
CO3	S	S	S		S			S	M		S	
CO4	S	S	S		S			S	M		S	
CO5	S	S	S		S			S	M		S	

CourseAssessmentmethods:

DIRECT		**INDIRECT**	
1.	Review–I	**1.**	Student exit survey
2.	Review–II	**2.**	Faculty Survey
3.	Review–III	**3.**	Industry
4.	End Semester VivaVoce	**4.**	Alumni

LIST OF ELECTIVES

BEC001 **COGNITIVE RADIO** **L T P C**

3 0 0 3

Course Objectives:

The studentshould bemadeto:

- Knowthebasicsof thesoftwaredefinedradios.
- Learnthedesignofthewireless networksbasedonthecognitive radios
- Understandtheconcepts of wireless networksand next generationnetworks

Course Outcomes:

Upon completionofthe course, studentswill be ableto

- Describe thebasicsofthe softwaredefinedradios.
- Designthewireless networksbasedonthecognitive radios.
- Gives an understanding of cognitive radio architecture
- Explain the concepts behind the wireless networks and next generation networks

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

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

UNITI INTRODUCTION TOSOFTWARE DEFINED RADIO 9

Definitionsandpotentialbenefits,softwareradioarchitectureevolution,technology tradeoffsand architecture implications.

UNITII SDRARCHITECTURE 9

Essential functions of the software radio, basic SDR, hardware architecture, Computational processingresources,softwarearchitecture, toplevelcomponentinterfaces,interface topologies amongplugandplaymodules,.

UNITIII INTRODUCTIONTOCOGNITIVE RADIOS 9

Markingradioself-aware,cognitivetechniques–positionawareness, environmentawarenessin cognitive radios,optimization ofradioresources, Artificial IntelligenceTechniques.

UNITIV COGNITIVERADIOARCHITECTURE 9

CognitiveRadio- functions,components anddesign rules,Cognitioncycle-orient,plan, decideand actphases,InferenceHierarchy,Architecture maps,BuildingtheCognitiveRadioArchitectureon SoftwaredefinedRadio Architechture.

UNITV NEXTGENERATION WIRELESS NETWORKS 9

TheXGNetworkarchitecture,spectrumsensing, spectrummanagement, spectrummobility,spectrum sharing,upperlayerissues,cross –layerdesign.

Total : 45 Periods

TextBooks

1. JosephMitolaIII,"SoftwareRadioArchitecture:Object-OrientedApproachestoWirelessSystem Engineering",JohnWiley&SonsLtd.2000.
2. ThomasW.Rondeau,CharlesW.Bostain,"ArtificialIntelligenceinWirelesscommunication",ARTECHHOUSE.2009.
3. BruceA. Fette, "Cognitive RadioTechnology",Elsevier,2009.
4. IanF.Akyildiz,Won –Yeol Lee,Mehmet C. Vuran,ShantidevMohanty,"Next generation/ dynamicspectrumaccess/cognitive radio wireless networks:A Survey"ElsevierComputer Networks, May2006.

References:

1. SimonHaykin, "Cognitive Radio:Brain–EmpoweredWireless Communications", IEEEJournal onselectedareas in communications, Feb 2005.
2. Hasari Celebi,Huseyin Arslan, "EnablingLocationand Environment Awareness in CognitiveRadios",ElsevierComputerCommunications, Jan 2008.
3. Markus Dillinger, KambizMadani,Nancy Alonistioti, "SoftwareDefined Radio",JohnWiley,2003.
4. Huseyin Arslan,"Cognitive Radio,SDR andAdaptive System", Springer, 2007.
5. AlexanderM.Wyglinski, Maziarnekovee,Y. Thomas Hu, "Cognitive Radio Communicationand Networks",Elsevier, 2010.

BEC002 INTEGRATED SERVICES DIGITAL NETWORK L T P C

3 0 0 3

Course Objectives:

- To Study basic concepts of ISDN standards and services.
- To develop knowledge in ISDN protocol Architecture and Signaling.
- To Study concepts of Broad band ISDN
- To Empower knowledge in Network Traffic Management.
- To have knowledge in Network performance Modeling and Estimation

Course Outcomes:

Students can develop their skills in

- basics of ISDN,
- Protocals involved in ISDN
- Broad Band ISDN
- Network Management

- To Estimate the Network Performance

	CO/PO Mapping (S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak											
	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO`12
CO1		M			S							S
CO2		M	M	M	S							S
CO3												S
CO4		S	S	M							M	S
CO5	S	S									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 Examinations		

UNIT I ISDN – STANDARDS AND SERVICES: 9

Review of switching technologies and OSI protocol architecture, ISDN channels, access interfaces, functional devices and standards, ISDN bearer services and teleservice attribute, Broadband services.

UNIT II ISDN PROTOCOL ARCHITECTURE AND SIGNALI NG 9

Physical layer protocol, D-channel datalink layer and layer 3 protocols, Network signaling systems, SS7 protocol overview and services, ISDN products, Switches, Multiplexers, Terminal adapters, ISDN chip sets.

UNIT III BROAD BAND ISDN 9

Frame Relay – concepts, protocols, applications and products, asynchronous transfer mode – concepts, protocols, application and products, switched multi megabit data service, Internet protocol over ISDN frame relay and ATM.

UNIT IV NETWORK TRAFFIC MANAGEMENT 9ATM traffic and congestion control, Traffic management framework, control mechanism and attributes, ABR traffic management

UNIT V NETWORK PERFORMANCE MODELING AND ESTIMATION 9

Queueing analysis, single server and multi server queues, Networks of Queues, Estimating model parameters, Self-similar traffic – performance implication, modeling and estimation

Total: 60 Periods

Text Books:

1.Gary C. Kesslar and Peter Southwick, "ISDN – concepts, facilities and services", McGraw Hill, 3rd Edition, 1997.

2.William Stallings, "High Speed Networks-TCP/IP and ATM Design Principles", Prentice Hall Inc., 1998.

References:

1. William Stallings , "High-Speed Networks and Internets: Performance and quality of Service" (2nd Edition) , 2002

2..Balaji Kumar, "Broad Band Communications" McGraw-Hill, 1995

BEC003 SATELLITE COMMUNICATION SYSTEMS L T P C
3 0 0 3

CourseObjectives:

- Toenable thestudent tobecome familiar with satellites andsatelliteservices.
- Studyof satellite orbits and launching.
- Studyof earth segment and spacesegment components
- Studyof satellite accessbyvarious users.
- Studyof DTHand compression standards

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Defineorbital mechanicsand launch methodologies

CO2: Describesatellite subsystems

CO3: Design link power budget forsatellites **CO4:** Compare competitive satelliteservices **CO5:** Explain satellite access techniques

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

UNIT I INTRODUCTION 9

Introduction, Types – Active and Passive Satellite, Frequency allocation, Satellite orbits,Kepler's laws, Definitions of terms for earth-orbiting Satellites, Apogee and Perigee heights, Orbit Perturbations,Geo stationary orbit, Antenna look angles, Limits of visibility, Earth Eclipse of Satellite, Sun transit outage, launching orbits.

UNIT II THE SPACE SEGMENT 9

Introduction, The Power supply, Attitude control, Spinning satellite stabilization, Momentum Wheel Stabilization, Station keeping,Thrmal control,TT&C subsustem,Transponders,The Wide Band receiver, The Input Demultiplexer,The Power Amplifier, The Antenna subsystem.

UNIT III THE EARTH SEGMENT AND ANTENNAS 9

Transmit receive earth station subsystems, up-converters-High Power Amplifier-Receive chain-LNA&LNB.TVRO earth station, The isotropic radiator and antenna gain, Horn antenna,TheParabolic reflector, Double reflector antenna-Cassie grain antenna-Gregorian antenna.

UNIT IV THE SPACE LINK & SATELLITE ACCESS 9

EIRP, Transmission losses The Link budget equation, System noise, Effects of rain, up link and down link C/N ratio. Multiple access techniques-Concepts and types of TDMA, FDMA and CDMA-Comparison and contrast of TDMA, FDMAand CDMA.

