BHARATH INSTITUTE OF HIGHER EDUCATION AND RESEARCH
ELECTRONICS AND COMMUNICATION ENGINEERING
B.TECH CURRICULUM AND SYLLABUS (R2015)
CHOICE BASED CREDIT SYSTEM (CBCS)

I – VIII SEMESTERS

SEMESTER I						
Course Code	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BEN101	HS	English – I	3	1	0	3
BMA101	BS	Mathematics – I	3	1	0	3
BPH101	BS	Engineering Physics - I	3	0	0	3
BCH101	BS	Engineering Chemistry – I	3	0	0	3
BCS101	ES	Fundamentals of Computing and Programming	3	0	0	3
BFI101 *	HS	Foreign/Indian Language	3	0	0	3
BME102	ES	Engineering Graphics-C	1	0	3	3
BEE101	ES	Basic Electrical and Electronics Engineering	2	0	0	2
PRACTICAL						
BCS1L1	ES	Computer Practice Laboratory	0	0	3	1
BEE1L1	ES	Basic Electrical and Electronics Engineering Practices Laboratory	0	0	3	1
BPC1L1 #	BS	Physics and Chemistry Laboratory	0	0	3/3	0
BSS1L7	HS	Yoga(to be conducted during weekends)				1
*Any one of the following courses:BFR101–French, BGM101–German, BJP101– Japanese, BKR101 – Korean, BCN101 – Chinese, BTM101 - Tamil						
#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)						
Total Number of Contact Hours = 35			**Total Number of Credits= 26**			

SEMESTER II						
Course Code	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BEN201	HS	English – II	3	1	0	3
BMA201	BS	Mathematics – II	3	1	0	3
BPH201	BS	Engineering physics – II	3	0	0	3
BCH201	BS	Engineering Chemistry – II	3	0	0	3
BCS201	ES	Internet Programming	2	0	0	2
BSS201	HS	Personality Development	2	0	0	2
BBT202	BS	Biology for Engineers	2	0	0	2
BME203	ES	Basic Mechanical Engineering	2	0	0	2
BCE201	ES	Basic Civil Engineering	2	0	0	2
PRACTICAL						
BCS2L1	ES	Internet Practices Lab	0	0	3	1
BCM2L1	ES	Basic Civil and Mechanical Engineering Practices Laboratory	0	0	3	1
BPC2L1#	BS	Physics and Chemistry Laboratory	0	0	3/3	1
BSS2L4/ BSS2L5/ BSS2L6	HS	NCC/ NSS/NSO (to be conducted during weekends)				1
Laboratory Classes on alternate weeks for Physics and Chemistry. (Lab exam including the first semester experiments also)						
Total Number of Contact Hours = 33			**Total Number of Credits= 26**			

SEMESTER III						
Code No.	**Category**	**Course Title**	**L**	**T**	**P**	**C**
Theory						
BMA301	BS	Mathematics -III	3	2	0	4
BEE305	PC	Electrical Machines	3	0	0	3
BEC301	PC	Signals and Systems	4	0	0	4
BEC302	PC	Principles Of Digital Electronics	3	1	0	4
BEE301	PC	Circuit Theory	3	0	0	3
BCE306	HS	Environmental Studies	3	0	0	3
Practical						
BEE3L3	PC	Electrical Engineering Lab	0	0	3	2
BEC3L1	PC	Electronic Devices and Circuits Lab	0	0	3	2
BEC3L2	PC	Digital Electronics Lab	0	0	3	2
Total No. of Contact Hours: 30					**Total Credits: 27**	

SEMESTER IV						
Code No.	**Category**	**Course Title**	**L**	**T**	**P**	**C**
Theory						
BMA402	BS	Numerical Methods	3	2	0	4
BEC402	PC	Electronic Circuits	3	0	0	3
BEC405	PC	Linear Integrated Circuits	3	0	0	3
BCS406	PC	Object Oriented Programming and Data Structures	3	0	0	3
BEC403	PC	Electromagnetic Fields and Waves	4	0	0	4
BEI406	PC	Electronic Instrumentation	3	0	0	3
Practical						
BEC4L1	PC	Electronic Circuit Design Lab	0	0	3	2
BCS4L3	PC	Object Oriented Programming and Data Structures Lab	0	0	3	2
BEC4L2	PC	Linear Integrated Circuits Lab	0	0	3	2
Total No. of Contact Hours: 30					**Total Credits: 26**	

SEMESTER V						
Code No.	**Category**	**Course Title**	**L**	**T**	**P**	**C**
Theory						
BEC505	PC	Digital Signal Processing	4	0	0	4
BEC502	PC	Microprocessor and Microcontroller	3	0	0	3
BEC504	PC	Communication Engineering-I	3	0	0	3
BMA504	BS	Random Process	3	2	0	4
	OE	Open Elective I	3	0	0	3
	CE	Core Elective I	3	0	0	3
Practical						
BEC5L1	PC	Digital Signal Processing laboratory	0	0	3	2
BEC5L6	PC	Microprocessor and Microcontroller Lab	0	0	3	2
BEC5L3	PC	Communication Engineering Laboratory -I	0	0	3	2
BEC5C1	PR	Comprehension I	0	0	0	1
Total No. of Contact Hours: 30			**Total Credits: 27**			

SEMESTER VI						
Code No.	**Category**	**Course Title**	**L**	**T**	**P**	**C**
Theory						
BEC601	PC	Computer Communication and Networks	3	0	0	3
BEC604	PC	Communication Engineering - II	3	0	0	3
BEI 601	PC	Control Systems	4	0	0	4
BSS601	HS	Value Education and Professional Ethics	3	0	0	3
	CE	Core Elective II	3	0	0	3
	NE	Non-Major Elective -I	3	0	0	3
Practical						
BEC6L1	PC	Computer Communication & Networks Lab	0	0	3	2
BEC6L2	PC	Electronics System Design Lab	0	0	3	2
BEC6L3	PC	Communication Engineering –II Lab	0	0	3	2
Total No. of Contact Hours: 28			**Total Credits: 25**			

SEMESTER VII						
Code No.	**Category**	**Course Title**	**L**	**T**	**P**	**C**
Theory						
BEC701	PC	Fiber Optic Communication	3	0	0	3
BEC702	PC	Digital CMOS VLSI	4	0	0	4
BEC703	PC	Microwave Engineering	3	0	0	3
BEC704	PC	Antennas and Wave Propagation	3	0	0	3
	NE	Non-Major Elective -II	3	0	0	3
	CE	Core Elective – III	3	0	0	3
Practical						
BEC7L1	PC	Digital CMOS VLSI Lab	0	0	3	2
BEC7L2	PC	Optical Communication Lab	0	0	3	2
BEC7L3	PC	Microwave Engineering Lab	0	0	3	2
BEC7P1	PR	Term Paper	0	0	4	2
Total No. of Contact Hours: 32				**Total Credits: 27**		

SEMESTER VIII						
Code No.	**Category**	**Course Title**	**L**	**T**	**P**	**C**
Theory						
	OE	Open Elective-II	3	0	0	3
	NE	Non- Major Elective-III	3	0	0	3
Practical						
BEC8C1	PR	Comprehension II	0	0	0	1
BEC8P1	PR	Project Work	0	0	18	9
Total No. of Contact Hours:24					**Total Credits : 16**	

Overall credits for the Programme: 200

SUMMARY OF CURRICULUM STRUCTURE AND CREDIT DISTRIBUTION

S. No.	Sub Area	Credit as per Semester								No. of Credit	% of credit
		I	II	III	IV	V	VI	VII	VIII		
1	Humanities & Social Sciences (HS)	7	6	3	-	-	3	-	-	19	9.50
2	Basic Sciences (BS)	9	12	4	4	4	-	-	-	33	16.50
3	Engineering Sciences (ES)	10	8	-	-	-	-	-	-	18	09.00
4	Professional Core (PC)	-	-	20	22	16	16	19	-	93	46.50
5	Core Electives (PE)	-	-	-	-	3	3	3	-	9	4.5
6	Non major Electives (NE)	-	-	-	-	-	3	3	3	9	4.5
7	Open Electives (OE)	-	-	-	-	3	-	-	3	6	3
8	Project Work, Seminar, Internship, Term Paper, etc. (PR)	-	-	-	-	1	-	2	10	13	6.50
	Total Credit	26	26	27	26	27	25	27	16	200	100%

LIST OF ELECTIVES

Code no.	Course Title	L	T	P	C
Core Elective–I (CE - I)					
BEC503	Transmission lines, Networks and Waveguides	3	0	0	3
BEC001	Advanced Computer Architecture	3	0	0	3
BEC008	MEMS and NEMS	3	0	0	3
BEC010	VLSI Design	3	0	0	3
Core Elective – II (CE-II)					
BEC015	ASIC Design	3	0	0	3
BEC012	Cryptography and Network Security	3	0	0	3
BEC007	Digital Image Processing	3	0	0	3
BEC002	Wireless Networks	3	0	0	3
Core Elective – III (CE-III)					
BEC016	Cognitive Radio	3	0	0	3
BEC005	Blue Tooth Technology	3	0	0	3
BEC003	Satellite Communication	3	0	0	3
BEC705	Cellular Mobile Communication	3	0	0	3
Non-Major Elective – I (NE-I)					
BCS002	Neural Networks	3	0	0	3
BBM054	Bio Informatics	3	0	0	3
BEI605	Embedded Systems Design	3	0	0	3
BCS702	Mobile And Pervasive Computing	3	0	0	3
Non-Major Elective – II (NE-II)					
BCS701	Grid and Cloud Computing	3	0	0	3
BCS008	Distributed Operating Systems	3	0	0	3
BCS603	Artificial Intelligence& Expert System	3	0	0	3
Non-Major Elective – III (NE-III)					
BBM405	Biosensors and Transducer	3	0	0	3
BEI704	Virtual Instrumentation	3	0	0	3
BET603	Telecommunication Switching Systems	3	0	0	3
Open Elective-I (OE-I)					
BBA008	Total Quality Management	3	0	0	3
BBA001	Principles of Management and Organizational Behavior	3	0	0	3
BBA004	Engineering Economics and Financial Management	3	0	0	3
Open Elective-II (OE-II)					
BEI701	Logic and Distributed Control System	3	0	0	3
BEI012	Analog Integrated Circuit Design	3	0	0	3
BET008	Integrated Service Digital Network	3	0	0	3

BEN101	ENGLISH - I	L	T	P	C
	Total Contact Hours – 60	3	1	0	3
	Prerequisite – +2 Level English				
	Course Designed by – Dept of English				

OBJECTIVES

To make the students learn the basic modes of communication for fluency and attainment of confidence in speech, reading and writing.

COURSE OUTCOMES (COs)

CO1	Understand the importance of being responsible, logical, and thorough.
CO2	Respond to the situations where short reports and instructions are required.
CO3	Explain "how things work", and what to suggest when "things don't work
CO4	Develop our confidence and authority in the practical use of language.
CO5	Able to Face interviews and competitive examinations

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H	H	H	H	H	M	L	L	H	H	H
	CO2							L				
	CO3	H						H		H		
	CO4	H	M				M	L	H	H		
	CO5							L				

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
		√							
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I STRUCTURES 12

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 TRANSCODING 12

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 REPORTING 12

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

UNIT IV FORMAL DOCUMENTATION 12

Writing project proposals - Presentation skills - Prefixes and suffixes - If conditions - Writing a review-Preparing minutes of the meeting, Agenda, official circulars.

UNIT V METHODOLOGY 12

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

TEXT BOOK:

1. Department of Humanities and Social Sciences Division, Anna University, Oxford University Press, 2013.

REFERENCES:

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.
3. Murali Krishna and Sunitha Moishra, Communication Skills for Engineers . Pearson, New Delhi, 2011.

BMA101	**MATHEMATICS I**	**L**	**T**	**P**	**C**
	Total Contact Hours - 60	3	1	0	3
	Prerequisite – + 2 Level Mathematics				
	Course Designed by – Dept of Mathematics				

OBJECTIVES

To make the students learn Mathematics in order to formulate and solve problems effectively in their respective fields of engineering.

COURSE OUTCOMES (COs)

CO1	Study the fundamentals of mathematics
CO2	Students learn multiple integral techniques
CO3	Students gain knowledge in application of variables
CO4	Find area and volume based on a function with one or more variables.
CO5	Apply matrix operations to solve relevant real life problems in engineering.
CO6	Formulate a mathematical model for three dimensional objects and solve

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H										
	CO2			M		H						
	CO3		H				M					
	CO4								L			
	CO5							H			L	
	CO6											L

3	Category	Humanities & Social Studies (HS)	Basic Sciences &Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Term Paper Seminar/ Internship (PR)
			√						

4	Approval	37th Meeting of Academic Council, May 2015

UNIT 1 MATRICES 12

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 12

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

UNIT III DIFFERENTIAL CALCULUS 12

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

UNIT 1V FUNCTIONS OF SEVERAL VARIABLES 12

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 12

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.

TEXT BOOK:

A. Ravish R.Singh and Mukkul Bhatt, "Engineering Mathematics-I" First Reprint, Tata McGraw Hill Pub Co., New Delhi. 2011.

B. 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 Wiley 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.

BPH101	**ENGINEERING PHYSICS I**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite – +2 level Physics				
	Course Designed by – Department of Physics				

OBJECTIVES:

To enhance the fundamental knowledge in Physics and its applications relevant to various stream Engineering and Technology

COURSE OUTCOMES (COs)

CO1	Understand the Principles and Laws of Physics
CO2	To understand the impact of Crystal Physics
CO3	Learn the Properties of Elasticity and Heat transfer.
CO4	Acquire Knowledge on Quantum Physics.
CO5	Understand the concepts on Laser & Ultrasonic's and its Applications
CO6	Understand the Principle of Laser and its Applications in Engineering and Medicine.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H						M			H	
	CO2		L	H		M				M		L
	CO3											
	CO4	H		M	L						L	
	CO5		L	L								L
	CO6		L	L								L

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
			√						
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I CRYSTAL PHYSICS 9

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and graphite structures (qualitative treatment)-

Crystal growth techniques –solution, melt (Bridgman and Czochralski) and vapour growth techniques (qualitative)

UNIT II PROPERTIES OF MATTER AND THERMAL PHYSICS 9

Elasticity-Hooke's law - Relationship between three modulii of elasticity (qualitative) – stress -strain diagram – Poisson's ratio –Factors affecting elasticity –Bending moment – Depression of a cantilever –Young's modulus by uniform bending- I-shaped girders Modes of heat transfer- thermal conductivity- Newton's law of cooling - Linear heat flow – Lee's disc method – Radial heat flow – Rubber tube method – conduction through compound media (series and parallel).

UNIT III QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jeans' Law from Planck's theory – Compton effect. Theory and experimental verification – Properties of Matter waves – G.P Thomson experiment-Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box - Electron microscope - Scanning electron microscope - Transmission electron microscope.

UNIT IV ACOUSTICS AND ULTRASONICS 9

Classification of Sound- decibel- Weber–Fechner law – Sabine's formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies. Production of ultrasonics by magnetostriction and piezoelectric methods - acoustic grating -Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C – scan displays, Medical applications – Sonogram.

UNIT V PHOTONICS AND FIBRE OPTICS 9

Spontaneous and stimulated emission- Population inversion –Einstein's A and B coefficients - derivation. Types of lasers – Nd:YAG, CO2, Semiconductor lasers (homo junction & hetero junction)- Industrial and Medical Applications. Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – attenuation, dispersion, bending - Fibre Optical Communication system (Block diagram) - Active and passive fibre sensors- Endoscope.

TEXT BOOKS:

1. Jayaraman D Engineering Physics I. Global Publishing House, 2014.
2. Arumugam M. Engineering Physics. Anuradha publishers, 2010.
3. Gaur R.K. and Gupta S.L. Engineering Physics. Dhanpat Rai Publishers, 2009.
4. Mani Naidu S. Engineering Physics, Second Edition, PEARSON Publishing, 2011.