UNIT V SATELLITE APPPLICATIONS 9

Satellite Mobile services, DBS, VSAT, Remote sensing, GPS, INTELSAT, INMARSAT, SARSAT, Video Conferencing and Internet connectivity

Total : 45 Periods

TEXTBOOK:

1.DennisRoddy, "Satellite Communication", 4th Edition,Mc GrawHill International,2006.

REFERENCES:

1. Wilbur L.Pritchard, Hendri G.Suyderhoud,Robert A.Nelson, "Satellite CommunicationSystemsEngineering",PrenticeHall/Pearson, 2007.
2. N.Agarwal,"Designof GeosynchronousSpace Craft",Prentice Hall,1986.
3. BruceR.Elbert,"TheSatelliteCommunicationApplications",HandBook,ArtechHouseBostan London,1997.
4. TriT. Ha, "Digital Satellite Communication", IIndedition,1990.
5. Emanuel Fthenakis, "Manual ofSatellite Communications", Mc GrawHill BookCo.,1984.
6. Robert G.Winch, "Telecommunication TransMissionSystems",McGraw-Hill BookCo., 1983.
7. BrianAckroyd,"WorldSatelliteCommunicationandearthstationDesign",BSPprofessional Books,1990.
8. G.B.Bleazard,"IntroducingSatellite communications", NCC Publication,1985

BEC004 ROBOTICS&AUTOMATION L T P C
3 0 0 3

CourseObjectives:

- To studythe various parts of robots and fields of robotics.
- To studythe various kinematics and inversekinematics of robots.
- To studythe Euler,Lagrangian formulation ofRobot dynamics.
- To studythe trajectoryplanningfor robot.
- To studythe control of robots forsomespecific applications.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Explain the basic concepts Asimov's laws of robotics of workingof robot

CO2: Analyzethefunction ofsensors in the robot

CO3: Write program to usearobot foratypical application

CO4: UseRobots in different applications.

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

CourseAssessmentmethods:

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 Examinations		

UNIT I BASIC CONCEPTS 9

Definition and origin of robotics – various generations of robots - Asimov's laws of robotics - robot anatomy – robot configuration, robot motions and degrees of freedom –control system of a robot - types of robot control – performance measures – stability, resolution, accuracy, repeatability and compliance of robot

UNIT II SENSORS AND MACHINE VISION9

Requirements of a sensor, Principles and Applications of the tactile sensors – touch sensors, force and torque sensors – non tactile sensors – light/ fiber optic sensor, laser sensor, acoustic, magnetic sensor – machine vision: model, sensing and digitizing, image processing and analysis, applications of machine vision in robotics.

UNIT III DRIVES, MANIPULATORS AND GRIPPERS 9

Hydraulic, pneumatic and electric drive systems – gears – Construction of manipulators – manipulator dynamics and force control – grippers – mechanical, vacuum and magnetic grippers design considerations.

UNIT IV KINEMATICS AND PROGRAMMING 9

Robot kinematics and Solution of inverse kinematics problem - Robot programming methods – lead through programming method: program as path in space, commands, program for pick and place operation – textual programming method: language structure, elements and functions languages

UNIT V CASE STUDIES 9

Multiple robots and machine interface – robot cell layout/ work cell, work cell design consideration, work cell controller – Robots in manufacturing applications, robots in non-manufacturing applications - selection of robot.

Total: 45 Periods

Text Books:

1. M.P.Groover, Mitchell Weiss, R.N Nagel, N.G Odrey, "Industrial Robotics – Technology, Programming and Applications",McGraw-Hill, 2008
2. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.

References:

1. Deb.S.R., Robotics technology and flexible Automation, John Wiley, USA 1992.
2. Asfahl C.R., Robots and manufacturing Automation, John Wiley, USA 1992.
3. Klafter R.D., Chimielewski T.A., Negin M., Robotic Engineering – An integrated approach, Prentice Hall of India, New Delhi, 1994.
4. Mc Kerrow P.J. Introduction to Robotics, Addison Wesley, USA, 1991.

BEC 005 BLUE TOOTH TECHNOLOGY L T P C
3 0 0 3

Course Objectives:

- To study the fundamental concepts of Bluetooth module.
- To analyze the protocol operation.
- To gain knowledge on various low power modes and Quality of Service parameters.
- To understand the security issues.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Understand Bluetooth's standards, architecture and operation.

CO2: Understand the APIs, radio interface and protocol layers used by Bluetooth.

CO3: Configure Bluetooth-enabled devices including mobile phones, PDAs and Access Points.

CO4: Install and configure Bluetooth hardware and software.

CO5: Configure LAN access, remote access and FAX gateway access point solutions using Bluetooth.

CO6: Understand and configure Bluetooth security and application level security.

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

CourseAssessmentmethods:

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 Examinations		

UNIT – I **9**

Basic Concepts: Origin, Blue tooth SIG, Protocol Stack, Security, applications and Profiles, Management, Test and qualification Technology Basics. RF and IR Wireless Communication.

UNIT – II **9**

Bluetooth Module: Antennas Patterns, Gain and losses; Types of antennas: on chip antennas Radio interface: FH, Modulation, symbol timing, power emission and control, Performance Parameters, RF architecture, Blur RF, Base band:- Blue tooth Device address system Timing ,Physical links , Packet, structuring types and construction, channel coding and time base synchronization.

UNIT – III **9**

Link controller and management: LCP, controller states, Pico net and scattered operations, Master/Slave Role switching LC Architectural Overview, LMC< Link set up, Quality of service, LMP version, Name Represent, Test Mode.

UNIT – IV 9

Bluetooth host: L LC and adaptation Protocol L2cap signalling: Connections: Blue Tooth profiles; Version 1.0; Generic Profiles, Serial and Object exchange.

UNIT – V **9**

Security: Encryption and security Key generation, security Modes and architecture, Low power Operation and QOS Management.

Total : 45 Periods

Text Books:

1.Blue tooth Connect without cables Jennifer Bray and c.f. stuntman Pearson Education 2001.

References:

1.Blue Tooth Reveeled: Brent A. Miller and C.Bisdikian, Pearson Education 2001.
2.Bluetooth Demystified Nathan J.Miller Tata Mc Graw Hill 2001

BEC 006 MEDICAL ELECTRONICSL T P C

3 0 0 3

CourseObjectives:

- TounderstandthebasicPhysiologyof-Nervoussystem,Circulatorysystem,Respiratory system and Urinarysystem.
- Tounderstandtheconceptofactionpotential,electrodetheoryanddifferentbiopotential characteristics andrecordingmethods.
- To studyvarious computer aided devices for biomedical applications.
- To studyand understandbasics ofbiotelemetrysystems.
- To studythe useof physiologicalassist devices.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Explain the basic Physiologyof-Nervous system,Circulatorysystem, Respiratorysystem and Urinarysystem.

CO2: Describethe concept of action potential, electrodetheoryand various bioelectric potentials generated in human bodyand relatedequipments.

CO3: Interpret various computer aided devices for biomedical applications.

CO4: Discuss concepts of biotelemetrysystems.

CO5: Discuss working and useofphysiologicalassist devices.

	CO/PO Mapping (S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak											
COs	ProgrammeOutcomes(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						
CO4	S	M	M	M								
CO5	S	S		M								

CourseAssessmentmethods:

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 Examinations		

UNIT I PHYSIOLOGY AND TRANSDUCERS 9

Cell and its structure – Action and resting – Potential propagation of action potential – Sodium pump – Nervous system – CNS – PNS – Nerve cell – Synapse – Cardio pulmonary system – Physiology of heart and lungs – Circulation and respiration – Transducers – Different types – Piezo–electric, ultrasonic, resistive, capacitive,inductive transducers – selection criteria.

UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENTS 9

Basic components of a biomedical system – Electrodes – Micro, needle and surface electrodes – Amplifiers – Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier.
ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms.

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENTS 9

Measurement of blood pressure – Cardiac output – Cardiac rate – Heart sound – Respiratory rate – Gas volume – Flow rate of Co2, O2 in exhaust air - pH of blood, ESR, GSR measurements – Plethysmography.

UNIT IV MEDICAL IMAGING AND PMS 9

X-ray machine - Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Electrical safety.

UNIT V ASSISTING AND THERAPEUTIC EQUIPMENTS 9

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy –
Heart – Lung machine – Audio meters – Dializers.

Total: 45Periods

Textbooks:

1. LeslieCromwell,"BiomedicalInstrumentationandMeasurement",PrenticeHallofIndia,New Delhi,2007.
2. JohnG.Webster,"MedicalInstrumentationApplicationandDesign",3rd Edition,WileyIndia Edition,2007

References:

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA Mc Graw-Hill, New Delhi,2003.
2. JosephJ.CarrandJohn M.Brown, "Introduction to Biomedical Equipment Technology",John Wiley and Sons, New York, 2004

BEC007 DIGITAL IMAGE PROCESSING L T P C

3 0 0 3

CourseObjectives:

- To studythe imagefundamentalsand mathematical transforms necessaryfor image processing.
- To studythe imageenhancement techniques
- To studyimagerestoration procedures.
- To studythe imagecompression procedures.
- To studythe imagesegmentation and representation techniques.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Reviewthe fundamentalconcepts ofadigital imageprocessingsystem **CO2:** Analyzeimages in the frequencydomain usingvarious transforms

CO3: Evaluatethe techniques forimage enhancementand imagerestoration.

CO4: Categorizevarious compression techniques.

CO5: InterpretImagecompression standards

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

UNIT I DIGITAL IMAGE FUNDAMENTAL 9

Elements of digital image processing systems, Elements of Visual perception, Image sampling and quantization, Matrix and Singular Value representation of discrete images.

UNIT II IMAGE TRANSFORMS 9

1D DFT, 2D DFT, Cosine, Sine Hadamard, Hear, Slant, KL, SVD transform and their properties.

UNIT III IMAGE ENHANCEMENT 9

Histogram – Modification and specification techniques Image smoothing, Image sharpening, generation of spatial masks from frequency domain specification, Nonlinear filters, Homomorphism filtering, false color, Pseudo color and color image processing.

UNIT IV IMAGE RESTORATION AND RECOGNITION 9

Image DEGRADATION models, Unconstrained and Constrained restoration, inverse filtering, Least mean square filter, Pattern Classes, optimal statistical classifiers, Neural networks and associated training methods and use of neural networks in image processing.

UNIT V IMAGE COMPRESSION 9

Run length, Huffman coding, Shift codes, arithmetic coding, bit plane coding, transform coding, JPEG Standard, wavelet transform, predictive techniques, Block truncation coding schemes, Facet modeling.

Total : 45 Periods

TEXTBOOK:

1. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010

REFERENCES:

1.Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.
3. Willliam K Pratt, "Digital Image Processing", John Willey, 2002.
4. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2

BEC008 MEMS AND NEMS

L	T	P	C
3	0	0	3

Course Objectives:

The student should be made to:

- Have a concept on the scope and recent development of the science and technology of micro- and nano-systems;
- Gain the physical knowledge underlying the operation principles and design of micro- and nano-systems;

- Gain the technical knowledge required for computer-aided design, fabrication, analysis and characterization of nano-structured materials, micro- and nano-scale devices;
- Learn some typical or potentially applicable micro- and nano-systems at the frontier of the development of the field;
- Gain experience on characterization and fabrication of some micro- and nano-systems.

Course Outcomes:

Upon completion of the course, students will be able to

CO1: Ability to understand the operation of micro devices, micro systems and their applications.
CO2: Ability to design the micro devices, micro systems using the MEMS fabrication process.
CO3: Gain a knowledge of basic approaches for various sensor design
CO4: Gain a knowledge of basic approaches for various actuator design
CO5: Develop experience on micro/nanosystems for photonics and optical applications

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

UNIT I OVERVIEW AND INTRODUCTION 9

New trends in Engineering and Science: Micro and Nanoscale systems Introduction to Design of MEMS and NEMS, Overview of Nano and Microelectromechanical Systems, Applications of Micro and Nanoelectromechanical systems, Microelectromechanical systems, devices and structures Definitions, Materials for MEMS: Silicon, silicon compounds, polymers, metals

UNIT II MEMS FABRICATION TECHNOLOGIES 9

Microsystem fabrication processes: Photolithography, Ion Implantation, Diffusion, Oxidation.Thin film depositions: LPCVD, Sputtering, Evaporation, Electroplating; Etching

techniques: Dry and wet etching, electrochemical etching; Micromachining: Bulk Micromachining, Surface Micromachining, High Aspect-Ratio (LIGA and LIGA-like) Technology; Packaging: Microsystems packaging, Essential packaging technologies, Selection of packaging materials

UNIT III MICRO SENSORS **9**

MEMS Sensors: Design of Acoustic wave sensors, resonant sensor, Vibratory gyroscope, Capacitive and Piezo Resistive Pressure sensors- engineering mechanics behind these Microsensors. Case study: Piezo-resistive pressure sensor

UNIT IV MICRO ACTUATORS **9**

Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces (Parallel plate, Torsion bar, Comb drive actuators), Micromechanical Motors and pumps. Case study: Comb drive actuators

UNITV NANOSYSTEMS AND QUANTUM MECHANICS **9**

Atomic Structures and Quantum Mechanics, Molecular and Nanostructure Dynamics: Shrodinger Equation and Wavefunction Theory, Density Functional Theory, Nanostructures and Molecular Dynamics, Electromagnetic Fields and their quantization, Molecular Wires and Molecular Circuits.

Total : 45 Periods

TEXT BOOKS:

1. Marc Madou, "Fundamentals of Microfabrication", CRC press 1997.
2. Stephen D. Senturia," Micro system Design", Kluwer Academic Publishers,2001
3. Tai Ran Hsu ,"MEMS and Microsystems Design and Manufacture" ,Tata Mcraw Hill, 2002.
4. Chang Liu, "Foundations of MEMS", Pearson education India limited, 2006.

BEC009 RADAR AND NAVIGATIONAL AIDS **L T P C**
3 0 0 3

CourseObjectives:

- To derive and discuss theRangeequation and thenatureof detection
- To detect movingtargetsand cluster.
- To understand trackingradars, principles of navigation and landing aids asrelated to navigation

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Analyzevarious types ofradarequipment.

CO2: Describeoperation ofMovingTargetIndicator and pulseDoppler radar

CO3: Analyzefeatures of Radar transmitters andreceivers

CO4: Distinguish different navigation systems

CO5: CompareNavigation aidsfordirection findingandrangeof travel ofaircrafts

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

UNIT 1. RANGE AND EQUATION AND TYPES OF RADAR: 9

Range parameters, pulsed radars, signal to noise ratio, integration of pluses beam parameters, system losses and propagation effects MTI, CW and pulse-Doppler radar, Delay lines tracking radar, monopulse, sequential, simultaneous, conical scan and monopulse trackers, Beacons.

UNIT2. TRANSMITTERS, RECEIVERS AND ANTENNAS: 9

Klystron, Magnetron, TWT amplifiers and ascillators, crossed fields devices, parabolic cassegrainian, coefficient squares antennas, Radomes, feeds, receivers, performance figures, Displays scope and PPI duplexers.

UNIT3.DETECTION OF RADAR SIGNALS IN NOISE: 9

MF, correlation detection, detector characteristics, automatic detection, CFAR receiver, pulse compression and classification of targets with Radar.

UNIT4. PROPAGATION OF RADAR WAVES AND CLUTTER: 9

Plane earth and spherical earth problem , Refraction and diffraction, GTD Analysers, Surface and Sea Clutter, Detection of targets, effects of weather on radar

UNIT5. RADAR TOPICS AND NAVIGATIONAL AIDS: 9

Synthetic Aperture, Over the Horizon radar, ARSR, ASR, Bistatic and monostatic radars, LORAN, ILS, GCA, direction finder, VOR concepts, airborne droppler navigation.