REFERENCES:

1. Searls and Zemansky. University Physics, 2009
2. Marikani A. Engineering Physics. PHI Learning Pvt., India, 2009.
3. Palanisamy P.K. Engineering Physics. SCITECH Publications, 2011.
4. http://ocw.mit.edu/courses/find-by-topic
5. http://nptel.ac.in/course.php?disciplineId=122
6. https://en.wikipedia.org/wiki/Engineering_physics

BCH101	ENGINEERING CHEMISTRY - I	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – +2 Level Chemistry				
	Course Designed by – Department of Chemistry				

OBJECTIVES

To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

COURSE OUTCOMES (COs)

CO1	Understand the principles of 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	Having a sound knowledge in the Field of the Conventional and non-Conventional energy
CO4	To impart knowledge on the essential aspects of electrochemical cells, emf and applications of EMF measurements
CO5	To make the students understand the Principles of corrosion and corrosion control .
CO6	To impart knowledge about the Conventional and non-conventional energy sources and energy storage devices

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H						H				
	CO2		L	H		M						
	CO3		M		H							
	CO4	H		M	L			H				
	CO5		L	L								
	CO6	H						H				

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
			√						
4	Approval	37th Meeting of Academic Council, May 2015							

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 polymerization - types of polymerization– Addition polymerization and Condensation polymerization – Mechanism of Polymerization - 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 ELECTRO CHEMISTRY 9

Introduction CELLS: types of 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) Conduct metric 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 control – sacrificial anode and impressed cathodic current methods – Protective coatings :Paints– constituents of the paint and their functions Metallic coatings – electroplating of Gold and electro less 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

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).
3. http://ocw.mit.edu/courses/find-by-topic
4. http://nptel.ac.in/course.php?disciplineId=122
5. https://en.wikipedia.org/wiki/Electrochemistry

BCS101	FUNDAMENTALS OF COMPUTING AND PROGRAMMING	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Nil				
	Course Designed by – Department of Computer Science & Engineering				

OBJECTIVES

Students will understand the basics of computers and solve computer oriented problems using various computing tools.

COURSE OUTCOMES (COs)

CO1	Learn the fundamental principles in computing.
CO2	Learn to write simple programs using computer language
CO3	To enable the student to learn the major components of a computer system.
CO4	Computing problems
CO5	To learn to use office automation tools.
CO6	To interpret and relate programs

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					H					
	CO2		L	H		M						
	CO3		L		S							
	CO4	M		M	W		M					
	CO5		L	L								
	CO6	H					H					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
				√					
4	Approval	37th Meeting of Academic Council, May 2015							

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.

TEXT BOOKS:

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

REFERENCES:

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

BFR 101	**FRENCH**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – +2 Level English				
	Course Designed by – Department of English				

OBJECTIVES

Language gives access and insights into another culture. It is a fundamental truth that cultures define themselves through languages.

COURSE OUTCOMES (COs)

CO1	Introduce the basics of the language to beginners
CO2	Understand a dialogue and dialogue presentation

CO3	To develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.
CO4	Synchronies I includes documents which initiate the learners to another world, another culture and which acclimatize them to the authentic use of the French language through the exploitation of written and iconographic documents. The Indian context has been used.
CO5	Grammatical and lexical notions as well as activities required for communication are learnt by the students.
CO6	Interpreting skills and confidence in the language.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H	L									
	CO2			H	L				H	H	M	L
	CO3			H	L				H	H	M	L
	CO4			H					H	H	M	L
	CO5			H	L				H	H	M	
	CO6			H					H	H	M	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
		√							

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I INTRODUCTION 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 GRAMMAR 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 CONVERSATION 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 PROPOSAL WRITING 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 FORMAL LETTERS 9

A concert: Savoir –faire: inviting, accepting, expressing one's inability to accept an invitation Regular & Irregular Verbs:
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

REFERENCES:

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

BGM 101	**GERMAN**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite +2 Level English				
	Course Designed by – Department of English				

OBJECTIVES

At the end of this course, students shall be able to obtain good knowledge of the language, to r write and speak German, whereby the emphasis is laid on speech.

COURSE OUTCOMES (COs)

CO1	Will have a basic knowledge of the language
CO2	Will acquire reading and writing skills.
CO3	Will develop basic conversational skills.
CO4	Will understand German lifestyle
CO5	Will gain confidence to survive in a global environment
CO6	Will have attained to survive and adopt change in a foreign culture .

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H	L									
	CO2			H	L				H	H	M	L
	CO3			H	L				H	H	M	L
	CO4			H					H	H	M	L
	CO5			H	L				H	H	M	
	CO6			H					H	H	M	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
		√							
4	Approval	37th Meeting of Academic Council, May 2015							

Course structure:

A. German Language (speaking, reading, writing, grammar and test)
B. Life in Germany (shopping, restaurant, doctor, government, bank, post)
C. The German Way (introduction, doing business, conversation, meetings, dining)
D. Germany (Culture, Climate)

UNIT I PRONOUNCIATION 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 SELF INTRODUCTION 9

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

UNIT III TRAINING 9

Addresses, Occupations, Studies - Grammar **- 'to be', the definite/indefinite** articles, individual Training

UNIT IV ORAL 9

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

UNIT V NARRATION 9

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

RESOURCES:

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

BJP 101	**JAPANESE**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – +2 Level English				
	Course Designed by – Department of English				

OBJECTIVES

To have a basic knowledge of Japanese language, Japanese culture and heritage
To impart knowledge Japanese lifestyle.

To give sufficient exposure to develop basic conversational skills.	
COURSE OUTCOMES (COs)	
CO1	Will have a basic knowledge of the language
CO2	Will acquire reading and writing skills.
CO3	Will develop basic conversational skills.
CO4	Will understand Japanese lifestyle
CO5	Will gain confidence to survive in a global environment
CO6	Will have attained to survive and adopt change in a foreign culture .

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H	L									
	CO2			H	L				H	H	M	L
	CO3			H	L				H	H	M	L
	CO4			H					H	H	M	L
	CO5			H	L				H	H	M	
	CO6			H					H	H	M	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
		√							
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I CULTURAL HERITAGE 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 USAGE 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 ORAL 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 ART AND CULTURE 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 DRILLS AND PRACTICE 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

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 beginners through advanced course, Living Language, 2012

BKR101	**KOREAN**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – +2 Level English				
	Course Designed by – Department of English				

OBJECTIVES

To have a basic knowledge of Korean language, Korean culture and heritage
To impart knowledge on Korean lifestyle and heritage.

COURSE OUTCOMES (COs)

CO1	Will have a basic knowledge of the language
CO2	Will acquire reading and writing skills.
CO3	Will develop basic conversational skills.
CO4	Will understand Korean lifestyle
CO5	Will gain confidence to survive in a global environment
CO6	Will have attained to survive and adopt change in a foreign culture .

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H	L									
	CO2			H	L				H	H	M	L
	CO3			H	L				H	H	M	L
	CO4			H					H	H	M	L
	CO5			H	L				H	H	M	
	CO6			H					H	H	M	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
		√							

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I PLANNING 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 MODIFIERS 9

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

UNIT III PLACING ORDERS 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 DESCRIPTIONS 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 GRAMMAR 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)

COURSE MATERIAL:

Korean for Non-Native Speakers (Student Book 1B) Korean Language Education Center, Sogang University

BCN 101	**CHINESE**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – +2 Level English				
	Course Designed by – Department of English				

OBJECTIVES

To have a basic knowledge of Chinese language, Chinese culture and heritage

To impart knowledge on Chinese lifestyle and heritage.

COURSE OUTCOMES (COs)	
CO1	Will have a basic knowledge of the language
CO2	Will acquire reading and writing skills.
CO3	Will develop basic conversational skills.
CO4	Will understand Chinese lifestyle
CO5	Will gain confidence to survive in a global environment
CO6	Will have attained to survive and adopt change in a foreign culture

Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	
2	CO1	H	L										
	CO2			H	L				H	H	M	L	
	CO3			H	L				H	H	M	L	
	CO4			H					H	H	M	L	
	CO5			H	L				H	H	M		
	CO6			H					H	H	M		
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)	Engg Sciences (ES)		Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)		Project/Term Paper/ Seminar/ Internship (PR)	
		√											
4	Approval	37th Meeting of Academic Council, May 2015											

UNIT 1 RISE OF DIALECTS 9

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

UNIT II VARIETIES 9

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

UNIT III CHARACTERS 9

Chinese characters, Homophones, Phonology

UNIT IV TRANSCRIPTIONS 9

Tones, Phonetic transcriptions, Romanization, Other phonetic transcriptions

UNIT V GRAMMAR 9

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

REFERENCES:

1. Hannas, William C. (1997), Asia's Orthographic Dilemma, University of Hawaii Press, ISBNHYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-8248-1892-0" 978-0-8248- 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, ISBN HYPERLINK http://en.wikipedia.org/wiki/Special:BookSources/978-1-55729-071-7,978-1-55729-071-7.
3. Ramsey, S. Robert (1987), The Languages of China, Princeton University Press, ISBNHYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-691-01468-5" 978-0-691-01468-5.
4. Schuessler, Axel (2007), ABC Etymological Dictionary of Old Chinese, Honolulu: University of Hawaii Press, ISBNHYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-8248-2975-9"978-0-8248-2975-9.

5. R. L. G. " Language borrowing Why so little Chinese in English?" The Economist. June 6, 2013.

BME 102	**ENGINEERING GRAPHICS - C**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	1	0	3	3
	Prerequisite – +2 Level Maths + Physics				
	Course Designed by – Dept of Mechanical Engineering				

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 (COs)

CO1	To know about different types of lines & use of different types of pencils in an engg. Drawing
CO2	To know how to represents letters & numbers in drawing sheet
CO3	To know about different types of projection
CO4	To know projection of points ,straight lines, solids etc.
CO5	To know development of different types of surfaces.
CO6	To know about isometric projection.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H										
	CO2	M	H									
	CO3			L								
	CO4						L		H	H		
	CO5			L						H		
	CO6			L							H	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
				√					
4	Approval	37th Meeting of Academic Council, May 2015							

UNITI BASIC CURVES, PROJECTION OF POINTS ANDSTRAIGHT LINES 9

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

UNITII PROJECTIONS OF PLANES AND SOLIDS 9

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

UNITIII ORTHOGRAPHIC PROJECTIONS, ISOMETRIC PROJECTIONS & FREE HAND SKETCHING 9

Orthographic projection of Simplepartsfrom3Ddiagram-Principlesofisometric projection and isometric view-isometric scale- Isometric projections of simple solids and truncated solids-Prisms, pyramids, cylinders, cones.

UNITIV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 9

Sectioning of solids in simple vertical position when the cutting lane 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.

UNITV PERSPECTIVE PROJECTION, BUILDING DRAWING AND COMPUTER AIDED DRAFTING 9

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

TEXT BOOKS:

1. N.D.Bhatt and V.M.Panchal, "Engineering drawing", charotar publishinghouse, 50th edition,2010.
2. K.V.Natarajan "ATextbook of Engineering Graphics", Dhanalakshmi Publishers, Chennai,2009.

REFERENCES:

1. K.R.Gopalakrishna, "Engineering drawing", (Vol-I&II combined) Subhasstores, 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 Interactivecomputergraphicsfordesignandproduction",Easterneconomyedition, Prentice Hall of India Pvt Ltd, NewDelhi,2005

BEE101	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	2	0	0	2
	Prerequisite – +2 Physics & +2 maths				
	Course Designed by – Department of Electrical & Electronics Engineering				

OBJECTIVES: To understand the laws of electrical engineering.

COURSE OUTCOMES (COs)

CO1	Students will gain knowledge regarding the various laws and principles associated with electrical systems.
CO2	Students will gain knowledge regarding electrical machines and apply them for practical problems.
CO3	Students will gain knowledge regarding various types semiconductors.
CO4	Student will gain knowledge digital electronics.
CO5	Student will gain knowledge on electronic systems.
CO6	Students will acquire knowledge in using the concepts in the field of electrical engg. projects and research.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M	H	M			L		L	L		
	CO2		H	M			L		L	L		
	CO3		H	M			L		L			
	CO4	M	H	M			L		L	L		
	CO5	M	H	M			L		L			
	CO6		H				L		L	H		

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
				√					

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I ELECTRIC CIRCUITS 6

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

UNIT II ELECTRICAL MACHINES 6

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

UNIT III BASIC MEASUREMENT SYSTEMS 6

Introduction to Measurement Systems, Construction and Operating principles of PMMC, Moving Iron, Dynamometer Wattmeter, power measurement by three-watt meter and two watt method – and Energy meter.

UNIT IV SEMICONDUCTOR DEVICES 6

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

UNIT V DIGITAL ELECTRONICS 6

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

TEXT BOOKS:

1. N.Mittal "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. McGrawHill Book Compay, 2nd Edition, 1983.
2. Hyatt W.H and Kemmerlay J.E. "Engineering Circuit Analysis", McGraw Hill International 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.

BCS1L1	**COMPUTER PRACTICE LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	1
	Prerequisite – Nil				
	Course Designed by – Department of Computer Science &Engineering				
OBJECTIVES: To impart basic computer knowledge					
COURSE OUTCOMES (COs)					
CO1	Demonstrate major algorithms and data				
CO2	Implementation of array operations				
CO3	Implementation of binary tree.				
CO4	Implementation of linked list				
CO5	Students will able to do analyse data using spread sheet				
CO6	Student will able to understand the basics of C programming.				
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low					

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	
2	CO1	H	H	L	H		H		L		H	H	
	CO2						H	H	L				
	CO3						H	H	L		M		
	CO4						H	H	L		M		
	CO5						H	H	L		M		
	CO6						H	H	L		M		

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
				√					
4	Approval	37th Meeting of Academic Council, May 2015							

A) WORD PROCESSING **6**

Document creation, Text manipulation with Scientific Notations. Table creation Table formatting and Conversion. Mail merge and Letter Preparation. Drawing-Flow Chart

B) SPREAD SHEET **9**

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* **15**

Data types, Expression Evaluation, Condition Statement. Arrays structures and Unions – Functions

D) SIMPLE C++PROGRAMMING **15**

-Classes and Objects
-Constructor and Destructor

***For Programming exercises Flow chart and Pseudo code are essential.**

BEE1L1	**BASIC ELECTRICAL AND ELECTRONIC ENGINEERING PRACTICES LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	0	0	3	1
	Prerequisite – +2 physics				
	Course Designed by – Department of Electrical & Electronics Engineering				

OBJECTIVES: To enhance the student with knowledge on electrical and electronic equipments.

COURSE OUTCOMES (COs)

CO1	Students will able to handle basic electrical equipments.
CO2	Students will able to do staircase wiring.

CO3	Students will able to understand domestic wiring procedures practically.
CO4	Student will able to assemble electronic systems.
CO5	Students will understand all the fundamental concepts involving electrical engineering
CO6	Students will understand all the fundamental concepts involving electronics engineering

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M	H	M			L		L	L	M	H
	CO2		H	M			L		L	L		H
	CO3		H	M			L		L			H
	CO4	M	H	M			L		L	L	M	H
	CO5	M	H	M			L		L		M	H
	CO6		H				L		L	H		H

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
				√					
4	Approval	37th Meeting of Academic Council, May 2015							

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 RLC circuit
4. Residential house wiring using fuse, switch, indicator, lamp and energy meter
5. Measurement of energy using single phase energy meter
6. Measurement of resistance to earth of electrical equipment

II 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**	**L**	**T**	**P**	**C**
	Total Contact Hours – 60	3	1	0	3
	Prerequisite – English I				
	Course Designed by – Department of English				

OBJECTIVES

Students will be able to actively participate in group discussions. Students will have

Telephonic Skills, Giving Directions and Information Transfer	
COURSE OUTCOMES (COs)	
CO1	To make the students aware to different kinds of Learner-friendly modes of language to a variety of self- instructional learning (Computer based)
CO2	To make students comprehend the habit of intelligent Reading as well as Computer- based competitive exams glob
CO3	To achieve a reasonably good level of competency in Report Writing.
CO4	To achieve a reasonably good level of competency in group discussions
CO5	To achieve a reasonably good level of competency in public speaking

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/POs	a	b	c	d	e	f	g	h	i	J	k
2	CO1	M	L	H	L	M			H		M	L
	CO2			H	L				H		M	L
	CO3			H	L	M			H		H	L
	CO4			H	L	M			H		M	L
	CO5			H	L	M			H		M	L

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
		√							
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I ORIENTATION 12

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 12

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

UNIT III THINKING SKILL 12

Self- introduction describing –Group Discussion – Debate –Role play- Telephone- Things- etiquette- Recommendation and Sequencing jumbled sentences to make a suggestions-paragraph-advertisement and notice, Designing or drafting posters, writing formal and informal invitations and replies.

UNIT IV WRITING SKILL 12

Definitions - Compound nouns - Abbreviations and acronyms – (a) 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 12

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.

TEXT BOOK:

1. Meenakshi Raman, Sangeetha Sharma , 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 Sangeetha Sharma , Technical Communication Principles and Practice, Oxford University Press, 2009.
3. Sangeetha Sharma, Binod M ishra , Communication skills for engineers and scientists , PHI Learning Pvt Ltd, New Delhi, 2010.

BMA 201	**MATHEMATICS – II**	**L**	**T**	**P**	**C**
	Total Contact Hours - 60	3	1	0	3
	Prerequisite – Mathematics I				
	Course Designed by – Department of Mathematics				

OBJECTIVES

Ability to apply these principles of mathematics in projects and research works.