Total: 45 Periods

Textbooks:

1.Merrill I. Skolnik," Introduction toRadar Systems",3rdEditionTataMc Graw-Hill 2003.
2.N.S.Nagaraja, "ElementsofElectronicNavigationSystems", 2ndEdition, TMH,2000.

References:

1.PeytonZ.Peebles:,"RadarPrinciples", JohnWiley,2004
2.J.CToomay," PrinciplesofRadar", 2nd Edition–PHI,2004

BEC010 MOBILE ADHOC NETWORKS L T P C
3 0 0 3

Course Objectives:

- Knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
- Knowledge of routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid.
- Knowledge of clustering mechanisms and the different schemes that have been employed, e.g., hierarchical, flat, and leaderless.
- Knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards. This includes their designs, operations, plus approaches to interoperability.
- Knowledge of sensor networks and their characteristics. This includes design of MAC layer protocols, understanding of power management, query processing, and sensor databases.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Describe the unique issues in ad-hoc/sensor networks.
CO2: Describe current technology trends for the implementation and deployment of wireless ad-hoc/sensor networks.
CO3: Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc/sensor networks.
CO4: Discuss the challenges in designing routing and transport protocols for wireless Ad-hoc/sensor networks.
CO5: Comprehend the various sensor network Platforms, tools and applications.

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

CourseAssessmentmethods:

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 Examinations		

UNIT I INTRODUCTION **9** Introduction to adhoc networks – definition, characteristics features, applications. Charectristics of Wireless channel, Adhoc Mobility Models:- Indoor and out door models.

UNIT II MEDIUM ACCESS PROTOCOLS **9**

MAC Protocols: design issues, goals and classification. Contention based protocols- with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT III NETWORK PROTOCOLS **9**

Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Energy aware routing algorithm, Hierarchical Routing, QoS aware routing.

UNIT IV END-END DELIVERY AND SECURITY **9**

Transport layer : Issues in desiging- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols**.**

UNIT V CROSS LAYER DESIGN AND INTEGRATION OF ADHOC FOR 4G **9**

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary prespective. Intergration of adhoc with Mobile IP networks.

TOTAL: 45 PERIODS

Text Books:

1. C.Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and protocols,

2.Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000nd edition, Pearson Education. 2007 .

References:

1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobilead hoc networking, Wiley-IEEE press, 2004.

2. Mohammad Ilyas, The handbook of adhoc wireless networks, CRC press, 2002.
3. T. Camp, J. Boleng, and V. Davies "A Survey of Mobility Models for Ad Hoc Network Research," Wireless Commun. and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2, no. 5, 2002, pp. 483–502
4. A survey of integrating IP mobility protocols and Mobile Ad hoc networks, Fekri M.Abduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, v 9.no.12007
5. V.T.Raisinhani and S.Iyer "Cross layer design optimization in wireless protocol stacks"Comp. communication, vol 27 no. 8, 2004.

BEC011 REMOTE SENSING L T P C
3 0 0 3

CourseObjectives:

- To understand the basic concepts of remote sensing.
- To understand the EMR interaction with atmosphere.
- To understand the techniques in optical and microwave remote sensing.
- To understand the applications of remote sensing in various fields.
- To provide exposure to students in gaining knowledge on concepts and applications leading to modeling of earth resources management using Remote Sensing
- To acquire skills in storing, managing digital data for planning and development.
- To acquire skills in advance techniques such as hyper spectral, thermal and LiDAR scanning for mapping, modeling and monitoring.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Fully equipped with concepts, methodologies and applications of Remote Sensing Technology.

CO2: Prepare the candidates for National and Global Employability

CO3: Acquire skills in handling instruments, tools, techniques and modeling while using Remote Sensing Technology

CO4: It empowers the candidate with confidence and leadership qualities.

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

COs	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	W									
CO2	M	M	W									
CO3		S	M									
CO4			M	S								

CourseAssessmentmethods:

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 Examinations		

UNIT I- REMOTE SENSING 9

Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body – Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra Red (IR), Near IR, Middle IR, Thermal IR and Microwave – Black Body Radiation - Planck's law – Stefan-Boltzman law.

UNIT II- EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS 9

Atmospheric characteristics – Scattering of EMR – Raleigh, Mie, Non-selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Materials – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy – Reflectance – Specular and Diffuse Reflection Surfaces- Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface:Imaging spectrometry and spectral characteristics.

UNIT III OPTICAL AND MICROWAVE REMOTE SENSING 9

Satellites - Classification – Based on Orbits and Purpose – Satellite Sensors - Resolution – Description of Multi Spectral Scanning – Along and Across Track Scanners– Description of Sensors in Landsat, SPOT, IRS series – Current Satellites - Radar –Speckle - Back Scattering – Side Looking Airborne Radar – Synthetic Aperture Radar –Radiometer – Geometrical characteristics ; Sonar remote sensing systems.

UNIT IV GEOGRAPHIC INFORMATION SYSTEM 9

GIS – Components of GIS – Hardware, Software and Organisational Context – Data –Spatial and Non-Spatial – Maps – Types of Maps – Projection – Types of Projection -Data Input – Digitizer, Scanner – Editing – Raster and Vector data structures –Comparison of Raster and Vector data structure – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters

UNIT V MISCELLANEOUS TOPICS 9

Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys Characteristics of Digital Satellite Image – Image enhancement – Filtering –Classification - Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Urban Applications- Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Water resources – Urban Analysis – Watershed Management – Resources Information Systems. Global positioning system – an introduction

Total: 45 Periods

TEXT BOOKS:

1. Jensen, J.R., 2000. Remote sensing of the environment: An earth resource perspective, Prentice Hall, Upper saddle river, NJ,

2. Joseph, George, (2003), Fundamental of Remote Sensing, University Press (India) Pvt. Ltd, Orient Longman Pte. Ltd., Hyderabad, India

3. Lillesand, T.M. and Kieffer, R.W., 2003. Remote Sensing and Image Interpretation, 5th Edition., Wiley, New York

4. Panda, B. C., 2008. Remote Sensing: Principles and Applications, Viva Books Private Limited, India

BEC012 CRYPTOGRAPHY AND NETWORK SECURITY L T P C
3 0 0 3

CourseObjectives:

- To know about various encryption techniques.
- To understand the concept of Publickeycryptography.
- To studyabout messageauthentication and hashfunctions
- To impart knowledgeonNetworksecurity
- To learn thebasic concepts of system level security

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Classifythe symmetric encryption techniques.

CO2: Illustrate various Publickeycryptographic techniques.

CO3: Evaluatethe authentication and hash algorithms.

CO4: Discuss authentication applications

CO5: Summarizethe intrusiondetection and its solutions to overcome theattacks.

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

CourseAssessmentmethods:

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 Examinations		

UNIT I INTRODUCTION 9

OSI Security Architecture - Classical Encryption techniques – Cipher Principles – Data Encryption Standard – Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES – AES Cipher – Triple DES – Placement of Encryption Function – Traffic Confidentiality

UNIT II PUBLIC KEY CRYPTOGRAPHY 9

Key Management - Diffie-Hellman key Exchange – Elliptic Curve Architecture and Cryptography - Introduction to Number Theory – Confidentiality using Symmetric Encryption – Public Key Cryptography and RSA.

UNIT III AUTHENTICATION AND HASH FUNCTION 9

Authentication requirements – Authentication functions – Message Authentication Codes – Hash Functions – Security of Hash Functions and MACs – MD5 message Digest algorithm - Secure Hash Algorithm – RIPEMD – HMAC Digital Signatures – Authentication Protocols – Digital Signature Standard.

UNIT IV NETWORK SECURITY 9

Authentication Applications: Kerberos – X.509 Authentication Service – Electronic Mail Security – PGP – S/MIME – IP Security – Web Security.