COURSE OUTCOMES (COs)

CO1	Student shall be able to Solve differential equations, simultaneous linear equations, and some special types of linear equations related to engineering.
CO2	Relate the use of mathematics in applications of various fields namely fluid flow, heat flow, solid mechanics, electrostatics, etc.
CO3	Ability to test hypothesis
CO4	Find intensity of degree of relationship between two variables and also bring out regression equations.
CO5	Understand to solve matrix problems related to real life problems.
CO6	Formulate mathematical models

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H		L								
	CO2		H				H		L	L		M
	CO3		H				H		L	L		M
	CO4					M						M
	CO5										M	M
	CO6										M	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
			√						
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I ORDINARY DIFFERENTIAL EQUATION 12

Higher order linear differential equations with constant coefficients - Method of variation of parameters **– Cauchy's** and L**egendre's linear equations** - simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS 12

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

UNIT III ANALYTIC FUNCTIONS 12

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 12

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

UNIT V STATISTICS 12

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

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 Mathematic", 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.

BPH201	ENGINEERING PHYSICS -II	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – ENGINEERING PHYSICS -I				
	Course Designed by – Department of Physics				

OBJECTIVES

- To expose the students to multiple areas of science of engineering materials which have direct relevance to different Engineering applications
- To understand the concepts and applications of conducting, Semiconducting, magnetic & dielectric materials as well as their optical properties.

COURSE OUTCOMES (COs)

CO1	Understand about properties and advancements of conducting materials.
CO2	Understand the principle and properties semiconducting materials.
CO3	Acquire Knowledge on Magnetic and dielectric Materials.
CO4	To Know about the creation of new materials with novel properties
CO5	To Understand the impact of modern materials in technical uses.
CO6	Learn new engineering materials and its characteristics

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H										
	CO2		L	H		M						
	CO3		M		H							
	CO4	H		M	L							
	CO5		L	L								
	CO6	H										

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
			√						
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I CONDUCTING MATERIALS 9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductor – carrier concentration derivation Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – compound semiconductors -direct and indirect band gap- derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration — Hall effect –Determination of Hall coefficient – Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials – Ferrites and its applications Superconductivity : properties – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

UNIT V ADVANCED ENGINEERING MATERIALS 9

Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, Nanomaterials– Preparation -pulsed laser deposition – chemical vapour deposition – Applications – NLO materials –Birefringence- optical Kerr effect – Classification of Biomaterials and its applications.

TEXT BOOKS:

1. Jayaraman D Engineering Physics II. Global Publishing House, 2014.
2. Palanisamy P.K. Materials Science. SCITECH Publishers, 2011.
3. Senthilkumar G. Engineering Physics II. VRB Publishers, 2011.

REFERENCES:

1.Arumugam M., Materials Science. Anuradha publishers, 2010
2. Pillai S.O., Solid State Physics. New Age International(P) Ltd., publishers, 2009
3. Marikani A. Engineering Physics. PHI Learning Pvt., India, 2009
4 http://ocw.mit.edu/courses/find-by-topic
5 http://nptel.ac.in/course.php?disciplineId=122
6 https://en.wikipedia.org/wiki/Engineering_physics

BCH 201	**ENGINEERING CHEMISTRY-II**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – ENGINEERING CHEMISTRY –I				
	Course Designed by – Department of Chemistry				
OBJECTIVES To impart a sound knowledge on the principles of chemistry involving application oriented topics required for all engineering branches.					
COURSE OUTCOMES (COs)					

CO1	Students will understand the concepts and further industrial applications of surface chemistry
CO2	To impart knowledge about the Industrial importance of Phase rule and alloys
CO3	To make the students to be conversant with Analytical techniques of chemistry and their importance
CO4	To have an idea and knowledge about the Chemistry of Fuels and
CO5	Understanding of engineering materials
CO6	All about bonding and molecular structures

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H	H	L		H		H				M
	CO2		H			H		H				
	CO3	H		L		H		H				M
	CO4			L		H		H				
	CO5			L		H		H				
	CO6			L		H		H		H		M

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
			√						

4	Approval	37th Meeting of Academic Council, May 2015

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 - nit riding . Non- ferrous alloys: Brass and Bronze

UNIT III ANALYTICAL TECHNIQUES 9

Introduction: Type of Spectroscopy - Atomic spectroscopy **–** molecular spectroscopy - Explanation IR spectroscopy **–** principles **–** instrumentation (block diagram only) **–** applications - finger print region UV-visible spectroscopy **—** principle **–** instrumentation (block diagram only) **–**

Beer-**Lambert's law**- – estimation of iron by colorimetry– Atomic absorption spectroscopy- principle - instrumentation (block diagram only) - estimation of Nickel by Atomic absorption spectroscopy Flame photometry– principles – instrumentation (block diagram only) - estimation of sodium ion by Flame photometry

UNIT IV FUELS 9

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

UNIT V ENGINEERING MATERIALS 9

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

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).
3. http://ocw.mit.edu/courses/find-by-topic
4. http://nptel.ac.in/course.php?disciplineId=122
5. https://en.wikipedia.org/wiki/Spectroscopy

BCS 201	**INTERNET PROGRAMMING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	2	0	0	2
	Prerequisite – Fundamentals of Computing & programming				
	Course Designed by – Dept of CSE				

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 (COs)

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

CO2	To know the correct way of solving problem.
CO3	To identify efficient way of solving problem.
CO4	To learn to use office automation tools.
CO5	To implement office automation tools
CO6	To learn and write program in "C".

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	
2	CO1	M	M	M	H	M		M			L	L	
	CO2	H	M	M	H	H		M			L	L	
	CO3	H	M		H	H		M			L	L	
	CO4	H	M		H	H		M			L	L	
	CO5	H	M	M	H	H		M			L	L	
	CO6	H			H	H		M			L	L	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
				√					
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I BASIC INTERNETCONCEPTS 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.

UNITII WEBDESIGNBASICS 6

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

UNITIII DYNAMIC HTML 6

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

UNITIV CLIENT ANDSERVERSIDEPROGRAMMING 6

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

UNITV INTERNETAPPLICATIONS 6

Onlinedatabase-functionsofonlinedatabase-MeritsandDemerits-InternetInformationSystems (IIS)-EDI applications in business and its types-Internet commerce-Types and Applications

.

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. Java Script: A Beginners Guide John Pollock 4thEdition, TMH Edition (2013)
4. VB Script Beginners Guide, Jyoti B. Giramkar, Create Space Independent Publishing (2014)

REFERENCES:

1... Krishnamoorthy & S.Prabhu, ''Internet and Java Programming'', New Age International Publishers, 2010.
2. Thomno A.Powell, ''The Complete Reference HTML and XHTML'', fourth edition, Tata McGraw Hill, 2001
3. E Commerce Kamlesh K.Bajaj, Debjani Nag, Tata McGraw Hill, Second edition, 2010

BSS201	**PERSONALITY DEVELOPMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	2	0	0	2
	Prerequisite – Nil				
	Course Designed by – Department of Management Studies				

OBJECTIVES

To make students groom their personality and prove themselves as good Samaritans of the society.

COURSE OUTCOMES (COs)

CO1	Individual or in-group class presentations pertaining to the applications of conce theories or issues in human development..
CO2	Scores obtained from essay and or objective tests.
CO3	Attendance, classroom participation, small group interactions.
CO4	Research and write about relevant topics.
CO5	Design and complete a research project that can take the form of a developme interview, an observation or assessment through service learning.
CO6	Develop and maintain a Reflection

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	L		H				M				
	CO2		H	H				M				
	CO3							M	H			
	CO4									H	H	
	CO5							M			H	H
	CO6							M				

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)

		√							
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I INTRODUCTION TO PERSONALITY DEVELOPMENT 6

The concept personality- Dimensions of theories of Freud & Erickson- personality – significant 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 6

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 6

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 6

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 6

Resume building- The art of participating in Group Discussion – Acing the Personal (HR & Technical) Interview -Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions.

TEXT BOOKS:

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

BBT202	BIOLOGY FOR ENGINEERS	L	T	P	C
	Total Contact Hours – 30	2	0	0	2
	Prerequisite – +2 Basic Science				
	Course Designed by – Department of Industrial Bio Technology				

OBJECTIVES

Gain vivid knowledge in the fundamentals and uses of biology, human system and plant system**.**

COURSE OUTCOMES (COs)

CO1	To understand the fundamentals of living things, their classification, cell structure and biochemical constituents
CO2	To apply the concept of plant, animal and microbial systems and growth in real life situations
CO3	To comprehend genetics and the immune system
CO4	To know the cause, symptoms, diagnosis and treatment of common diseases
CO5	To give a basic knowledge of the applications of biological systems in relevant industries

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H						M				
	CO2		H							H		
	CO3			H							M	
	CO4										H	
	CO5											
	CO6						H					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
			√						

4	Approval	37th Meeting of Academic Council, May 2015

UNITI INTRODUCTION TO LIFE 6

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 6

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

UNIT IV HUMAN DISEASES 6

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

UNIT V BIOLOGY AND ITS INDUSTRIAL APPLICATION 6

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.

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

BME203	BASIC MECHANICAL ENGINEERING	L	T	P	C
	Total Contact Hours – 30	2	0	0	2
	Prerequisite – +2 Level Maths & Physical Science				
	Course Designed by – Dept of Mechanical Engineering				

OBJECTIVES

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

and realize physical systems, components, or processes	
COURSE OUTCOMES (COs)	
CO1	An ability to apply knowledge of mathematics
CO2	An ability to apply knowledge of science, and engineering
CO3	Ability to design and conduct experiments, as well as to analyze and interpret data.
CO4	An ability to function on multi-disciplinary teams
CO5	To provide basic Knowledge of basic manufacturing process.
CO6	Ability to identify, formulate, and solve engineering problems

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M	M	M	H	M		M			L	L
	CO2	H	M	M	H	H		M			L	L
	CO3	H	M		H	H		M			L	L
	CO4	H	M		H	H		M			L	L
	CO5	H	M	M	H	H		M			L	L
	CO6	H			H	H		M			L	L

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
				√					

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I ENERGY RESOURCES AND POWER GENERATION 6

Renewable and Non-renewableresources-solar,wind,geothermal,steam,nuclearandhidepowerplants-Layout,
majorcomponentsandworking.ImportanceofEnergystorage,Environmentalconstraintsofpowergeneration 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-CONDITIONINGSYSTEM 6

Terminology of Refrigeration and Air-Conditioning, Principle of Vapor Compression& Absorption system- Layoutoftypicaldomesticrefrigerator-window&Splittyperoomairconditioner.

UNITIV MANUFACTURING PROCESSES 6

Brief description of mould makes 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.

UNITV MECHANICALDESIGN 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.

TEXTBOOKS:

1. T.J.Prabhu etal, "BasicMechanicalEngineering", SciTechPublications(p)Ltd,2000

REFERENCES:

1. NAGPAL,G.R,"PowerplantEngineering",KhannaPublishers,2004.
2. RAO.P.N,"ManufacturingTechnology",TataMcGraw-HillEducation,2000.
3. Kalpakjian,"ManufacturingEngineeringandTechnology",AdissoWesleypublishers,1995.
4. Ganesan.V,"Internalcombustionengines",TataMcGraw-HillEducation,2000.
5. C.P.Arora,"RefrigerationandAir Conditioning",TataMcGraw-HillEducation,2001.
6. V.B.Bhandari,"DesignofMachineelements",TataMcGraw-HillEducation,2010.

BCE 201	**BASIC CIVIL ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours – 30	2	0	0	2
	Prerequisite – +2 Level Maths & Physical Science				
	Course Designed by – Department of Civil Engineering				

OBJECTIVES: Understand the basic concepts of civil engineering.

COURSE OUTCOMES (COs)

CO1	Will gain knowledge in Design, concept preparation
CO2	Loading calculation
CO3	Structural component design
CO4	Drawing and chart preparation
CO5	Will understand the components of buildings.
CO6	Will learn the engineering aspects to dams , water supply and sewage disposal.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H	H			H		L				
	CO2					H	H					
	CO3							H	L			
	CO4									L		
	CO5										H	L
	CO6										H	L

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
				√					
4	Approval	37th Meeting of Academic Council, May 2015							

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)

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" (3rded. 2000), TUG Publishers, New Delhi/Tata McGrawHill Publication Co., New Delhi

REFERENCE BOOKS:

1. Rangwala.S.C, "Engineering Materials", 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. RamamruthamS., "Basic Civil Engineering", DhanpatRai Publishing Co. (P) Ltd. (1999).

BCS2L1	INTERNET PRACTICES LABORATORY	L	T	P	C
	Total Contact Hours - 45	0	0	3	1
	Prerequisite – Fundamentals of computing & Programming, Computer practice lab.				
	Course Designed by – Dept of CSE				

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 con science.

COURSE OUTCOMES (COs)

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 identify and implement the correct and efficient way of solving problem.
CO4	To learn to use office automation tools.
CO5	To infer from use office automation tools.
CO6	To learn and write program in "C".

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M	M	M	H	M		M			L	L
	CO2	H	M	M	H	H		M			L	L
	CO3	H	M		H	H		M			L	L
	CO4	H	M		H	H		M			L	L
	CO5	H	M	M	H	H		M			L	L
	CO6	H			H	H		M			L	L

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
				√					
4	Approval	37th Meeting of Academic Council, May 2015							

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
   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.

BCM2L1	**BASIC CIVIL & MECHANICALENGINEERING PRACTICES LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	0	0	3	1
	Prerequisite – Nil				
	Course Designed by – Department of Mechanical Engineering & Civil Engineering				

OBJECTIVES

To provide exposure to the students with hands on experience on various basic Civil & Mechanical Engineering practices.

COURSE OUTCOMES (COs)

CO1	Learn Basic concepts
CO2	Students will get exposure regarding pipe connection for pumps & turbines and to study the joint used in roofs, doors, windows and furniture's.
CO3	Students will get exposure regarding smithy, foundry operations and in latest welding operations such as TIG, MIG, CO2, spot welding etc.,
CO4	Students will get hands on experience on basic welding techniques, machining and sheet metal works.
CO5	Students will get hands on experience on basic machining techniques

CO6	Students will get hands on experience on basic sheet metal techniques

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H	L									
	CO2				H							
	CO3					H	L	L				
	CO4		H				M		L			H
	CO5		H				M		L			H
	CO6		H				M		L			H

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
				√					
4	Approval	37th Meeting of Academic Council, May 2015							

LIST OF EXPERIMENTS

I. CIVILENGINEERINGPRACTICE

Buildings:

a) Studyofplumbingandcarpentrycomponentsofresidentialandindustrialbuildings.Safetyaspects.

Plumbing Works:

a) Studyofpipelinejoints,itslocationandfunctions:valves,taps,couplings,unions,reducers,elbowsin house hold 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 connection of 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 Handtools and Powertools:

a) Study of the joints in roofs, doors, windows and furniture.

b) Hands-on-exercise: Woodwork, joints by sawing, planning and cutting.

c) Preparation of halfjoints, Mortise and Tenon joints.

II MECHANICALENGINEERINGPRACTICE

Welding:

a) 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
e) Preparation of butt joints, lap joints and tee joints by arc welding

Machine assembly practice:

a) Assembling,dismantlingand Studyofcentrifugalpump
b) Assembling,dismantlingand Studyofairconditioner
c) Assembling,dismantlingandStudyoflathe

Moulding:

a) Moulding operations like mould preparation for gear and step cone pulley etc

Fitting:

a) Fitting Exercises–Preparation of square fitting and vee–fitting models.

Demonstration:

a) Smithy operations, upsetting, swaging,setting down and bending.Example–Exercise–Productionofhexagonalheaded bolt.
b) Gas welding.

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", Sci tech Publication, (1999).

BPC 2L1	**PHYSICS AND CHEMISTRY LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	0	0	3/3	1
	Prerequisite – Engineering Physics and Chemistry lab				
	Course Designed by – Department of Physics & Chemistry				

OBJECTIVES: To impart knowledge to the students in practical physics and chemistry

COURSE OUTCOMES (COs)

CO1	Students will understand the concept of hall effect
CO2	Students will understand the concept of semiconductors. .
CO3	Student will understand the working of spectrometer.
CO4	Student will able practically understand the chemical reactions.
CO5	Students will Study the magnetic hysteresis and energy product

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M	H	M			L		L	L	M	H
	CO2		H	M			L		L	L		H
	CO3		H	M			L		L			H

	CO4	M	H	M			L		L	L	M	H	
	CO5		H				L		L	H		H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)				
			√										
4	Approval	37th Meeting of Academic Council, May 2015											

I -LIST OF EXPERIMENTS – PHYSICS

1. Determination of Wavelength, and particle size using Laser
2. Determination of acceptance angle in an optical fiber.
3. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
4. Determination of wavelength of mercury spectrum – spectrometer grating
5. Determination of thermal conductivity of a bad conductor – Lee‟s Disc method.
6. Determination of Young‟s modulus by Non uniform bending method
7. Determination of specific resistance of a given coil of wire – Carey Foster‟s Bridge
8. Determination of Young‟s modulus by uniform bending method
9. Determination of band gap of a semiconductor
10. Determination of Coefficient of viscosity of a liquid –Poiseuille‟s method
11. Determination of Dispersive power of a prism - Spectrometer
12. Determination of thickness of a thin wire – Air wedge method
13. Determination of Rigidity modulus – Torsion pendulum

II-LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of hardness of Water by EDTA
2. Estimation of Copper in brass by EDTA
3. Determination of DO in water (Winkler'smethod)
4. Estimation of Chloride in Water sample (Argento metry)
5. Estimation of alkalinity of Water sample
6. Determination of molecular weight
7. Conduct metric titration (Simple acid base)
8. Conduct metric titration (Mixture of weak and strong acids)
9. Conduct metric titration using $BaCl_2$vs Na_2SO_4
10. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)
11. pH titration (acid & base)
12. Determination of water of crystallization of a crystalline salt (Copper Sulphate)
13. Estimation of Ferric iron by spectrophotometer.