UNIT V SYSTEM LEVEL SECURITY 9

Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems.

Total: 45 Periods

TextBooks:

1. WilliamStallings,CryptographyandNetworkSecurity,6th Edition,Pearson Education,March 2013.
2.CharlieKaufman,RadiaPerlmanandMikeSpeciner,"NetworkSecurity",Prentice HallofIndia,2002.

References:

1. BehrouzA.Ferouzan, "Cryptography&NetworkSecurity",TataMc GrawHill,2007.
2. Charles Pfleeger, "Security in Computing",4th Edition,Prentice Hall ofIndia,2006.
3. Ulysess Black, "InternetSecurity Protocols", PearsonEducationAsia,2000.
4. Charlie Kaufmanand Radia Perlman, Mike Speciner, "NetworkSecurity,SecondEdition,Private Communicationin PublicWorld", PHI2002.
5. BruceSchneierand NeilsFerguson, "Practical Cryptography", FirstEdition,WileyDream tech India PvtLtd, 2003.

BEC013AUTOMOTIVE ELECTRONICS **L T P C**

3 0 0 3

CourseObjectives:

- ToprovideAutomotiveElectronicsrelateddomainexposureandtoestablishalearning platformfor embeddedsystemdevelopmentenvironmentwiththeapplicationof engineeringaspects in the development lifecycleofprojects forautomobiles.

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Describevarious electrical and electronicsystemsin automobile.
CO2: Discuss embedded system usingRISC processor.
CO3: Applyconcepts for Embedded System development. **CO4:** Interpret different controlsystem modules.
CO5: Explain embedded system communication protocols in automobiles

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong,M-Medium, W-Weak

COs	ProgrammeOutcomes(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		M								
CO5		S	M	M								

CourseAssessmentmethods:

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 Examinations		

AUTOMOBILEELECTRICALSANDELECTRONICS 08

BasicElectricalComponentsandtheiroperationinanautomobile- Startingsystems,Charging systems–ignitionsystems- Electronicfuelcontrol-Environmentallegislationforpollution-Overviewof vehicle electronic systems-Power trainsubsystem-chassissubsystem-comfortand safetysubsystems.

INTRODUCTIONTOEMBEDDEDSYSTEMS 08

Embedded Systemsdefinition- Components ofEmbeddedsystems–Microprocessor-ClassificationofMicroprocessors-Microcontrollers-Memory -Peripherals.Introductiontoan embeddedboard(TMS470based/ARM9based)forhandsonlabsessions(RISCprocessor based with standard peripherals /interfacesandI/Os)

OPERATINGSYSTEMINEMBEDDEDENVIRONMENT 07

IntroductiontoOS- General Purpose OS,RTOS-,Kernel- Pre-emptive&Non pre-emptive, Scheduler,Interrupt-Interruptlatency andContextSwitchLatency-BoardSupportpackage, Task-Multi-tasking,Tasksynchronization,Inter-task communication,Featuresof a typical embedded RTOS(μC/OS-II)

INTEGRATEDDEVELOPMENTENVIRONMENT 08

IntegratedDevelopmentEnvironment(IDE)- Getting Started,Hardware/Software Configuration (Boot Service, Host– TargetInteraction),Booting, Reconfiguration, Managing IDE,TargetServers,Agents,Cross–Development,debugging-IntroductiontoanIDEforthe lab board–RTOS, PC based debugger.

EMBEDDEDSYSTEMINAUTOMOTIVEAPPLICATIONS 10

Engine Managementsystems- Diesel/Gasoline systems,Varioussensors used insystem-Vehiclesafety systems-electroniccontrolofbrakingandtraction-Introductiontocontrol elementsandcontrolmethodology-Electronictransmissioncontrol-Body electronics-Infotainmentsystems–Navigationsystems- system leveltests–Softwarecalibration using engine and vehicle dynamometers-Environmental tests for electroniccontrol units.

EMBEDDEDSYSTEMCOMMUNICATIONPROTOCOLS 04

Introduction toControl networking- Communication protocols inembedded systems-SPI,I^2C, USB, -Vehiclecommunication protocols – Introduction to CAN, LIN, FLEXRAY, MOST, KWP2000-Details of CAN

REFERENCES:

1. R.K. Jurgen,–Automotive electronics handbook‖McGrawHillProfessional,1999
2. Paul Pop, Petru Eles, Zebo Peng –Analysis and Synthesis of Distributed Real-TimeEmbedded Systems‖Springer,21-Dec-2004
3. B.KantaRao–Embedded Systems‖PHILearning Pvt.Ltd.2011

BEC014 EMBEDDED SYSTEM L T P C

3 0 0 3

Course Objectives:

The studentshould bemadeto:

- Learnthe basics of hardware units in embedded system and system on chip..
- Befamiliarwith theembedded computingplatformdesignand analysis.
- Be exposed tothebasicconceptsofrealtimeOperatingsystem.
- Learnthesystemdesigntechniquesand networks forembeddedsystems

Course Outcomes:

Upon completionofthe course, studentswill be ableto:

- Outlinetheconceptsofembeddedsystems
- Explain thebasicconceptsof real timeOperatingsystemdesign.
- Use thesystemdesign techniquestodevelopsoftwareforembeddedsystems
- Differentiate between the general purpose operating system and the real time operating system
- Model real-timeapplications usingembedded-systemconcepts

CO/PO Mapping

(S/M/Windicates strength of correlation) S-Strong, M-Medium, W-Weak

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

CourseAssessmentmethods:

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 Examinations		

UNIT - 1 : INTRODUCTION TO EMBEDDED SYSTEMS 9

Definition and Classification - Overview of Processors and hardware units in an embedded system - Software embedded into the system - Exemplary Embedded Systems - Embedded Systems on a Chip (SOC) and the use of VLSI designed circuits.

UNIT - 2 : DEVICES AND BUSES FOR DEVICES NETWORK 9

I/O Devices - Device I/O Types and Examples - Synchronous - Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices - UART and HDLC - Parallel Port Devices - Sophisticated interfacing features in Devices/Ports- Timer and Counting Devices - '12C', 'USB', 'CAN' and advanced I/O Serial high speed buses- ISA, PCI, PCI-X, Cpci and advanced buses.

UNIT - 3 : PROGRAMMING CONCEPTS AND EMBEDDED PROGRAMMING IN C, C++ 9

Programming in assembly language (ALP) vs. High Level Language - 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 - Cross compiler - Optimization of memory codes.

UNIT - 4 : REAL TIME OPERATING SYSTEMS - PART - 19

Definitions of process, tasks and threads - Clear cut distinction between functions - ISRs and tasks by their characteristics - Operating System Services- Goals - Structures- Kernel - Process Management - Memory Management - Device Management - File System Organisation and Implementation - I/O Subsystems - Interrupt Routines Handling in RTOS, REAL TIME OPERATING SYSTEMS : RTOS Task scheduling models - Handling of task scheduling and latency and deadlines as performance metrics - Co-operative Round Robin Scheduling - Cyclic Scheduling with Time Slicing (Rate Monotonics Co-operative Scheduling) - Preemptive Scheduling Model strategy by a Scheduler - Critical Section Service by a Preemptive Scheduler - Fixed (Static) Real time scheduling of tasks - INTER PROCESS COMMUNICATION AND SYNCHRONISATION - Shared data problem - Use of Semaphore(s) - Priority Inversion Problem and Deadlock Situations - Inter Process Communications using Signals - Semaphore Flag or mutex as Resource key - Message Queues - Mailboxes - Pipes - Virtual (Logical) Sockets - Remote Procedure Calls (RPCs).

UNIT - 5 : REAL TIME OPERATING SYSTEMS - PART - 2 **9**

Study of Micro C/OS-II or Vx Works or Any other popular RTOS - RTOS System Level Functions - Task Service Functions - Time Delay Functions - Memory Allocation Related Functions - Semaphore Related Functions - Mailbox Related Functions - Queue Related Functions - Case Studies of Programming with RTOS - Understanding Case Definition - Multiple Tasks and their functions - Creating a list of tasks – Functionsand IPCsExemplaryCodingSteps.