BMA301	**MATHEMATICS - III**	**L**	**T**	**P**	**C**
	Total Contact Hours – 75	3	2	0	4
	Prerequisite – Mathematics I & II				
	Course Designed by – Dept. of Mathematics				

OBJECTIVES

- To introduce Fourier series analysis which is central to many applications in engineering apart
- From its use in solving boundary value problems systems.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations
- That model several physical processes and to develop Z transform techniques for discrete time

COURSE OUTCOMES (COs)

CO1	Solve PDE of second and higher order with constant coefficients.
CO2	Expand given functions by using the concept of Fourier series
CO3	Find Solve many of the Engineering models of Heat equations and Wave equations which are PDEs with boundary conditions
CO4	Solve many problems in Automobile, Medicine, Electronic Engineering which are Differential equations of linear or nonlinear
CO5	Solve differential equations by Laplace transforms
CO6	To understand about Fourier Transform which is necessary for signal processing.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/SOs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					M				L	
	CO2	M		H		H			L	H		M
	CO3	M		M	H					M		
	CO4	M						M		M	H	
	CO5		L	M	H	H				H		
	CO6				H	H	H			H		

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
			√						

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+6

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 9+6

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

UNIT III BOUNDARY VALUE PROBLEMS 9+6

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

UNITIV LAPLACE TRANSFORMS 9+6

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 up to second order with constant coefficients and simultaneous equations of first order with constant coefficients.

UNIT V FOURIER TRANSFORMS 9+6

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

TEXT BOOKS:

1. Kreyszig, E.,"Advanced Engineering Mathematics"8th Edition, John Wiley and Sons, (Asia) Pvt., Ltd, Singapore, 2000.
2. Grewal, B.S.,"Higher Engineering Mathematics" (35thEdition), Khanna Publishers, Delhi2000.

REFERENCE BOOKS:

1. Kandasamy, P., Thilakavathy, K., and Gunavathy,K. "Engineering Mathematics",Volumes 1 and 3(4th Edition) S Chand and Co., New.
2. Narayanan, S.Manicavachangam Pillai, T.K.Ramanaiah, E.,"Advanced mathematics for Engineering Students", Volume2 and 3(2nd Edition), S.Viswanathan (printers & publishers Pvt, Ltd.,) 1992.
3. Venkataraman, M.K,"Engineering Mathematics"Volumes3-A&B, 13th Edition National Publishing Company, Chennai, 1998.
4. Shanmugam,T.N.:http:.www.annauniv.edu/shan/trans.h

BEE305	ELECTRICAL MACHINES	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite –Basic Electrical and Electronics Engineering				
	Course Designed by – Dept. of Electrical and Electronics Engineering.				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Outline the basics of electrical machines and analyze the characteristics of DC machines.
CO2	Understand and implement speed control techniques for practical applications.
CO3	Describe the working of transformer and assess its regulation and efficiency on load and no-load.
CO4	Know the working concept of different types of induction motor and analyze the operating behavior of induction motor using its performance indices.
CO5	Explain the basics of synchronous machines and interpret performance characteristics.
CO6	Understand the power generation and transmission system.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/SOs	a	b	c	d	e	f	g	h	i	j	k
	CO1						M				H	
	CO2	M		H								
	CO3				H					M		
	CO4	M						M				H
	CO5		L									
	CO6						H					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I CIRCUITS AND TRANSFORMERS 9

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

UNIT II DC MOTORS 9

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

UNIT III INDUCTION MOTORS 9

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

UNIT IV SYNCHRONOUS AND SPECIAL MACHINES 9

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

UNIT V TRANSMISSION AND DISTRIBUTION 9

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

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.

REFERENCE BOOKS:

1. www.ceecs.fau.edu

BEC301	SIGNALS AND SYSTEMS	L	T	P	C
	Total Contact Hours –60	4	0	0	4
	Prerequisite – Mathematics-II				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	To Understand different types of signals-continuous and discrete,odd and even,periodicand a periodic etc.Be able to classify systems based on their properties
CO2	To familiarize the concepts of transform based continuous time and discrete time analysis

	of signals and systems
CO3	Analyze continuous time signals and systems by using appropriate mathematical tools
CO4	Analyze sampling process and sampling of discrete time signals.
CO5	Analyze discrete time signals and systems by using appropriate mathematical tools
CO6	Determine Fourier transforms for continuous-time and discrete-time signals (or impulse-response functions), and understand how to interpret and plot Fourier transform magnitude and phase functions.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	E	f	g	h	i	j	k
2	CO1	H	M		M	H						
	CO2	H			M	H					L	
	CO3	M			H	H						
	CO4					H		M				M
	CO5	H	M		M							
	CO6	H	M		M		M				M	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	roject/Term Paper/ Seminar/ Internship (PR)nship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

UNITI 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. signals, Fourier Transform and Laplace Transform in Signal Analysis.

UNIT III LTI-CT SYSTEMS 12

Differential equation, Block diagram representation, Impulse response, Convolution integral, Frequency response, Fourier Methods and Laplace transforms in analysis, State equations and Matrix.

UNIT IV ANALYSIS OF D.T. SIGNALS **12**

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

UNIT V LTI-DT SYSTEMS **12**

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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, 20076.
4.www.nptel.ac.in

BEC302	PRINCIPLES OF DIGITAL ELECTRONICS	L	T	P	C
	Total Contact Hours – 60	3	1	0	4
	Prerequisite –Basic Electrical & Electronics Engineering				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

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

COURSE OUTCOMES (COs)

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 sequential circuits
CO6	To illustrate the concept of asynchronous sequential circuits

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H	H		H	L	M			M		
	CO2	M	H	M	H		M					
	CO3	H	H									
	CO4	H										
	CO5	M	H	M	H		M			M		
	CO6	H	H	M	H					M		

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	roject/Term Paper/ Seminar/ Internship (PR)
					√				
4	Approval		37th Meeting of Academic Council, May 2015						

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, Flip-flops - 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/Down counterSynchronousUp/Down counters, Modulo–n-counter, 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.

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.

REFERENCE BOOKS:

1. John F.Wakerly, "Digital Design", Fourth Edition, Pearson/PHI, 2008
2. John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning,2006.
3. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition,TMH,2006.
6 .http://www.electrical4u.com/digital-electronics

BEE301	CIRCUIT THEORY	L	T	P	C
	Total Contact Hours-45	3	0	0	3
	Prerequisite- Basic Electrical & Electronics Engg				
	Course Designed by – Dept of Electrical & Electronics Engineering				

OBJECTIVES

To develop problem solving skills and understanding of circuit theory through the application of techniques and principles of electrical circuit analysis to common circuit problems.

COURSE OUTCOMES (COs)

CO1	To develop an understanding of the fundamental laws and elements of electric circuits.
CO2	To develop the ability to apply circuit analysis to DC and AC circuits
CO3	To understand advanced mathematical methods such as Laplace and Fourier transforms along with linear algebra and differential equations techniques for solving circuits problem
CO4	To learn the "alphabet" of circuits, including wires, resistors, capacitors, inductors, voltage and current sources, and operational amplifiers.
CO5	To understand about sinusoidal steady state analysis.
CO6	To analyze about coupled circuits.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M	H	H	H	L	M	L			H	M
	CO2	M	H	H	M	M	H	M	M		L	M
	CO3	H	M		H	H		M			L	L
	CO4	H	M		H	H	L	M	M		L	M
	CO5	M	M	M	M	H		M			L	L
	C06	M	H	H	H	L	M	L			H	M

3	Category	Humanities and Social Sciences (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I BASIC CIRCUIT CONCEPTS 9

Circuit elements – Kirchhoff's Law – V-I Relationship of R,L and C – Independent Sources – Dependent sources – Simple Resistive circuits – Networks reduction – Voltage division – current source transformation.- Analysis of circuit using mesh current and nodal voltage methods.

UNIT II SINUSOIDAL STEADY STATE ANALYSIS 9

Phasor – Sinusoidal steady state response concepts of impedance and admittance – Analysis of simple circuits – Power and power factors — Solution of three phase balanced circuits and three phase unbalanced circuits –-Power measurement in three phase circuits.

UNIT III NETWORK THEOREMS (BOTH AC AND DC CIRCUITS) 9

Superposition theorem – The venin's theorem - Norton's theorem-Reciprocity theorem- Maximum power transfer theorem.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 9

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input with sinusoidal input.

UNIT V RESONANCE AND COUPLED CIRCUITS 9

Series and paralled resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

TEXT BOOKS:

1.Sudhaker A. and Shyam Mohan S.p., "Dircuits and Network Analysis and Synthesis" TataMcGrew Hill Co. Ltd., New Delhi, 1994.

2. Hyatt W.H. and Kemmerlay J.E. „Engineering Circuits Analysis", McGrew Hill international Editions,1993.

REFERENCE BOOKS:

1.Edminister J.A. "Theory and Problems of Electric Circuits " Schaum's outline series, McGrew Hill Book Company 2nd edition, 1983.

3.http://nptel.ac.in/courses/108102042/

BCE306	ENVIRONMENTAL STUDIES	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Engineering chemistry I & II				
	Course Designed by – Dept of Civil Engineering				

OBJECTIVES

1. To study the nature and facts about environment.
2. To find and implement scientific, technological, economic and political solutions to environmental problems.
3. To study the interrelationship between living organism and environment.
4. To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.

5. To study the dynamic processes and understand the features of the earth's interior and surface. 6. To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

COURSE OUTCOMES (COs)	
CO1	Play an important role in transferring a healthy environment for future generations
CO2	To study the interrelationship between living organism and environment.
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

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low												
1	COs/POs	a	B	c	d	e	F	g	h	i	j	k	
2	CO1						M	M			M		
	CO2	L					M	H			H		
	CO3		H					H					
	CO4							M			M		
	CO5	M	M					H					
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)		Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)		Project/Term Paper/ Seminar/
		√											
4	Approval	37th& 38th Meeting of Academic Council, May 2015 and January 2016											

UNIT I THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES 9

Definition, scope and importance, Need for 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 effect on forests and tribal people.

b) Water resources : Use and over-utilization of surface and ground water, flood, drought conflicts over water, dams-benefits and problems.

c) Mineral resources : Uses and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources : World food problems, changes caused by agriculture and overgrazing , effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, case studies.

f) Land resources : Land as a resource, Land degradation, man induced landslides, soil erosion and desertification

Role of an individual in conversation of natural resources, Equitable use of resources for sustainable lifestyles.

UNIT II ECOSYSTEMS 8

Concepts of an ecosystem. Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the following ecosystem :- Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, (ponds, streams, lakes, rivers, oceans, estuaries)-

Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation - Ethics : Issues and possible Solutions, Climate change, global warming, acid rain, ozone layer depletion.

UNIT III BIODIVERSITY AND ITS CONSERVATION 7

Introduction and Definition - genetic, species and ecosystems diversity, Biogeographical classification of India - Value biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, national and local levels. India as a mega-diversity nation, Hot-spots of biodiversity -Threats to biodiversity, habitat, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation biodiversity - In-situ and Ex-situ conservation of biodiversity.

Environmental Pollution 7

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

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 8

From Unsustainable to Sustainable development, Urban problems related to energy, nuclear accident and holocaust, case studies, wasteland reclamation, Environmental Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife protection Act, Forest Conservation Act, Issues involved in enforcement of environmental Legislation, public awareness –

Fireworks and its impact on the Environment – Chemicals used in Fireworks – (Fuel –oxidizing Agent – Reducing Agent –Toxic Materials – Fuel –Binder- Regulator) – Harmful nature of ingredients – chemical effects on health due to inhaling fumes – Noise produced by fire crackers – Noise pollution – Noise level standards for fire crackers – Intensity of sound – Impact on hearing – Safety measures.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations, population explosion-Family Welfare programs, Environment and human health, Human Rights, Value Education, HIV and AIDS, Women and Child Welfare, Role of Information Technology in Environment and Human health - Case Studies.

TEXTBOOKS:

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p

3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,Ahmedabad – 380 013, India, 1989.
4. Benny Joseph, "Environmental Studies"., TATA McGraw Hill, 2010

REFERENCES

1. Trivedi R.K., "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol.I and II, EnviroMedia 2009
2. Cunningham, W.P.Cooper, T.H.Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. Wager K.D. "Environmental Management", W.B. Saunders Co., Philadelphia, USA, 1998.
4. Trivedi R.K. and P.K. Goel, "Introduction to Air Pollution", Techno Science Publications 2013
5. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB),2001.
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
7. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
8. Jadhav, H &Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
9. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
10. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
11. Rao M N. &Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publish Co. Pvt. Ltd. 345p.
12. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut.
13. http://eng.mft.info/uploadedfiles/gfiles/c8e31c9e52d84c3.pdf

BEE3L3	ELECTRICAL ENGINEERING LAB	L	T	P	C
	Total Contact Hours – 45	0	0	3	2
	Prerequisite – Basic Electrical & Electronics Engineering practices Lab				
	Course Designed by – Dept. of Electrical and Electronics Engineering.				

OBJECTIVES

To understand the performance of electrical generators, motors and transformers by conducting different tests

COURSE OUTCOMES (COs)

CO1	Experimentally verify the performance characteristics of Generators
CO2	Experimentally verify the performance characteristics of Motors
CO3	Experimentally verify the performance characteristics of Transformers
CO4	To verify the performance characteristics of Induction motors.
C05	To Understand the concepts of alternators
C06	To verify the performance of compound motors

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H			H							
	CO2	H	H	H	H	H				M	M	
	CO3	H		H	H							
	CO4		H		H							
	CO5	M			H					M	M	
	CO6		H	M	H	H						

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/
					√				

4	Approval	37th Meeting of Academic Council, May 2015

List of Experiments:

1. Power Measurements in 3-phase circuits.
2. Swinburne's Test.
3. Speed control of DC Shunt motors
4. Load Test on DC shunt generator
5. OCC and Load Test on DC shunt generator
6. OC and SC tests on Transformers
7. Load Test on Transformer.

8. Regulation of alternator by EMF and MMF methods.
9. Equivalent circuit on Single phase induction motor.
10. Load test on DC Compound motor
11. Speed control of DC Compound motor.
12. Study of DC and AC motor starters.

Experiments beyond the syllabus should be conducted.

BEC3L1	**ELECTRONIC DEVICES AND CIRCUITS LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	0	0	3	2
	Prerequisite –Basic Electrical & Electronics Engineering practices Lab				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

- To be exposed to the characteristics of basic electronic devices
- Model the electronic circuits using tools such as PSPICE

COURSE OUTCOMES (COs)

CO1	Learn the characteristics of basic electronic devices.
CO2	Learn the Characteristics of UJT
CO3	Learn the Characteristics of FET
CO4	Learn about Power amplifiers.
CO5	Learn about Differential amplifiers
CO6	To understand the concepts of simulation by using Spice tool

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	B	c	d	e	f	g	h	i	j	k
2	CO1	H			H		M			M	M	
	CO2	M		H	H			M				
	CO3	M		H	H			M		M	M	
	CO4	M			H	H						
	CO5	M	L		H							
	CO6		H	H	H		H			M		

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	roject/Term Paper/ Seminar/
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

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

Experiments beyond the syllabus should be conducted.

BEC3L2	**DIGITAL ELECTRONICS LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	0	0	3	2
	Prerequisite – Basic Electrical & Electronics Engineering practices Lab				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

- To know the concepts of Combinational circuits.
- To understand the concepts of flip-flops, registers and counters

COURSE OUTCOMES (COs)

CO1	Learn the basics of gates.
CO2	Construct basic combinational circuits and verify their functionalities
CO3	Apply the design procedures to design basic sequential circuits
CO4	Learn about counters
CO5	Learn about Shift registers
CO6	To understand the basic digital circuits and to verify their operation

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M			H		M			M		
	CO2	H		H	H			M			M	
	CO3	H		H	H			M		M	M	
	CO4	M	M	H	H	H						
	CO5	M	L		H							
	CO6	H	H	H	H		H			M		

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	roject/Term Paper/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

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.