Total: 45 Periods

Text Books:

1. Wayne Wolf, "Computers as Components - Principles of Embedded Computer System Design", Morgan Kaufmann Publisher, 2006.

2.Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill, First reprint Oct. 2003

References:

1. Steve Heath, Embedded Systems Design, Second Edition-2003
2. David E-Simon, "An Embedded Software Primer", Pearson Education, 2007.
3. K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design &Programming", dreamtech press, 2005.
4Tim Wilmshurst, "An Introduction to the Design of Small Scale Embedded Systems", Pal grave Publisher, 2004.
5. Sriram V Iyer, Pankaj Gupta, "Embedded Real Time Systems Programming", TataMc-Graw Hill, 2004.
6. Tammy Noergaard, "Embedded Systems Architecture", Elsevier,2006.

BEC 015 ADVANCED COMPUTER ARCHITECTURE

L	T	P	C
3	0	0	3

CourseObjectives:

- To makestudents know about theParallelism concepts in Programming
- Togive thestudents an elaborate idea about thedifferent memorysystems and buses.
- To introducethe advanced processorarchitecturesto thestudents.
- To makethe students know about theimportanceofmultiprocessor and multicomputers.
- To studyabout data flow computer architectures

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto

CO1: Demonstrate concepts ofparallelism in rdware/software.

CO2: Discuss memoryorganization and mappingtechniques.

CO3: Describearchitectural features of advanced processors.

CO4: Interpret performanceofdifferent pipelined processors.

CO5: Explain data flow in arithmetic algorithms

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

CourseAssessmentmethods:

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 Examinations		

PARALLELCOMPUTERMODELS 9

EvolutionofComputerarchitecture,systemattributestoperformance,Multiprocessorsand multicomputers, Multi-vectorandSIMDcomputers, PRAMandVLSI models-Parallelismin Programming,conditionsfor Parallelism-ProgramPartitioning andScheduling-programflow Mechanisms-Speedupperformancelaws-Amdahl‘slaw,Gustafson‘slaw-Memory bounded speedup Model.

MEMORYSYSTEMSANDBUSES 9

Memory hierarchy-cacheandsharedmemory concepts-Cachememory organization-cache addressingmodels,Aliasingproblemincache,cachememory mappingtechniques-Shared memory organization-Interleavedmemory organization,Lowerorderinterleaving,Higherorder interleaving. Backplanebus systems-Bus addressing, arbitration and transaction.

ADVANCEDPROCESSORS 9

Instructionsetarchitectures-CISCandRISCscalar processors-Super scalar processors-VLIW architecture-MultivectorandSIMDcomputers-Vectorprocessingprinciples-Cray Y-MP816 system-Inter processorcommunication

MULTIPROCESSORANDMULTICOMPUTERS 9

Multiprocessor systeminterconnects- Cross barswitch, Multiport memory-Hotspotproblem, Message passing mechanisms-Pipelined processors-Linear pipeline, on linear pipeline-Instruction pipeline design-Arithmetic pipelinedesign.

DATAFLOWCOMPUTERSANDVLSICOMPUTATIONS 9

Dataflowcomputerarchitectures-Static,Dynamic-VLSI Computing Structures-Systolicarray architecture, mapping algorithmsinto systolicarrays,Reconfigurableprocessorarray-VLSI matrixarithmeticprocessors-VLSI arithmeticmodels,partitionedmatrixalgorithms,matrix arithmeticpipelines.

Total:45 Periods

REFERENCES:

1.Kai Hwang and F.A.Briggs,‖Computerarchitecture andparallel processor‖'McGraw Hill,N.Y, 1999

2.David A. Patterson and JohnL. Hennessey,–Computer organization and design‖ Elsevier,Fifthedition, 2014.

BEC 016	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 Examinations		

NATUREOFSPEECHSIGNAL **09**

Speechproductionmechanism,Classificationofspeech,sounds,natureofspeechsignal,models ofspeech production.
Speechsignalprocessing:purposeofspeechprocessing,digitalmodelsforspeechsignal,Digital processingof speech signals, Significance, short time analysis.

TIMEDOMAINMETHODSFORSPEECHPROCESSING **09**

Timedomainparametersofspeech,methodsforextractingtheparameters,Zerocrossings,Auto correlation function, pitch estimation.

FREQUENCYDOMAINMETHODSFORSPEECHPROCESSING **09**

ShorttimeFourieranalysis,filterbankanalysis,spectrographicanalysis,Formatextraction, pitch extraction, Analysis-synthesis systems.

LINEARPREDICTIVECODINGOFSPEECH **09**

Formulation of linear prediction problem in time domain, solution of normal equations, Interpretation oflinear prediction in auto correlation and spectral domains.

SPEECHANALYSISANDSYNTHESIS **09**

Cepstralanalysisofspeech,formantandpitchestimation,Applicationsofspeechprocessing- Speech recognition, Speech synthesisand speakerverification.

Total:45 Periods

REFERENCES:

1.L.R. Rabinerand R.E Schafer,–Digital processingof speech signals‖, Prentice Hall, 1993

2. L.R. Rabinerand Biling HwangJuang,–Fundamentals of Speech recognition‖, Pearson Education, 2003

3. J.LFlanagan,–SpeechAnalysisSynthesisandPerception‖-2nd Edition-SpringerVerlag, 1972.

4. I.H.Witten, –Principles ofComputer Speech‖,Academicpress, 1983.

5. ThomasF.Quateri,–Discrete-TimeSpeechProcessing–PrinciplesandPractice‖,Pearson Education, 2004.

BEC 017 **SOFT COMPUTING** **L T P C**

Course Objectives: **3 0 0 3**

- 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 Examinations		

INTRODUCTIONTOSOFTCOMPUTINGANDNEURALNETWORKS 9

Introduction - Soft computing constituents – From conventional AI to computationalintelligence –Evolutionarycomputation– Neuro-Fuzzyand soft computingcharacteristics

GENETICALGORITHMS 9

IntroductiontoGeneticAlgorithm(GA)–Goalsof optimization– Simple GA– Simulation– Important similarities-Applications of GA–RiseofGA-GAapplicationofhistorical interest– Improvements in basic technique-DeJong and function optimization

NEURALNETWORKS9

Adaptive networks–Backpropagationforfeed forwardnetworks–Batchlearning–Patternby patternlearning- Supervisedlearningneuralnetworks–Radialbasisfunctionnetworks– Unsupervisedlearningneuralnetworks– Competitivelearning network–Kohonenself organisingnetworks-Hebbian learning

FUZZYLOGIC 9

Fuzzysets–Settheoreticoperations–Fuzzyrulesandfuzzyreasoning–Extensionprinciple andfuzzyrelation– FuzzyIf-thenrules-Fuzzyinferencesystems–Mamdanifuzzy models– Sugeno fuzzymodels– Tsukamoto fuzzymodels

NEURO-FUZZYMODELING 9

Adaptiveneuro-fuzzyInferencesystems–Classificationandregressiontrees–Decisiontrees–CART algorithm fortreeinduction-Data clusteringalgorithms

Total:45 Periods

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-HallofIndia, 2003.

2. DavidE.Goldberg,–GeneticAlgorithmsinSearch,Optimization andMachine Learning‖,Singapore: Addison Wesley, 2001.
3. JamesA.FreemanandDavidM.Skapura,–NeuralNetworksAlgorithms,Applications, and ProgrammingTechniques‖.New Delhi: Pearson Education, 2003.
4. MitchellMelanie,–An IntroductiontoGeneticAlgorithm‖. NewDelhi:Prentice Hall,1998.
5. GeorgeJ.KlirandBoYuan,–Fuzzy SetsandFuzzyLogic-Theoryand Applications‖New Delhi: PHI1995.
6. JacekM.Zurada,‖Introduction toArtificialNeuralSystems‖. Boston:PWS Publishers,1992.