Experiments beyond the syllabus should be conducted.

BMA402	**NUMERICAL METHODS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 75	3	2	0	4
	Prerequisite – Mathematics I,II,III				
	Course Designed by – Dept. of Maths.				

OBJECTIVES

- To train the students to Predict the system dynamic behavior through solution of ODEs modeling the system
- To solve PDE models representing spatial and temporal variations in physical systems through numerical methods.

COURSE OUTCOMES (COs)

CO1	Solve a set of algebraic equations representing steady state models formed in engineering problems
CO2	Fit smooth curves for the discrete data connected to each other or to use interpolation methods over these data tables
CO3	Find the trend information from discrete data set through numerical differentiation and Summary information through numerical integration.
CO4	Predict the system dynamic behavior through solution of ODEs modeling he system
CO5	Solve PDE models representing spatial and temporal variations in physical systems through numerical methods.
CO6	To train the students with Mathematical techniques to solve problems in Engineering with numerical data.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	
2	CO1	H	H				M			L			
	CO2	H	H	M	M	H				M	H		
	CO3	H					H						
	CO4	H		M		H							
	CO5	H	M							M			
	CO6	H	H	M		M	H			L	H		

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	roject/Term Paper/ Seminar/ Internship
			√						
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEM 9+6

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

UNIT II INTERPOLATION (FINITE DIFFERENCES) 9+6

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

UNIT III NUMERICAL DIFFERNTIATION AND INTEGRATION 9+6

Numerical Differentiation with interpolation polynomials, Numerical integration by Trapezoidal Simpson"s (Both 1/3" and 3/8") rule, Double integrals using Trapezoidal and Simpson"s rule.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATION 9+6

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

UNIT V BOUNDARY VALUE PROBLEMS FOR ODE AND PDE 9+6

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.

TEXT BOOKS:

1. Sastry.SS "Introductory Numerical Methods" PHI, 2010
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.

REFERENCE BOOKS:

1.Grewal, B.S. "Higher Engineering Mathematics (36th edition)" Khanna Publication Delhi .
2Curtis F.Gerald. "Applied Numerical Analysis" 7th Edn. Pearson Education, Chennai-600113.
3.Dennis G.Zill and Warren S.Wright. "Advanced Engineering Mathematics". 3rd Edn. Jones & Bartlett Publishers, UK. 1992
4. www.mathforcollege.com

BEC402	ELECTRONIC CIRCUITS	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Circuit Theory, Basic Electrical & Electronics Engineering				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

- Develop the fundamental knowledge about the need for biasing and its various methods.
- Analyze the small signal equivalents circuits and high frequency analysis of Bipolar
- Junction Transistor and Field Effect Transistor
- Analyze the methods of constructing feedback amplifiers, oscillators and tuned amplifiers.
- Outline the performance of wave shaping circuits, multivibrators and time base generators
- Construction of power supplies

COURSE OUTCOMES (COs)

CO1	Discuss the concepts of various biasing methods for BJT. Analyze the BJT configurations and BJT amplifiers using small signal model.
CO2	To learn about the large signal amplifiers
CO3	To learn about the various feedback amplifier.
CO4	Understand the basic principles of different types of tuned amplifiers and learn the neutralization techniques
CO5	Describe the operation of multivibrator circuits, time base generators, and their applications
CO6	Discuss the working and characteristics of regulated power supply and SMPS.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	
2	CO1	M	M		H		M			M			
	CO2	H		H	H			M			M		
	CO3	H		H	H			M		M	M		
	CO4	M	M	H	H	H							
	CO5	M	L		H								
	CO6	H	H	H	L					M			

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ roject/Term Paper/ Seminar/
					√				

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I BASIC DEVICE STABILIZATION AND LOW FREQUENCY DESIGN ANALYSIS 9

circuits for BJT, DC and AC Load lines, Stability factor analysis, Temperature compensation methods, biasing circuits for FET's and MOSFET's. 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 II 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 III 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, 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, Quartz Crystal Oscillator circuits.

UNIT IV TUNED AMPLIFIERS & MULTIVIBRATOR CIRCUITS 9

Tank circuits, Analysis of single tuned amplifier, Double tuned, stagger tuned amplifiers, instability of tuned amplifiers, stabilization techniques, Narrow band neutralization using coil, Broad banding using Hazeltine neutralization, Class C tuned amplifiers and their applications. Efficiency of Class C tuned Amplifier. Astable multivibrators, monostable and bistable multivibrator using similar and complementary transistors, speed up capacitors, Schmitt trigger circuits.

UNITV RECTIFIERS, BLOCK OSCILLATORS AND TIMEBASE GENERATORS9

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. RC and RL wave shaping circuits, UJT sawtooth generators, Linearization using constant current circuit, Bootstrap and Miller saw tooth generators, current time base generators, Time base circuits - Voltage-Time base circuit, Current-Time base circuit.

TEXTBOOK:

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

2.David A.Bell,"Electronic Devices and Circuits", FifthEdition, Oxford University Press,2000

3. Donald .A. Neamen, Electronic Circuit Analysis and Design –2nd Edition,Tata McGraw Hill, 2009.

4. Millman.J. and Halkias C.C, "Integrated Electronics", McGraw Hill, 2001.

REFERENCE BOOKS:

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

2.Adel.S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", 6th Edition, Oxford University.

3.David A., "Bell Electronic Devices and Circuits", Oxford Higher Education Press,5th Editon,
4.Behzad Razavi, "Design of Analog CMOS Integrated Circuits", Tata Mc Graw Hill,2007.
5.Paul Gray, Hurst, Lewis, Meyer "Analysis and Design of Analog Integrated Circuits",

BEC405	LINEAR INTEGRATED CIRCUITS	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Principle of Digital Electronics				
	Course Designed by – Dept. of Electronics and Communication Engineering				

OBJECTIVES

- 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 multipliers
- To know about various analog switches and different A/D and D/A convertors.
- To understand the concepts of switched capacitor filters, Voltage regulator

COURSE OUTCOMES (COs)

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
CO4	Gain knowledge about PLL
CO5	Learn about various techniques to develop A/D and D/A convertors
CO6	Develop skills to develop simple filter circuits and various amplifiers and can solve problems related to it.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1		H				M					
	CO2	M			H	M				M		
	CO3	M	M	M		M						
	CO4	M						M				
	CO5		L		M	L		M		M	M	
	CO6	M		M			H					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	roject/Term Paper/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

UNIT ICIRCUIT CONFIGURATION FOR LINEAR ICS 9

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

UNIT II APPLICATION OF OPERATIONAL AMPLIFIERS 9

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 9

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 9

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 9

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.

TEXT BOOKS:

1. D.Roy Choudhry,Shail Jain,"LinearIntegratedCircuits", NewAgeInternational Pvt.Ltd.,2000.
2. Sergio Franco, "Design with Operational Amplifiers and Analog IntegratedCircuits",3rd Edition, Tata McGraw-Hill, 2007.

REFERENCE BOOKS:

1.Ramakant A.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.GrayandMeyer,"Analysisand Design ofAnalogIntegratedCircuits",WileyInternational,2005.
5.MichaelJacob,"ApplicationsandDesignwithAnalogIntegratedCircuits",PrenticeHallofIndia,1996.WilliamD.Stanley,"OperationalAmplifierswithLinearIntegratedCircuits",PearsonEducation,2004.
7.S.Salivahanan&V.S.Kanchana Bhaskaran, "Linear IntegratedCircuits",TMH,2008.
8. www.chegg.com/tutors/

BCS406	OBJECTED ORIENTED PROGRAMMING AND DATA STRUCTURES	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Fundamentals of Computing and Programming				
	Course Designed by – Dept. of Computer Science Engineering.				

OBJECTIVES

- To develop solutions to a given problems using class object concepts.
- To understand the concepts offloading, inheritance and polymorphism
- To learn the basic data structures and its operations.

COURSE OUTCOMES (COs)

CO1	Develop solutions to a given problems using class object concepts.
CO2	Illustrate overloading, inheritance and polymorphism concepts with example
CO3	Explain the basic data structures and its operations
CO4	Make use of basic data structures to solve problems
CO5	To develop programs using C++ which forms the basic for advanced programming
CO6	Outline various searching and sorting algorithms

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
	L	M	H				M					
	CO2	M			H	M				M		
	CO3	M	M			M						
	CO4	L						M				
	CO5	H	H	L	M			M		M	M	
	CO6	M					H					

3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I DATA ABSTRACTION&OVERLOADING 9

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

UNIT II INHERITANCE&POLYMORPHISM 9

Base Classes and Derived Classes–Protected Members–Overriding –Public,Protected and Private Inheritance –Constructors and Destructors in derived Classes–Implicit Derived– Class Object To Base–Class Object Conversion–Virtual functions–This Pointer–Abstract Base Classes and Concrete Classes– Virtual Destructors– Dynamic Binding.

UNIT III LINEAR DATASTRUCTURES 9

Abstract Data Types(ADTs)–ListADT–array-basedimplementation– linked list implementation– singly linked lists–Polynomial Manipulation-Stack ADT – Queue ADT

UNIT IV NON-LINEAR DATASTRUCTURES 9

Trees–BinaryTrees–Binary tree representation and traversals–The Search Tree ADT– Graph and its representations–Graph Traversals–Breadth-first search–Depth-first search– Bi-connectivity**.**

UNIT V SORTING AND SEARCHING 9

Sorting algorithms:Insertion sort-Quick sort –Mergesor-Searching: Linear search –Binary Search.

TEXT BOOKS:

1. Deitel and Deitel,―C++,HowTo Program‖,FifthEdition, PearsonEducation, 2005.
2. BhushanTrivedi,―Programming withANSIC++,AStep-By-Step approach, OxfordUniversityPress, 2010.

REFERENCE BOOKS:

1. Goodrich, Michael T., Roberto Tamassia,DavidMount, ―Data Structuresand Algorithms in C++‖, 7th Edition, Wiley. 2004
2. Thomas H. Cormen, CharlesE. Leiserson, RonaldL. Rivest andClifford Stein, "Introduction to Algorithms", Second Edition, McGraw Hill, 2002.
3. BjarneStroustrup,―TheC++ProgrammingLanguage‖,3rdEdition,Pearson Education,2007

4.EllisHorowitz,SartajSahniandDineshMehta,―Fundamentals ofDataStructures inC++‖, GalgotiaPublications, 2007.

OtherReferences:

1. http://users.cis.fiu.edu/~weiss/
2. www.youtube.com/watch?v=x3aC8F1X8ao

BEC403	ELECTROMAGNETIC FIELDS AND WAVES	L	T	P	C
	Total Contact Hours -60	4	0	0	4
	Prerequisite –Mathematics-III				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

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 (COs)

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
CO6	To understand, and analysethe electromagnetic field distribution which forms the basis for advanced subjects related to electromagnetic field.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H			M		M					
	CO2	M	M	M				M			H	
	CO3	M						L				
	CO4					H		M		M	M	
	CO5		L	M	M					M		
	CO6	M				H	H			H		

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)(PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT ISTATIC ELECTROMAGNETIC FIELDS 12

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

UNIT II STATIC MAGNETIC FIELD 12

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

UNIT IIIELECTRIC FIELD IN DIELECTRICS 12

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

UNIT IV MAGNETIC FIELD IN FERROMAGNETIC MATERIALS 12

Magnetic materials, Magnetic dipoles, Loops and Solenoids, Magnetization, Inductance, Energy in an Inductor and Energy Density, Boundary relations, Ferro magnetism, Hysteresis, Reluctance and Permeance, Problems.

UNIT VTIME 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, Comparison of field and circuit theory, Circuit Application of pointing Vector.

TEXT BOOKS:

1. William H Hayt and Jr John A Buck, "Engineering Electromagnetics",Tata McGraw-Hill Publishing Company Ltd, NewDelhi, 2008
2. Sadiku MH,"Principles of Electromagnetics", Oxford University PressInc, NewDelhi,2009
3. David K Cheng, "Field and Wave Electromagnetics", Pearson EducationInc,Delhi,2004

REFERENCE BOOKS:

1. John D Kraus and Daniel A Fleisch,"Electromagnetics with Applications",McGrawHill Book Co,2005
2. Karl E Longman and SavaV Savov,"Fundamentals of Electromagnetics",Prentice Hall of India,NewDelhi,2006
3. Ashutosh Pramanic,"Electromagnetism", Prentice Hall of India,NewDelhi,2006
4. www.Wiley.com

BEI406	**ELECTRONIC INSTRUMENTATION**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite –Basic Electrical & Electronics Engineering				
	Course Designed by – Dept. of Electronics and instrumentation Engineering.				

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.

COURSE OUTCOMES (COs)

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	To have a deep understanding about instrumentation concepts this can be applied to control systems.
CO6	Relate the usage of various instrumentation standards.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1		M									
	CO2	H		H		M	L		M	M		

	CO3	M	M	H	H				M		M		
	CO4	H		H	H	H			M				
	CO5				M					M			
	CO6	H	L				H				L		
3	Category	Humanities & Social Studies (HS)		Basic Sciences & (BS)		Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)	
							√						
4	Approval	37th Meeting of Academic Council, May 2015											

UNIT ITRANSDUCERS **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 IISIGNAL GENERATOR AND SIGNAL ANALYZERS **9**

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

UNIT III DIGITAL INSTRUMENTS **9**

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

UNIT IV DATA DISPLAY AND RECORDING SYSTEM **9**

CRO, single beam, dual trace, double beam CRO, Digital storage and Analog storage Oscilloscope, sampling Oscilloscope, Power scope, Curve Tracer, Analog, Digital Recorders and Printers.

UNIT V COMPUTER CONTROLLED TEST SYSTEM **9**

Testing and Audio amplifier, Testing a Radio Receiver, Instrument used in Computer Controlled Instrumentation, Digital Control Description, Microprocessor based measurements, Isolation and safety standards of Electronic equipments, Case studies in Instrumentation.

TEXT BOOKS:

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

REFERENCE BOOKS:

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.
3. Oliver and Cage, " Electronic Measurements and Instrumentation ", McGraw Hill, 1975.
4. https://www.nptel.ac.in

BEC4L1	ELECTRONIC CIRCUIT DESIGN LAB	L	T	P	C
	Total Contact Hours - 45	0	0	3	2
	Prerequisite –Electronics Devices and circuits Lab				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

- To gain hands on experience in designing electronic circuits.
- To learn simulation software used in circuit design.
- To learn the fundamental principles of amplifier ,Oscillator and multivibrator circuits
- Construct waveform generation circuits

COURSE OUTCOMES (COs)

CO1	Analyse the characteristics of amplifiers.
CO2	Analyse the characteristics of Oscillators.
CO3	Analyse the characteristics of Multivibrators
CO4	Analyse the characteristics of tuned amplifiers
CO5	Analyse the frequency response of amplifiers using pSpice
CO6	Model the design of electronic circuits using PSpice

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H		H	H		M			M		
	CO2	H	M	H	H		M		M	M	L	
	CO3	M	M		H							
	CO4	M			H			M				
	CO5			M		H						
	CO6	L	H	H		H	H		M	M	M	

3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

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

Experiments beyond the syllabus should be conducted.

BEC4L2	**LINEAR INTEGRATED CIRCUITS LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2
	Prerequisite – Basic Electrical & Electronics Engineering Lab				
	Course Designed by – Dept. of Electronics and Communication Engineering				

OBJECTIVES

- To apply operational amplifiers in linear and nonlinear applications.
- To acquire the basic knowledge of special function ICs
- To use SPICE software for circuit design

COURSE OUTCOMES (COs)

CO1	Design and analyse the various linear application of op-amp
CO2	Design and analyse the various non-linear application of op-amp
CO3	Design and analyse filter circuits using op-amp
CO4	Design and analyse oscillators and multivibrator circuits using op-amp
CO5	Design and analyse the various application of 555 timer
CO6	Analyse the performance of oscillators and multivibrators using SPICE

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H		H	H		M		L			
	CO2	H		H	H					M	L	
	CO3	M	M	M	H	M			H	M	M	
	CO4	M		M	H					M		
	CO5	M		M	H					H		
	CO6	H	M	M	H	M				H	M	

3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

LIST OF EXPERIMENTS

1. Inverting and non-inverting 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

Experiments beyond the syllabus should be conducted.

BCS4L3	**OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2
	Prerequisite –Computer Practice Lab				
	Course Designed by – Dept. of Computer Science Engineering				

OBJECTIVES

- To learn various object oriented concepts through simple programs.
- To understand the concepts of searching and sorting algorithms

COURSE OUTCOMES (COs)

CO1	Implement various object oriented concepts through simple programs
CO2	Implement different data structures usingC++.
CO3	Apply the different data structures for implementing solutions to practical problems.
CO4	Demonstrate searching algorithms
CO5	Demonstrate sorting algorithms
CO6	To develop the skills in programming using c++ which forms the basics for advanced programming

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H	H				M		L			
	CO2				M	M				M	M	
	CO3		M		M	M		M		M	M	
	CO4	M	M	M						M		
	CO5	M		M						H		
	CO6	H	H	M		M		H		H	M	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

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
   - Array implementation
   - Linked list implementation
4. Binary Search tree
5. Sorting
   - Quick sort
   - Mergesort
6. Searching
   - Linear search
   - Binarysearch

Experiments beyond the syllabus should be conducted.

BEC505	DIGITAL SIGNAL PROCESSING	L	T	P	C
	Total Contact Hours - 60	4	0	0	4
	Prerequisite –Signals and Systems				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES:

- To study about discrete time systems and to learn about FFT algorithms.
- To study the design techniques for FIR and 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 (COs)

CO1	To apply DFT for the analysis of digital signals & systems
CO2	To design FIR filters
CO3	To design IIR filters
CO4	To characterize finite Word length effect on filters
CO5	To have a deep understanding on basics of digital signal processing which can be applied to communication systems
CO6	To design the Multirate Filters

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H			H	H						
	CO2	H	H	H	H	H				M		
	CO3	H	H	H	H	H				M		
	CO4		M		M		H			M		
	CO5	M									M	
	CO6			H			L					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I DISCRETE – TIME SIGNALS AND SYSTEMS 12

Sampling of Analogue signals – aliasing – standard discrete time signals – classification – discrete time systems – Linear time invariant stable casual discrete time systems – classification methods – linear and circular convolution – 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 IVFINITE WORD LENGTH EFFECTS: 12

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

UNIT V SPECIAL TOPICS IN DSP: 12

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1.Sanjit K.Mitra,"Digital Signal Processing–A Computer Based Approach",Tata McGraw Hill,

2. A.V.Oppenheim, R.W. Schafer andJ.R. Buck, "Discrete-Time Signal Processing", 8th IndianReprint,Pearson,2004.
3. www.ocw.mit.edu

BEC502	MICROPROCESSOR AND MICROCONTROLLER	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite –Principles of Digital Electronics				
	Course Designed by – Dept. of Electronics and Communication Engineering				

OBJECTIVES

- The objective of this course is to become familiar with the architecture and the instruction set of an Intel microprocessor
- Assembly language programming will be studied as well as the design of various types of digital and analog interfaces
- Understand the architecture of 8085 and 8051

COURSE OUTCOMES (COs)

CO1	Design and implement programs on 8086,ARM, PIC.
CO2	Design I/O circuits.
CO3	The program prepares students to successfully compete for employment in Electronics, Manufacturing and Embedded fields.
CO4	Design Memory Interfacing circuits.
CO5	Design and implement 8051 microcontroller based systems.
CO6	Describe the architecture and instruction set of ARM microcontroller

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M	H		H		M			H	M	
	CO2	M	L	H		M				L		
	CO3	M										
	CO4	M			H	H				M	M	
	CO5	M	H			H				M		

	CO6					M	H						
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)	
							√						
4	Approval	37th Meeting of Academic Council, May 2015											

UNITI MICROPROCESSOR 8086 9

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 9

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 9

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).

UNIT IV MICROCONTROLLER-8051 9

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 MICROPROCESSOR & MICROCONTROLLER 9

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

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.

REFERENCE BOOKS:

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;
3.www.nuvoton.com

BEC504	COMMUNICATION ENGINEERING I	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite –Signals and Systems				
	Course Designed by – Dept. of Electronics and Communication Engineering				

OBJECTIVES

- 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.

COURSE OUTCOMES (COs)

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	To evaluate 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	To understand trade-offs (in terms of bandwidth, power, and complexity requirements)
CO6	Design of practical communication system at the block diagram level under certain constraints and requirements

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H		M	H		M	M			M	
	CO2	M	M					M		M		
	CO3	M	M		H	M	L			M	L	
	CO4	M		M		H					M	
	CO5		M		M		M			H		
	CO6	H	M		M	M		M		M		

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I AMPLITUDE MODULATION SYSTEMS 9

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 9

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 9

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 9

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.

REFERENCE BOOKS:

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.
3. www.techvyom.com

BMA504	RANDOM PROCESS	L	T	P	C
	Total Contact Hours - 75	3	2	0	4

	Prerequisite – Mathematics II
	Course Designed by – Dept. of Mathematics

OBJECTIVES

- To impart adequate knowledge about probability concepts,
- To make students understand Moment Generating Functions.

COURSE OUTCOMES (COs)

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	To make students understand Discrete and Continuous Random variables, Random Processes and their applications in Electronic Transmissions
CO5	To Understand about the correlation Functions
CO6	Find the trend information from discrete data set through numerical differentiation and summary information through random process

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					M	M	H	H		H
	CO2	H	M	H								
	CO3	H			H	M	M				L	
	CO4	H		M		H		M	L			M
	CO5	H	M		M			H		M		
	CO6	H	M			M	H			M	M	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
			√						
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I PROBABILITY AND RANDOM VARIABLES 9+6

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 9+6

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

UNIT III RANDOM PROCESSES 9+6

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

UNIT IV CORRELATION FUNCTION 9+6

Auto correlation for discrete and continuous processes, Cross correlation functions, Correlation integrals.

UNIT V SPECTRAL DENSITIES 9+6

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

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", HarperandRowPublishers, New York, (1982).

REFERENCE BOOKS:

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.
5. Pearson Education, Chennai-600113
6. www.math.chalmers.se/Stat/.../CTH/.../091

BEC5L1	DIGITAL SIGNAL PROCESSING LABORATORY	L	T	P	C
	Total Contact Hours - 45	0	0	3	2
	Prerequisite – Object Oriented Programming & data Structures Lab				
	Course Designed by – Dept. of. Electronics and Communication Engineering				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Experiment concepts of DSP and its applications using MATLAB Software
CO2	To understand about the basic signal generation
CO3	To learn Fourier Transform Concepts
CO4	To design FIR filters
CO5	To design IIR filters.
CO6	Demonstrate their abilities towards DSP processor based implementation of DSP systems

Mapping of Course Outcomes with Program outcomes (POs
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	B	c	d	e	f	g	h	i	j	k	
2	CO1	H	H		M	H	M			M			
	CO2	L		M		H		M					
	CO3	M				H		M		M	M		
	CO4	M	M	M		H		M		M	M		
	CO5	M	M	M		H				M			
	CO6	L			M						H		
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)		Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)	
							√						
4	Approval	37th Meeting of Academic Council, May 2015											

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.

Experiments beyond the syllabus should be conducted.

BEC5L6	**MICROPROCESSOR AND MICROCONTROLLER LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2
	Prerequisite –Digital Electronics Lab				
	Course Designed by – Dept. of Electronics and Communication Engineering				

OBJECTIVES

- Study the Architecture of 8085&8086 microprocessor.
- Learn the design aspects of I/O and Memory Interfacing circuits.
- Study the Architecture of 8051 microcontroller

COURSE OUTCOMES (COs)

CO1	Design and implement programs on 8085 microprocessor.
CO2	Design and implement programs on 8086 microprocessor.

CO3	Design interfacing circuits with 8085
CO4	Design interfacing circuits with 8086.
CO5	Design and implement 8051 microcontroller based systems
CO6	To Understand the concepts related to I/O and memory interfacing

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	B	c	d	e	f	g	h	i	j	k
2	CO1	H			M		L		L	H	L	
	CO2	H			M			M				
	CO3	M	M	M	H			M		M		
	CO4	M	M	M	H				H		M	
	CO5	M	H	H		H				H		
	CO6			M			M					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

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.

Experiments beyond the syllabus should be conducted.

BEC5L3	**COMMUNICATION ENGINEERING LABORATORY-I**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2

	Prerequisite –Nil
	Course Designed by – Dept. of Electronics and Communication Engineering

OBJECTIVES

- To practice the basic theories of analog communication system.
- 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 using the simulation software or hardware implementation.

COURSE OUTCOMES (COs)

CO1	To develop practical knowledge about theories of analog communication
CO2	To develop practical knowledge about simulation software
CO3	To provide hands-on experience to the students, so that they are able to apply theoretical concepts in practice.
CO4	Demonstrate various pulse modulation techniques
CO5	Evaluate analog modulated waveform in time /frequency domain and also find modulation index
CO6	Develop understanding about performance of analog communication systems

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H	M				M		L	M		L
	CO2	M										
	CO3	M	M	M	H						L	
	CO4	M	M	M		H		M		H		H
	CO5		L	M					M			
	CO6	M					H				H	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				

4	Approval		37th Meeting of Academic Council, May 2015

LIST OF EXPERIMENTS

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 using P-SPICE**.**

RESOURCESREQUIRED

1. AM Kit
2. TDM Kit

Experiments beyond the syllabus should be conducted.

BEC5C1	**COMPREHENSION-I**	**L**	**T**	**P**	**C**
	Prerequisite –All subjects up to fifth semester	0	0	0	1
	Course Designed by – Dept. of Electronics and Communication Engineering				

OBJECTIVES

- To provide a complete review of Electronics & Communication Engineering topics covered up to fifth semesters, so that a comprehensive understanding is achieved.
- It will also help students to face job interviews, competitive examinations and also to enhance the employment potential.
- To provide overview of all topics covered and to assess the overall knowledge level up to fifth semester.

BEC601	**COMPUTER COMMUNICATION AND NETWORKS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite - Communication Engineering-I				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Explain the networks, topologies and layers of OSI model, compare with TCP/IP model.
CO2	Classify error control and flow control techniques and types of LAN technologies.
CO3	Analyze different routing algorithms and methods to improve QOS.
CO4	Explain the role of protocols in networking.
CO5	Summarize the transport layer protocols and congestion controls methods.
CO6	Describe various application layer services and cryptographic techniques.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H	H			M	M				H	L
	CO2	M	L							M		
	CO3	M	H	M	M			H			M	
	CO4	M	H	M	M	H		M		M		H

	CO5								L		H		
	CO6	H					M						
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)	
							√						
4	Approval	37th Meeting of Academic Council, May 2015											

UNIT I DATA COMMUNICATION: 9

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

UNIT II DATA LINK CONTROL AND PROTOCOLS: 9

Flow control and error control, stop and wait, Sliding windows, Automatic Repeat (ARQ), Asynchronous Protocols, - X MODEM, Y MODEM, Synchronous protocols – Character Oriented and Bit oriented protocols (HDLC).

UNIT III LOCAL AREA NETWORKS: 9

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

UNIT IV WIDE AREA NETWORKS: 9

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

UNIT V UPPER OSI LAYERS: 9

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

TEXT BOOKS:

1. Behrus A. Forouzane.tal, "Data Communication and Networking", 2nd Edition, Tata McGraw-

REFERENCE BOOKS:

1. William Stallings, "Data and Computer Communication", Fifth Edition, Prentice Hall of India,1997.

2.Andrew S.Tanenbaum, "Computer networks", Third Edition, prentice Hall of India, 1996.

3.www.studytonight.com/computer-network...

BEC604	COMMUNICATION ENGINEERING - II	L	T	P	C
	Total Contact Hours -45	3	0	0	3
	Prerequisite – Communication Engineering-I				
	Course Designed by – – Dept. of Electronics and Communication Engineering				

OBJECTIVES

- 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 (COs)

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 noise performance in various receivers
CO5	Design basic communication systems
CO6	To understand the basic concepts of analog pulse modulation techniques

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H	M		M		M	H		H		
	CO2	M	M	H		M	M	M		H		M
	CO3	M			H					H		
	CO4	M	M			M		M		H		
	CO5		L	H		M						M
	CO6	M	M		M		L					L

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

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.

UNIT V 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.

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.

REFERENCEBOOKS:

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
3.www.scribd.com

BEI601	CONTROL SYSTEMS	L	T	P	C
	Total Contact Hours - 60	4	0	0	4
	Prerequisite – Electronic Instrumentation, Signals & Systems				
	Course Designed by – Dept. of Electronics and Instrumentation Engineering.				

OBJECTIVES

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

	criteria and to do simple problems.
COURSE OUTCOMES (COs)	
CO1	Outline the development of mathematical models to represent systems and theirrepresentation by transfer functions
CO2	Discuss the transient and steady state response of control systems
CO3	Practice frequency domain plots (Bode and Polar)
CO4	Analyze performance of control systems
CO5	Design compensation networks
CO6	Design the different types of compensators

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	B	c	d	e	f	g	h	i	j	k
2	CO1	H					M	L		M	M	
	CO2	M	L	H	M	M				L		
	CO3	M			H							
	CO4	M		M		H		M			H	
	CO5		L							M		
	CO6						H					

3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

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.

TEXT BOOKS:

1. J.Nagrath andM.Gopal, "Control SystemEngineering", NewAgeInternational Publishers, 5thEdition, 2007.

REFERENCE BOOKS:

1. Benjamin.C.Kuo, "Automatic control systems", Prentice Hall ofIndia, 7th Edition, 1995.
2. M.Gopal, "Control System– Principles and Design",TataMcGrawHill, 2nd Edition,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.
5. www.electrical4u.com

BSS601	VALUE EDUCATION AND PROFESSIONAL ETHICS	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Nil				
	Course Designed by – Dept of Management Studies				

OBJECTIVES

- To teach the philosophy of Life, personal value, social value, mind cultural value and personal health
- To teach professional ethical values, codes of ethics, responsibilities, safety, rights and related global issues.

COURSE OUTCOMES (COs)

CO1	To learn about philosophy of Life and Individual qualities
CO2	To learn and practice social values and responsibilities
CO3	To learn and practice mind culture, forces acting on the body and causes of diseases and their curing
CO4	To learn more of Engineer as Responsible Experimenter.
CO5	To learn more of Risk and Safety assessment with case studies.
CO6	To learn more of Responsibilities and Rights as Professional and facing Global Challenges

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1			M		H		M	H	M	L	L
	CO2			M		H		M	H	M	L	L
	CO3			M		H		M	H	M	L	L
	CO4			H		H		M	H	M	L	L

	CO5			H		H		M	H	M		L	L	
	CO6			H		H		M	H	M		L	L	
3	Category	Humanities & Social Studies (HS)		Basic Sciences & Maths (BS)		Engg Sciences (ES)	Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (GOE	Project/Term Paper/ Seminar/ Internship (PR)
		√												
4	Approval	37th Meeting of Academic Council, May 2015												

UNIT I PHILOSOPHY OF LIFE AND INDIVIDUAL QUALITIES 9

Human Life on Earth - Purpose of Life, Meaning and Philosophy of Life. The Law of Nature – Protecting Nature /Universe. Basic Culture - Thought Analysis - Regulating desire - Guarding against anger - To get rid of Anxiety – The Rewards of Blessing - Benevolence of Friendship - Love and Charity - Self – tranquility/Peace

UNIT II SOCIAL VALUES (INDIVIDUAL AND SOCIAL WELFARE) 9

Family - Peace in Family, Society, The Law of Life Brotherhood - The Pride of Womanhood – Five responsibilities/duties of Man : - a) to himself, b) to his family, c) to his environment, d) to his society, e) to the Universe in his lives, Thriftness (Thrift)/Economics. Health - Education - Governance - People's Responsibility / duties of the community, World peace.

UNIT III MIND CULTURE & TENDING PERSONAL HEALTH 9

Mind Culture - Life and Mind - Bio - magnetism, Universal Magnetism (God –Realization and Self Realization) - Genetic Centre – Thought Action – Short term Memory – Expansiveness – Thought – Waves, Channelising the Mind, Stages - Meditation, Spiritual Value. Structure of the body - the three forces of the body- life body relation, natural causes and unnatural causes for diseases, Methods in Curing diseases

UNIT IV ENGINEERING AS SOCIAL EXPERIMENTATION AND ENGINEERS'SRESPONSIBILITIES FOR SAFETY 9

Engineering as Experimentation – Engineer as Responsible Experimenters – Codes of Ethics – The Chalenger, case study. Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – The Three Mile Island and Chernobyl case studies.

UNIT V ENGINEERS'S RESPONSIBILITIES FOR RIGHTS AND GLOBALISSUES 9

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Whistle Blowing – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development –Engineers as Managers – Consulting Engineers – Engineers as Expert Eye Witnesses and Advisors – Moral Leadership

TEXT BOOKS:

1. Value Education for Health, Happiness and Harmony, The World Community Service, Centre Vethathiri Publications (Unit 1 – III).