BEC 018 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						M	M		M		S	S
CO2						M	M		S		S	S
CO3						M	M				S	S
CO4						M	M				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 Examinations		

INTRODUCTION 09

DefinitionofQuality,DimensionsofQuality,Quality costs,TopManagementCommitment, Quality Council,QualityStatements,BarrierstoTQMImplementation, Contributionsof Deming, Juran and Crosby,Team Balancing

TQMPRINCIPLES09

Customer satisfaction–Customer PerceptionofQuality,CustomerComplaints, ServiceQuality, Customer Retention, Continuous ProcessImprovement,5S, Kaizen, Just-In-Time and TPS

STATISTICALPROCESSCONTROL 09

Theseventoolsofquality,NewsevenManagementtools,StatisticalFundamentals–Measures ofcentralTendency andDispersion,PopulationandSample,NormalCurve,ControlChartsfor variables andattributes,Concept of sixsigma.

TQMTOOLS 09

Quality Policy Deployment(QPD),QualityFunctionDeployment(QFD),Benchmarking, Taguchi Quality Loss Function, Total ProductiveMaintenance(TPM), FMEA

QUALITYSYSTEMS 09

NeedforISO9000andOtherQuality Systems,ISO9001:2008QualitySystem–Elements, Implementation ofQualitySystem, Documentation, QualityAuditing,ISO14001:2004

Total:45 Periods

REFERENCES:

1. Dale H.Besterfiled,–Total QualityManagement‖,Pearson Education
2. JamesR.Evans&WilliamM.Lidsay,–The ManagementandControlofQuality‖, South- Western (ThomsonLearning), 2008.
3. Feigenbaum.A.V. –TotalQualityManagement‖,McGrawhill
4. Oakland.J.S. –Total QualityManagement‖,Butterworth– Hcinemann ltd.,oxford
5. NarayanaV.andSreenivasan,N.S.–Quality Management–ConceptsAndTasks‖, NewAgeInternational 2007.
6. Zeiri. –Total QualityManagement forEngineers‖, wood head Publishers.

BEC 019 **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										S
CO2		S										S
CO3	M	M				M			S			S
CO4		S							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 Examinations		

LINEARMODEL **09**

ThephasesofORstudy–formationofanL.Pmodel–graphicalsolution–simplexalgorithm–artificial variables technique (BigM method, twophasemethod), dualityinsimplex

TRANSPORTATIONANDASSIGNMENTMODELS **09**

Transportationmodel–InitialsolutionbyNorthWestcornermethod–leastcostmethod–VAM. Optimalitytest–MODImethod and steppingstone methodAssignment model – formulation– balanced andunbalancedassignment problems

PROJECTMANAGEMENTBYPERT& CPM **09**

Basic terminologies – Constructingaproject network– SchedulingCPMcomputations– PERT - resourcesmoothening,Resourceleveling, PERT cost

REPLACEMENTANDSEQUENCINGMODELS **09**

Replacementpolicies-Replacementofitemsthatdeterioratewithtime(valueofmoney 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)Sequencingmodels-njobon2machines–njobson3machines–njobsonmmachines, Travelingsalesman problem

INVENTORYANDQUEUINGTHEORY **09**

Variablesininventoryproblems,EOQ,deterministicinventorymodels,orderquantity withprice break, techniques in inventorymanagementQueuingsystemanditsstructure–Kendall‘snotation– Commonqueuingmodels-M/M/1:FCFS/∞/∞ -M/M/1: FCFS/n/∞-M/M/C: FCFS/∞/∞-M/M/1: FCFS/n/m

Total:45 Periods

REFERENCES:

1. TahaH.A.,‖Operation Research‖,Pearson Education
2. Hiraand Gupta‖Introduction to Operations Research‖,S.Chandand Co.2002
3. Hiraand Gupta‖Problems inOperations Research‖,S.Chand and Co.2008
4. Wagner,‖Operations Research‖, PrenticeHallofIndia, 2000
5. S.Bhaskar,‖OperationsResearch‖, AnuradhaAgencies, Second Edition, 2004

BEC 020 ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT L T PC

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						M					S	S
CO2						M			M		S	S
CO3						M					S	S
CO4						M			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 Examinations		

ECONOMICS,COSTANDPRICINGCONCEPTS 09

Economictheories–Demandanalysis –Determinantsofdemand– Demandforecasting– Supply– Actualcostandopportunity cost–Incrementalcostandsunkcost–Fixedandvariable cost– Marginalcosting–Totalcost–Elementsof cost–Costcurves–Breakevenpointand breakevenchart– Limitationsof breakeven chart–Interpretationof breakevenchart– Contribution– P/V-ratio,profit-volumeratioorrelationship–Pricefixation–Pricing policies– Pricingmethods

CONCEPTSONFIRMSANDMANUFACTURINGPRACTICES 09

Firm–Industry–Market–Marketstructure–Diversification–Verticalintegration–Merger–Horizontal integration

NATIONAL INCOME, MONEY AND BANKING, ECONOMIC ENVIRONMENT 09

Nationalincomeconcepts–GNP–NNP–Methodsofmeasuring nationalincome–Inflation–Deflation–Kindsofmoney–Valueofmoney–Functionsofbank–Typesofbank–Economic liberalization– Privatization– Globalization

CONCEPTSOFFINANCIALMANAGEMENT 09

Financialmanagement–Scope–Objectives–Timevalueofmoney–Methodsofappraising project profitability– Sources offinance– Workingcapital and management of working capital

ACCOUNTINGSYSTEM,STATEMENTANDFINANCIALANALYSIS 09

Accountingsystem–Systemsofbook-keeping–Journal–Ledger–Trailbalance–Financial statements – Ratio analysis– Types ofratios– Significance –Limitations

Total:45 Periods

REFERENCS:

1. PrasannaChandra, ‒Financial Management‖(Theory& Practice) TMH
2. Weston &Brigham,‒Essentials of Managerial Finance‖
3. Pandey,I. M., ‒FinancialManagement‖
4. ‒Fundamentals of Financial Management‖-James C. Van Horne.
5. ‒Financial Management&Policy‖-James C. Van Horne
6. ‒Management Accounting &Financial Management‖-M. Y. Khan&P. K. Jain

BEC 021 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												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M	M							S
CO2	S	M										S
CO3	S	M	M									S
CO4	M	M	M								S	
CO5	S	M		W	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 Examinations		

DISCRETE-TIMERANDOMSIGNALS **09**

Discrete random process – Ensemble averages, Stationary and ergodic processes, AutocorrelationandAutocovariance propertiesandmatrices, White noise, PowerSpectral Density, Spectral Factorization,InnovationsRepresentationand Process,Filteringrandom processes.

SPECTRUMESTIMATION **09**

Introductiontopowerspectrumestimation-Parameterestimation-Biasandconsistency–Non-parametric methods- Periodogram- Modified Periodogram–BartlettMethod- Welch Method-Blackman-Tukey method-ARMA,AR,MAprocesses-Yule-Walkerequations–Parametricmethods for spectral estimation.

LINEARPREDICTIONANDESTIMATION **09**

Forwardandbackwardlinearprediction–Latticefilterrealization-OptimumFiltering–FIRWeiner filter– Filtering andLinear prediction–Non-causal and causalIIR Weiner filters

ADAPTIVEFILTERS **09**

Principlesofadaptivefilters -FIRadaptivefilters– Newton's steepestdescent adaptivefilter–LMS adaptation algorithms–RLS algorithm, Applications - Noisecancellation–channelequalization–echocancellers.

WAVELETTRANSFORM **09**

Fourier Transform and its limitations – Short Time Fourier Transform – Continuous,WaveletTransform-Multi-resolutionanalysis-DiscreteWaveletTransform-HaarWavelet–Daubechies Wavelet –Implementation ofwavelet transform with sub-band coding.