2. Mike W Martin and Roland Schinzinger, Ethics In Engineering, Tata Mcgraw Hill, Newyork 2005 (Units IV & V)

REFERENCE BOOKS:

1. Philosophy of Universal Magnetism (Bio - magnetism, Universal Magnetism) The World Community Service Centre Vethathiri Publications (for Unit III)
2. Thirukkural with English Translation of Rev. Dr. G.U. Pope, Uma Publication, 156, Serfoji Nagar, Medical College Road,Thanjavur 613 004 (for Units I - III)
3. R S Nagaarazan, Textbook On Professional Ethics And Human Values, New Age International Publishers, 2006 (for Units IV-V)
4. Charles D Fledderman, Engineering Ethics, Prentice Hall,New Mexico, 2004 (Units IV-V)
5. www.waceinc.org/philly2011/conference.../KARSTE~1.PDF

BEC6L1	**COMPUTER COMMUNICATION AND NETWORKS LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2
	Prerequisite – Communications Engineering I lab				
	Course Designed by – Dept. of Electronics and communication Engineering				

OBJECTIVES

- Defining, using and implementing Computer Networks and the basic components of a Network system.
- Knowing and Applying pieces of hardware and software to make networks more efficient, faster, more secure, easier to use, able to transmit several simultaneous messages, and able to interconnect with other networks.
- Differentiating the various types of network configurations and applying them to meet the changing and challenging networking needs of organizations.

COURSE OUTCOMES (COs)

CO1	Understand fundamental underlying principles of computer networking
CO2	Understand details and functionality of layered network architecture.
CO3	Apply mathematical foundations to solve computational problems in computer networking
CO4	Analyze performance of various communication protocols.
CO5	Compare routing algorithms
CO6	Practice packet /file transmission between nodes

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					M		L	H		M
	CO2	M	L	H	M	M					M	
	CO3	M			H					M		
	CO4	M	M			H		M				H
	CO5		M	H							L	

	CO6						H						
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)				
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4	Approval	37th Meeting of Academic Council, May 2015											

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 Go back-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

Experiments beyond the syllabus should be conducted.

BEC6L2	**ELECTRONICS SYSTEM DESIGN LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2
	Prerequisite –Electronics Circuits, Communication Engineering I lab				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

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

COURSE OUTCOMES (COs)

CO1	Design different forms of power supply.
CO2	Design Voltage regulators
CO3	AM/FM transreceiver.
CO4	Know the design procedure of Instrumentation amplifier and Digital Indicator.
CO5	Learn CAD based PCB layout design.
CO6	Understand the working of modems and timers.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	

2	CO1	H					M		L	H		M	
	CO2	M	L	H	M	M					M		
	CO3	M			H					M			
	CO4	M	M			H		M				H	
	CO5		M	H							L		
	CO6						H						

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

LIST OF EXPERIMENTS

1. Design of high current linear variable DC Power supply.
2. Design of Switched Mode power supply.
3. Design of AC / DC Voltage regulator using SCR.
4. Design of Programmable Logic controller.
5. Design of process control timer.
6. Design of AM / FM transreceiver
7. Design of wireless data Modems
8. Design of Instrumentation amplifier and Digital Indicator
9. PCB layout Design using CAD
10. Microprocessor based system design.
11. DSP based system design.

. **Experiments beyond the syllabus should be conducted.**

BEC6L3	**COMMUNICATION ENGINEERING-II LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2
	Prerequisite –Communication engineering-I Lab				
	Course Designed by – Dept. of Electronics and Communication Engineering				

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.

COURSE OUTCOMES (COs)

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
CO6	Develop understanding about performance of digital communication systems

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					M		L	M		L
	CO2	M	L	H								
	CO3	M			H						L	
	CO4	M				H		M		H		H
	CO5		L						M			
	CO6						H				H	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
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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

Experiments beyond the syllabus should be conducted.

BEC701	**FIBRE OPTIC COMMUNICATION**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Electromagnetic Fields and waves.				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

- To learn the basic elements of optical fiber transmission link, fiber modes Configurations and structures.
- To understand the different kind of losses, signal distortion, SM fibers.
- To learn the various optical sources, materials and fiber splicing
- To learn the fiber optical receivers and noise performance in photo detector.
- To learn link budget, WDM, solitons and SONET/SDH network.

COURSE OUTCOMES (COs)

CO1	Demonstrate an understanding of optical fiber communication link, structure, propagation and transmission properties of an optical fiber.
CO2	Estimate the losses and analyze the propagation characteristics of an optical signal in different types of fibers
CO3	Describe the principles of optical sources and power launching-coupling methods.
CO4	Compare the characteristics of fiber optic receivers.
CO5	Design a fiber optic link based on budgets
CO6	To assess the different techniques to improve the capacityof the system.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					M		L	M		L
	CO2	M	L	H								
	CO3	M			H						L	
	CO4	M				H		M		H		H
	CO5		L						M			
	CO6						H				H	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I INTRODUCTION TO OPTICAL FIBER 9

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.

UNIT IISIGNAL DEGRADATION IN OPTICAL FIBER 9

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.

UNIT III FIBER OPTICAL SOURCES 9

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.

UNIT IVFIBER OPTICAL RECEIVERES 9

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.

UNIT V DIGITAL TRANMISSION SYSTEM 9

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.

TEXT BOOKS:

1. Gerd Keiser, ―Optical Fiber Communications Tata McGraw–Hill Education private Limited, New Delhi, fifth Edition, 2008, Reprint2009.

REFERENCE BOOKS:

1. J.Senior,―Optical Communication, Principles and Practice‖, Prentice Hall of India, third Edition,2004.
2. J.Gower,―Optical Communication System‖, Prentice Hall ofIndia,2001
3. Yarvi.A.‖QuantumEletronics‖,JohnWiley4th edition,1995
4 https://books.google.co.in/books?isbn=9380156693

BEC702	DIGITAL CMOS VLSI	L	T	P	C
	Total Contact Hours - 60	4	0	0	4
	Prerequisite – Principles of Digital Electronics				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

- To learn basic CMOS Circuits.

- To learn CMOS process technology.
- To learn techniques of chip design using programmable devices.
- To learn the concepts of designing VLSI Subsystems.

COURSE OUTCOMES (COs)

CO1	To learn about IC fabrication, MOS transistor action and its parameters.
CO2	Express the Layout of simple MOS circuit using Lambda based design rules.
CO3	About the implementation of various adders and multipliers in VLSI technology.
CO4	About the design styles of FPGA.
CO5	About testing of CMOS circuits.
CO6	To understand the concepts of modeling a digital system using Hardware Description Language.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M							H	M		
	CO2	M		H					M	H	H	
	CO3	M		M	H						H	H
	CO4	M				H			M		H	
	CO5		H							H		
	CO6	H				H						H

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

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 PROCESSAND 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 level switch level modeling, Design hierarchies, Behavioral and RTL modeling, Test benches, Design of decoder, equality detector, comparator, priority encoder, half adder, full adder, Ripple carry adder, D latch and D flip flop

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.

REFERENCE BOOKS:

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
6.https://en.wikipedia.org/wiki/Very-large-scale_integration

BEC703	MICROWAVE ENGINEERING	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Electromagnetic Fields and waves.				
	Course Designed by – Dept. of Electronics and Communication Engineering				

OBJECTIVES

- Microwave Engineering introduces the student to RF/microwave analysis methods and design techniques..
- Scattering parameters are defined and used to characterize devices and system behavior. Passive and active devices commonly utilized in microwave subsystems are analyzed
- To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
- To understand about microwave measurements..

COURSE OUTCOMES (COs)

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	Know how to model and determine the performance characteristics of a microwave circuit or system.
CO6	Identify the measurement techniques for different parameters like VSWR, impedance, frequency, power of microwave sources and loads.

Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low												
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					M				M	
	CO2	M	M	M	M					H		M
	CO3	M		M	M	M						
	CO4	M				M		M			H	
	CO5		M	M						M		M
	CO6				M		H					
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)	
							√					
4	Approval	37th Meeting of Academic Council, May 2015										

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.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Collin R.E., "Foundation of Microwave Engineering", 2nd Edition, TMH, 1992.
2. Samuel Y. Liao, "Microwave devices and Circuits", PHI Pvt Ltd., 1995.
3. http://www.microwaves101.com

BEC704	**ANTENNA AND WAVE PROPAGATION**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Electromagnetic Fields and waves.				
	Course Designed by – Dept. of Electronics and Communication Engineering				

OBJECTIVES

- Students will be introduced to antennas, their principle of operation
- Antenna analysis and their applications.
- introduce the student to wave propagation over ground, through troposphere and ionosphere; diversity principles,
- Propagation effectsin microwave systems, satellite, space, and radar links.

COURSE OUTCOMES (COs)

CO1	Define various antenna parameters
CO2	Analyze radiation patterns of antennas
CO3	Evaluate antennas for given specifications
CO4	Illustrate techniques for antenna parameter measurements
CO5	To understand the various applications of antennas.
CO6	Discuss radio wave propagation

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					M			H		M
	CO2	M	M	H	M	M					L	
	CO3	M		M	H			M		M		
	CO4	M		M	M	H		M				H
	CO5		L								M	
	CO6		M				L					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I BASIC ANTENNA CONCEPTS 9

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 9

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: 9

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: 9

Yagi uda Antenna, Tunstile 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 9

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,

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

REFERENCE BOOKS:

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.
4.www.studynama.com/.../229-Antenna-wave-propagation-(AWP)-pdf-eb.

BEC7L1	DIGITAL CMOS VLSI LAB	L	T	P	C
	Total Contact Hours - 45	0	0	3	2
	Prerequisite –Digital Electronics Lab				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Demonstrate a clear Understanding in hardware design language Verilog HDL.
CO2	Model a Combinational circuit using hardware description language Verilog HDL and validate itsfunctionality.
CO3	Design and implement a sub system on a FPGA board.
CO4	Model a Sequential circuit using hardware description language Verilog HDL and validate its functionality..
CO5	Demonstrate implementation of FPGA of ADC.
CO6	To Understand the FPGA implementation of Traffic Light Controller

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H				H	M		M		H	H
	CO2	M	M	H		H	M	H		M		
	CO3	M	H		H			L	M	M	M	M
	CO4	M	H	H	M	H	M	H		M		
	CO5		L		M					L		
	CO6				M						L	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

LIST OF 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

REQUIREMENTSHARDWARE

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

SOFTWARE

1. XILINX 10.1
2. Modelsim

Experiments beyond the syllabus should be conducted.

BEC7L2	**OPTICAL COMMUNICATION LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2
	Prerequisite –Communication Engineering I & II lab				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

- To studythe performance parameters of optical source and detector.
- To study fiber losses and loss mechanism the operation of optical detectors – PIN photodiode, avalanche photodiode
- To study the light propagation of the fiber.

COURSE OUTCOMES (COs)

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
CO5	To study the numerical aperture of the fiber
CO6	To become familiar with different modes.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	
2	CO1	H					M		H			M	

	CO2	M	L	H	M	M		H	H	M	H		
	CO3	M	H	H	H	M	M	M		M			
	CO4	M	H		M			M	M	M			
	CO5	M	M			M	M			L			
	CO6				M						M	H	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
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4	Approval	37th Meeting of Academic Council, May 2015							

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. Setting up a digital link using 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

Resources required:

1. Optical Communication Kit
2. CRO
3. FG

Experiments beyond the syllabus should be conducted.

BEC7L3	**MICROWAVE ENGINEERING LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2
	Prerequisite – Electromagnetic Fields and waves.				
	Course Designed by – Dept. of Electronics and Communication Engineering				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Demonstrate the characteristics of Microwave sources
CO2	Demonstrate the characteristics of directional Couplers
CO3	To test the characteristics of microwave components
CO4	To analyze the radiation pattern of antenna.
CO5	To measure antenna gain
CO6	Practice microwave measurement procedures

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H		H	H		M		L			
	CO2	M	L	H	H					H	M	
	CO3	M			H							L
	CO4	M			H	M		M				
	CO5		M		H	M				L	M	
	CO6						H					H

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

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.

Experiments beyond the syllabus should be conducted.

BEC7P1	**TERM PAPER**	**L**	**T**	**P**	**C**
	Total Contact Hours – 4 hours per week	0	0	4	2
	Prerequisite – Nil				
	Course Designed by – Dept. of Electronics and Communication Engineering				

OBJECTIVES

- Learn to work as a member of a project team.
- Understand project management tasks.
- Develop a hardware / software solution for a real-time, industry relevant problem.

COURSE OUTCOMES (COs)

CO1	Apply knowledge of basic science and engineering to Electronics and Communication Engineering problems
CO2	Implement the simple applications and verify using modern simulation tools.
CO3	Identify, formulate, and model engineering equipment
CO4	Recognize the real world applications and to solve with core engineering knowledge.
CO5	Analyze and work on multidisciplinary tasks
CO6	Choose latest tools, software and equipment to solve real world problems

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					M		H			
	CO2	M	L	H				H	H	L	H	
	CO3	M	H		H		M	L		M		H
	CO4	H	H		M	H		M	M	M		
	CO5		L				M			L		
	CO6				M		H					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
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VIII SEMESTER

BEC8C1	COMPREHENSION-II	L	T	P	C
	Prerequisite –All subjects up to eighth semester	0	0	0	1
	Course Designed by – Dept. of Electronics and Communication Engineering				

OBJECTIVES

- To provide a complete review of Electronics & Communication Engineering topics covered up to eighth semesters, so that a comprehensive understanding is achieved.
- It will also help students to face job interviews, competitive examinations and also to enhance the employment potential.
- To provide overview of all topics covered and to assess the overall knowledge level up to eighth semester.

BEC8P1	PROJECT WORK	L	T	P	C
	Total Contact Hours – 18 hours per week	0	0	18	9
	Prerequisite – Term paper				
	Course Designed by – Dept. of Electronics and Communication Engineering				

OBJECTIVES

- Learn to work as a member of a project team.
- Understand project management tasks.
- Develop a hardware / software solution for a real-time, industry relevant problem.

COURSE OUTCOMES (COs)

CO1	Apply knowledge of basic science and engineering to Electronics and Communication Engineering problems
CO2	Implement the simple applications and verify using modern simulation tools.
CO3	Identify, formulate, and model engineering equipment
CO4	Recognize the real world applications and to solve with core engineering knowledge.
CO5	Analyze and work on multidisciplinary tasks
CO6	Choose latest tools, software and equipment to solve real world problems

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					M		H			
	CO2	M	L	H				H	H	L	H	
	CO3	M	H		H		M	L		M		H
	CO4	H	H		M	H		M	M	M		
	CO5		L				M			L		
	CO6				M		H					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
									√
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CORE ELECTIVE – I

BEC503	TRANSMISSION LINES, NETWORKS AND WAVEGUIDES	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite –Electromagnetic Fields and waves.				
	Course Designed by – Dept. of Electronics and Communication Engineering				

OBJECTIVES

- To introduce the various types of transmission lines and to discuss the losses associated.
- To give thorough understanding about impedance transformation and matching.
- To impart knowledge on filter theories and waveguide theories

COURSE OUTCOMES (COs)

CO1	Discuss the fundamental concepts of wave propagation in Transmission Lines and Wave Guides
CO2	Analyze the line parameters and various losses in transmission lines.
CO3	Apply smith chart for line parameter and impedance calculations
CO4	Evaluate the characteristics of parallel plane and rectangular wave guides.
CO5	Evaluate the characteristics of Circular waveguides.
CO6	Evaluate the characteristics of resonators.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H		M	H		M	M			M	
	CO2	M	L					M		M		
	CO3	M	M		H	M				M	L	
	CO4	M	M	M		H		M				
	CO5		M								M	
	CO6				M					L		

3	Category	Humanities & Social Studies (HS)	Basic Sciences	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
						√			
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UNITI TIME VARRYINGFIELDSAND MAXWELL'S EQUTIONS 9

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 9

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 IIITHE UNIFORM PLANE WAVE 9

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 9

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 9

General Wave behaviors 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.