Total:45 Hrs

REFERENCES:

1. Monson H.Hayes– ―Statistical Digital Signal Processing and Modeling‖, WileyEastern,2009.
2. JohnG.Proakis,DimitrisG.Manolakis, ―DigitalSignalProcessing,Principles,Algorithmsand Applications‖, PHI,3rdEdition,2014.
3. SanjitK.Mitra,―DigitalSignalProcessing: AComputerBasedApproach‖,2ndEdition, Tata McGraw-Hill, 2001.
4. Dimitris G. Manolakis,VinayK. Ingle, Stephen M. Kogon, ―Statistical and Adaptive SignalProcessing‖,Artech House,2005.
5. C. SidneyBurrus, Ramesh A.Gopinath, Haitao Guo,―Introduction to Wavelets andWavelet Transforms‖, PrenticeHall, 1998.

BEC 022 HIGHSPEEDNETWORKS 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	M	M									
CO4	M											
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 Examinations		

FrameRelayNetworks–Asynchronoustransfermode–ATMProtocolArchitecture, ATMlogicalConnection,ATMCell–ATMServiceCategories–AAL. High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel –High speed Wirelessnetworks – Architecture of 802.11n.

CONGESTION AND TRAFFIC MANAGEMENT 9

QueuingAnalysis –QueuingModels–SingleServerQueues–EffectsofCongestion– CongestionControl–TrafficManagement–CongestionControlinPacketSwitching Networks– FrameRelayCongestionControl.

TCP AND ATM CONGESTION CONTROL 9

TCPFlowcontrol–TCPCongestionControl– Retransmission–TimerManagement– Exponential RTO backoff–KARN'sAlgorithm– Windowmanagement–Performance of TCPoverATM.

INTEGRATED AND DIFFERENTIATED SERVICES 9

IntegratedServicesArchitecture–Approach,Components,Services –QueuingDiscipline, FQ, PS, BRFQ,GPS,WFQ–RandomEarlyDetection,DifferentiatedServices.

PROTOCOLS FOR QOS SUPPORT 9

RSVP–Goals&Characteristics,DataFlow,RSVPoperations,ProtocolMechanisms–Multiprotocol Label Switching–Operations,Label Stacking,Protocoldetails–RTP–ProtocolArchitecture,Data Transfer Protocol,RTCP

Total : 45 Periods

REFERENCES:

1. **William Stallings-High Speed Networks and Internet, Second Edition, PrenticeHA2002.**
2. Warland & PRavin VAraiya,-High Performance Communication Networks,Second Edition, Jean Harcourt Asia Pvt. Ltd.,2000
3. Irvan Pepe link, Jim Guichard and Jeff Apcae-MPL Sand VPN Architecture, CISCO Press Volume – I and II,2003.

BEC 023 REAL-TIMEEMBEDDED SYSTEMS L T P C

Course Objectives: 3 0 0 3

- 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 – IIRTOS.

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		M								
CO5		M	M		M							

Course Assesment 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 Examinations		

ARCHITECTURE OF EMBEDDED SYSTEMS **09**

Definition and classification- Qverview 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 DevicePorts– Sophisticated interfacing features in Devices Ports-Timer and Counting Devices – Serial bus communication protocols: I2C,_USB‘,_CAN‘and Advanced I/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 µC/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.

Total: 45 Periods

REFERENCES:

1. RajKamal―EmbeddedSystemsArchitectureProgrammingandDesign‖, 2ndEdition ,TMH,2008
2. David E.Simon ―An Embedded Software Primer‖, Pearson Education, 4th Reprint, 2007.
3. Steve Heath, ―Embedded Systems Design‖, 2ndEdition., Elsevier Publications, 2006.

4. Wayne Wolf, ―Computers as Components; Principles of Embedded Computing SystemDesign,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.WLewis,―Fundamentalsof EmbeddedSoftware‖PearsonEducation2001.

BEC 024 Internet and Java Programming

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce students the basics of internet and HTML
- To introduce the fundamental concepts of Java programming.
- To explain advanced concepts of java programming
- To learn Java applets.

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 Examinations		

Basicsof InternetandHTML **09**

Introduction toInternet-Internet technology and Protocol(Overview)-Internet connectivity-WWW-HTML:Basic Tags-Tables-List-Forms-Internet and Web Security

JavaFundamentals-I **09**

Java Fundamentals– Control Structures– Classes – Methods -GarbageCollection–Inheritance

JavaFundamentals-II **09**

PackagesandInterfaces–ExceptionHandling-StringHandling–java.lang.package:Primitive typeWrapper classes.

JavaAdvancedFeatures **09**

Multithreading:Threadmodel-LifeCycle–Synchronization-Inter-threadCommunication–I/O Package:File class– Stream classes– Utilpackage: CollectionInterfaces–Collection classes.

JavaApplets **09**

Appletclass–EventHandling:Eventclasses-EventListenerInterfaces-Adapterclasses–AWTpackage: Windows, Graphics and Text–LayoutManagers

Total:45 Periods

REFERENCES:

1. Isrd Group,‖Internet TechnologyAnd Web Design‖,TataMcGrawHill,2011
2. Herbert Schildt, –TheComplete Reference– Java‖, Tata McGraw Hill, Ninth edition,2014
3. Deitel and Deitel,–Java: How to Program‖,NinthEdition, PrenticeHall, Tenth Edition,2014
4. BruceEckel , ‖Thinkingin Java‖, Fourth Edition, Pearson Education, 2006
5. CayS.Horstmann,GaryCornell,‖Core Java,VolumeI—Fundamentals‖, EighthEdition,Sun Microsystems, 2011.

BEC 025 **ASIC DESIGN** **L T P C**

Course Objectives: **3 0 0 3**

- 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 Examinations		

INTRODUCTIONTOASICS,CMOSLOGIC,ASICLIBRARYDESIGN 09

Typesof ASICs- Designflow–CMOStransistors- CMOSDesignrules–Combinationallogic Cell Sequentiallogiccell- Transistoras Resistors- Transistor parasitic capacitance–Logical effort - Librarycelldesign–Libraryarchitecture.

PROGRAMMABLE ASICS, PROGRAMMABLE ASIC LOGIC CELLS 09 ANDPROGRAMMABLEASICI/OCELLS

Antifuse-StaticRAM-EPROMandEEPROMtechnology-PREPbenchmarks-ActelACT-XilinxLCA –Altera FLEX-AlteraMAXDC & AC inputs and outputs-XilinxI/O blocks.

PROGRAMMABLEASIC INTERCONNECT,PROGRAMMABLEASIC 09DESIGNSOFTWAREANDLOWLEVELDESIGN

Entry:ActelACT-XilinxLCA-XilinxEPLD-AlteraMAX5000and7000-AlteraMAX9000-AlteraFLEX–Designsystems-LogicSynthesis-HalfgateASIC-Lowleveldesign language -PLA tools EDIF-CFIdesign representation.

SILICONONCHIPDESIGN 09

VoiceoverIPSOC-IntellectualProperty–SOCDesignchallenges-Methodologyanddesign- FPGAto ASICconversion– Designforintegration-SOC verification-Settop box SOC.

PHYSICALANDLOWPOWERDESIGN 09

Over view of physicaldesignflow- tipsandguideline for physicaldesign-modern physical design techniques- power dissipation-low power design techniques and methodologies-low power design tools-tips and guideline forlow power design.

Total:45 Periods

REFERENCES:

1. M.J.S. Smith, ―Application SpecificIntegrated Circuits‖,Pearson Education, 2008
2. WayneWolf, ―FPGA-Based System Design‖, PrenticeHall PTR, 2009.
3. FarzadNekoogarandFaranakNekoogar,―FromASICstoSOCs:APracticalApproach‖, PrenticeHall PTR, 2003.
4. R.Rajsuman,―System-on-a-Chip Designand Test‖, Santa Clara, CA: Artech HousePublishers, 2000
5. F.Nekoogar,―Timing VerificationofApplication-SpecificIntegratedCircuits(ASICs)‖,PrenticeHall PTR, 1999.