TEXTBOOK:

1. John D Ryder, "Networks lines and fields", Prentice Hall of India, New Delhi, 2005

REFERENCE BOOKS:

1. William H Haytand Jr John A Buck, "Engineering Electro magnetic" Tata McGraw-Hill

Publishing Company Ltd, New Delhi, 2008
2.David K Cheng, "Field and Wave Electromagnetics", Pearson Education Inc,Delhi,2004
3. John D Kraus and Daniel A Fleisch,"Electromagnetics with Applications", McGraw Hill BookCo,2005
4. GSN Raju, "Electromagnetic Field Theory and Transmission Lines", Pearson Education, 2005
5. Bhag Singh Guru and HR Hiziroglu, "Electromagnetic Field Theory Fundamentals", Vikas Publishing House, New Delhi,2001.
6.N.Narayana Rao, " Elements of Engineering Electromagnetics"6thedition PrenticeHall,2004
7.mit.edu/.../Microwave_Engineering_David_M_Pozar_4ed_Wiley_2011

BEC001	ADVANCED COMPUTER ARCHITECTURE	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Principles of Digital Electronics				
	Course Designed by – Dept. of Electronics & Communication Engineering				

OBJECTIVES

- To make students know about the Parallelism concepts in Programming
- To give the students an elaborate idea about the different memory systems and buses.
- To introduce the advanced processor architectures to the students.
- To make the students know about the importance of multiprocessor and multi-computers.
- To study about data flow computer architectures

COURSE OUTCOMES (COs)

CO1	Demonstrate concepts of parallelism in hardware/software.
CO2	Discuss memory organization and mapping techniques.
CO3	Describe architectural features of advanced processors.
CO4	Interpret performance of different pipelined processors.
CO5	Explain data flow in arithmetic algorithms
CO6	Development of software to solve computationally intensive problems.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

		a	b	c	d	e	f	g	h	i	j	k
1	COs/POs											
2	CO1	H					M				M	
	CO2	M	M	H					L			
	CO3	M		H	H					H		
	CO4	M				H		M				M
	CO5		M			M				M		
	CO6						H					

3	Category	Humanities & Social Studies (HS)	Basic Sciences	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
						√			
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UNIT IPARALLEL COMPUTER MODELS **9**

Evolution of Computer architecture, system attributes to performance, Multi processors and multi computers, Multi-vector and SIMD computers, PRAM and VLSI models-Parallelism in Programming, conditions for Parallelism-Program Partitioning and Scheduling-program flow Mechanisms-Speed up performance laws-Amdahl‘s law, Gustafson‘s law-Memory bounded speedup Model.

UNIT IIMEMORY SYSTEMS AND BUSES **9**

Memory hierarchy-cache and shared memory concepts-Cache memory organization-cache addressing models, Aliasing problem in cache, cache memory mapping techniques-Shared memory organization-Interleaved memory organization, Lower order interleaving, Higher order interleaving. Back plane bus systems-Bus addressing, arbitration and transaction.

UNIT IIIADVANCED PROCESSORS **9**

Instruction set architectures-CISC and RISC scalar processors-Super scalar processors-VLIW architecture- Multivector and SIMD computers-Vector processing principles-Cray Y-MP 816 system-Inter processor communication

UNIT IVMULTI PROCESSOR AND MULTI COMPUTERS **9**

Multiprocessor system interconnects- Cross bar switch, Multiport memory-Hot spot problem, Message passing mechanisms-Pipelined processors-Linear pipeline, on linear pipeline-Instruction pipeline design-Arithmetic pipeline design.

UNIT VDATA FLOW COMPUTERS AND VLSI COMPUTATIONS **9**

Data flow computer architectures-Static, Dynamic-VLSI Computing Structures-Systolic array architecture, mapping algorithms into systolic arrays, Reconfigurable processor array-VLSI matrix arithmetic processors-VLSI arithmetic models, partitioned matrix algorithms, matrix arithmetic pipelines.

TEXT BOOKS:

1. Kai Hwang, Advanced Computer architecture Parallelism, scalablity, Programmablity, McGraw Hill,N.Y, 2003
2. Kai Hwang and F.A.Briggs, Computer architecture and parallel processor‖‘ McGraw Hill, N.Y, 1999

REFERENCE BOOKS:

1. David A. Patterson and John L. Hennessey, ―Computer organization and design‖ Elsevier, Fifth edition, 2014.
2. www.sci.tamucc.edu/~sking/Courses/COSC5351/syllabus.php

BEC008	MEMS AND NEMS	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite –Engineering Physics – I & II, Engineering Chemistry –I & II				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

- 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;
- Learn some typical or potentially applicable micro- and nano-systems at the frontier of the development of the field..

COURSE OUTCOMES (COs)

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/nano systems for photonics.
CO6	Gain the technical knowledge required for computer-aided design, fabrication, analysis and characterization of nano-structured materials, micro- and nano-scale devices.

.Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H				M	M		H	M	H	
	CO2	M	M	M		M		H				
	CO3	M	H		M		M					H
	CO4	M	H	M				M	M		M	
	CO5		M	M		H	M		M	M		M
	CO6				M	H	H			M		

3	Category	Humanities & Social Studies (HS)	Basic Sciences &	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
						√			
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UNIT I OVERVIEW AND INTRODUCTION 9

New trends in Engineering and Science: Micro and Nano scale systems Introduction to Design of MEMS and NEMS, Overview of Nano and Micro electro mechanical Systems, Applications of Micro and Nano electro mechanical systems, Micro electro mechanical 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

UNIT V NANOSYSTEMS AND QUANTUM MECHANICS **9**

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

TEXT BOOKS:

1. Marc Madou, "Fundamentals of Micro fabrication", CRC press 1997.
2. Stephen D. Senturia," Micro system Design", Kluwer Academic Publishers,2001

REFERENCE BOOKS:

1. Tai Ran Hsu ,"MEMS and Microsystems Design and Manufacture" ,Tata McGraw Hill,2002.
2. Chang Liu, "Foundations of MEMS", Pearson education India limited, 2006
3.www.tutorials point.com

BEC010	**VLSI DESIGN**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Principles of Digital Electronics, Electronics Circuits.				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

- To learn basic CMOS Circuits.
- To learn CMOS process technology.
- To learn techniques of chip design using programmable devices.
- To learn the concepts of designing VLSI Subsystems.

COURSE OUTCOMES (COs)

CO1	Identify the various IC fabrication methods.
CO2	Express the Layout of simple MOS circuit using Lambda based design rules.
CO3	Apply the Lambda based design rules for subsystem design.
CO4	Differentiate various FPGA architectures.
CO5	Design an application using Verilog HDL.
CO6	Concepts of modeling a digital system using Hardware Description Language.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					M		H			
	CO2	M	L	H					M	L	H	
	CO3	M			H				M			H

	CO4	M				H		M	M				
	CO5		L							L			
	CO6						H						
3	Category	Humanities & Social Studies (HS)		Basic Sciences & Maths (BS)		Engg Sciences (ES)	Professional core (PC)		Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)	
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UNIT I MOS TRANSISTOR THEORY 9

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

UNIT II MOS CIRCUITS AND DESIGN 9

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

UNIT III SUBSYSTEM DESIGN & LAYOUT 9

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

UNIT IV PROGRAMMABLE LOGIC DEVICES 9

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

UNIT V VERILOG HDL DESIGN PROGRAMMING 9

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

TEXT BOOKS:

1. Douglas A.Pucknell, K. Eshragian,―Basic VLSI Design‖, Third edition,PHI,2009

REFERENCE BOOKS:

1. Neil.H.E.Weste,KamaranEshraghian,―PrinciplesofCMOSVLSIDesign‖,Second Edition,

AddisoWesleyPublications,2002
2. SamirPalnitkar,―VerilogHDL–GuidetoDigitaldesignandsynthesis‖,SecondEdition Pearson Education,2009
3. Wayne Wolf, ―Modern VLSI Design‖, Pearson Education , 2003
https://en.wikipedia.org/wiki/Very-large-scale_integration

CORE ELECTIVE-II

BEC015	ASIC DESIGN	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite - Principles of Digital Electronics				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

- To acquire knowledge about different types of ASICs design.
- To study about various types of Programmable ASICs architectures and interconnects.

COURSE OUTCOMES (COs)

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.
CO6	Low power design techniques and methodologies.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H		M		M	M	M	H	M		L
	CO2	M	L	H				H		L	H	
	CO3	M	H	M				M	M	M		H
	CO4	M	H	H		M				M		M
	CO5		L			M	M	M		L		M
	CO6				M	M	H	M				

3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
						√			
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UNIT I INTRODUCTION TO ASICS, CMOS LOGIC, ASIC LIBRARY DESIGN 9

Types of ASICs - Design flow – CMOS transistors- CMOS Design rules –Combinational logic

Cell Sequential logic cell - Transistor as Resistors - Transistor parasitic capacitance – Logical effort - Library cell design – Library architecture.

UNIT II PROGRAMMABLE ASICS, PROGRAMMABLE ASIC LOGIC CELLS 9

Anti fuse - Static RAM - EPROM and EEPROM technology - PREP benchmarks - Actel ACT - Xilinx LCA –Altera FLEX - Altera MAX DC & AC inputs and outputs - Xilinx I/O blocks.

UNIT III PROGRAMMABLE ASIC INTERCONNECT, PROGRAMMABLE ASIC DESIGN SOFTWARE AND LOW LEVEL DESIGN 9

Entry: Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Altera MAX 9000 - Altera FLEX –Design systems - Logic Synthesis - Half gate ASIC -Low level design language - PLA tools EDIF- CFI design representation.

UNIT IV SILICON ON CHIP DESIGN 9

Voice over IP SOC - Intellectual Property – SOC Design challenges- Methodology and design-FPGA to ASIC conversion – Design for integration-SOC verification-Set top box SOC.

UNIT V PHYSICAL AND LOW POWER DESIGN 9

Over view of physical design flow- tips and guideline for physical design- modern physical design techniques- power dissipation-low power design techniques and methodologies-low power design tools- tips and guideline for low power design.

TEXT BOOKS:

1. M.J.S. Smith, ―Application Specific Integrated Circuits‖, Pearson Education, 2008

REFERENCE BOOKS:

1. Wayne Wolf, ―FPGA-Based System Design‖, Prentice Hall PTR, 2009.
2. Farzad Nekoogar and Faranak Nekoogar, ―From ASICs to SOCs: A Practical Approach‖, Prentice Hall PTR, 2003.
3. www.vhdl.org/rassp/vhdl/guidelines/DesignReq.pdf

BEC012	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite –Communication Engineering-I				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

- To know about various encryption techniques.
- To understand the concept of Public key cryptography.
- To study about message authentication and hash functions
- To impart knowledge on Network security

COURSE OUTCOMES (COs)

CO1	Classify the symmetric encryption techniques.
CO2	Illustrate various Public key cryptographic techniques.
CO3	Evaluate the authentication and hash algorithms.
CO4	Discuss authentication applications
CO5	Summarize the intrusion detection and its solutions to overcome the attacks.

CO6	Basic concepts of system level security												
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	
2	CO1	H		M		M	M	M	H	M		L	
	CO2	M	L	H				H		L	H		
	CO3	M	H	M	M			M	M	M		H	
	CO4	M	H	H		M				M		M	
	CO5		M			M	M	M		M			
	CO6				M	M	H	M					
3	Category	Humanities & Social Studies (HS)		Basic Sciences & Maths (BS)		Engg Sciences (ES)	Professional Core (PC)		Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)	
									√				
4	Approval	37th Meeting of Academic Council, May 2015											

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 IVNETWORK 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.

TEXT BOOKS:

1. WilliamStallings,CryptographyandNetworkSecurity,6th Edition, Pearson Education, March 2013.
2. Charlie Kaufman, Radia Perlman and Mike Speciner,"Network Security",Prentice Hall of India,2002.

REFERENCE BOOKS:

1. Behrouz A. Ferouzan, "Cryptography&NetworkSecurity",TataMcGrawHill,2007.
2. Charles Pfleeger, "Security in Computing",4th Edition, Prentice Hall ofIndia,2006.
3. Ulysess Black, "Internet Security Protocols", PearsonEducationAsia,2000.
4. Charlie Kaufman and Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication in Public World", PHI2002.
5. Bruce Schneier and Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dream tech India PvtLtd, 2003.
6.www.ics.uci.edu/~stasio/spring04/ics180.html

BEC007	DIGITAL IMAGE PROCESSING	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Digital Signal Processing				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Review the fundamental concepts of a digital image processing system
CO2	Analyze images in the frequency domain using various transforms
CO3	Evaluate the techniques for image enhancement and image restoration
CO4	Categorize various compression techniques.
CO5	Interpret Image compression standards
CO6	Interpret image segmentation and representation techniques.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					M		H			
	CO2	M	M	H				H		L		
	CO3	M	H	M				M	M	M		H
	CO4	M	H			M				M	H	M
	CO5		M			M	M	M		L		M
	CO6				M	M	H	M				

3	Category	Humanities & Social Studies (HS)	Basic Sciences &	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
						√			
4	Approval	37th Meeting of Academic Council, May 2015							

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.

TEXT BOOKS:

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

REFERENCE BOOKS:

1.Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Third Edition Tata McGraw 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, HI Learning Pvt. Ltd., 2
5.www.tutorialspoint.com/dip/

BEC002	WIRELESS NETWORKS	L	T	P	C

	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Communication engineering-I, Random Process				
	Course Designed by – Dept. of Electronics &Communication Engineering				

OBJECTIVES

- To study about Wireless networks, protocol stack and standards.
- To study about fundamentals of 3G Services, its protocols and applications.
- To study about evolution of 4G Networks, its architecture and applications.

COURSE OUTCOMES (COs)

CO1	Conversant with the latest 3G/4G and Wi-MAX networks and its architecture.
CO2	Design and implement wireless network environment for any application using latest wireless protocols and standards.
CO3	Implement different type of applications for smart phones and mobile devices with latest network strategies
CO4	Compare and contrast multiple division techniques, mobile communication systems, and existing wireless networks.
CO5	Classify network protocols, ad hoc and sensor networks, wireless MANs, LANs and PANs;
CO6	Apply wireless ID technologies, in particular RFID work.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					M				M	
	CO2	M	L	H					L			
	CO3	M			M					H		
	CO4	L				H		M				M
	CO5		M									
	CO6						H					

3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective	Project/ Seminar/ Internship (PR)
						√			
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT- I WIRELESS LAN 9

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

UNIT- II MOBILE NETWORK LAYER 9

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6- Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing, Destination Sequence distance vector, Dynamic source routing

UNIT –III MOBILE TRANSPORT LAYER 9

TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility - Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks.

UNIT- IV WIRELESS WIDE AREA NETWORK 9

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol.

UNIT- V 4G NETWORKS 9

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, OFDM-MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.

TEXT BOOKS:

1.Jochen Schiller, Mobile Communications, Second Edition, Pearson Education 2012.(Unit I,II,III)

2.Vijay Garg, - Wireless Communications and Networking‖, First Edition, Elsevier 2007.(Unit IV,V)

REFERENCE BOOKS:

1.Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband‖, Second Edition, Academic Press, 2008.

2.Anurag Kumar, D.Manjunath, Joy kuri, ―Wireless Networking, First Edition, Elsevier 2011.

3.Simon Haykin , Michael Moher, David Koilpillai, ―Modern Wireless Communications, FirstEdition, Pearson Education 2013

CORE ELECTIVE III

BEC016	COGNITIVE RADIO	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Computer Communication and Networks				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

- Learn the design of the wireless networks based on the cognitive radios
- Understand the concepts of wireless networks and next generation networks.

COURSE OUTCOMES (COs)	
CO1	Describe the basics of the software defined radios.
CO2	To learn the hardware and software architecture of software defined radio
CO3	Design the wireless networks based on the cognitive radios.
CO4	Gives an understanding of cognitive radio architecture
CO5	Explain the concepts behind the wireless networks and next generation networks
CO6	To have a better understanding of cognitive techniques

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Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	
2	CO1	H				M	M		H	M	H		
	CO2	M	M	M		M		H					
	CO3	M	H		M		M					H	
	CO4	M	H		L			M	M		M		
	CO5		M	M		H	M		M	M		M	
	CO6				M	H	H			M			
3	Category	Humanities & Social Studies (HS)	Basic Sciences &	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)				
						√							
4	Approval	37th Meeting of Academic Council, May 2015											

UNITI INTRODUCTION TOSOFTWARE DEFINED RADIO 9

Definitionsandpotentialbenefits,softwareradioarchitectureevolution,technology trade off sand architecture implications.

UNITII SDRARCHITECTURE 9

Essential functions of the software radio, basic SDR, hardware architecture, Computational processing resources, software architecture, top level component interfaces, interface topologies among plug and play modules,.

UNITIII INTRODUCTION TOCOGNITIVE RADIOS 9

Marking radio self-aware, cognitive echniques–position awareness, environment awareness in cognitive radios, optimization o fradio resources, Artificial Intelligence Techniques.

UNITIV COGNITIVE RADIOARCHITECTURE 9

Cognitive Radio- functions, components and design rules, Cognition cycle-orient, plan, decide and act phases, Inference Hierarchy, Architecture maps, Building the Cognitive Radio Architecture on Software defined Radio Architecture.

UNITV NEXTGENERATION WIRELESS NETWORKS 9

The XGNetwork architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross –layer design.

TEXT BOOKS:

1. JosephMitolaIII,"SoftwareRadioArchitecture:Object-OrientedApproachesto Wireless System Engineering",JohnWiley&SonsLtd.2000.
2. Thomas W. Rondeau, Charles W.Bostain, "Artificial Intelligence in Wireless communication", ARTECH HOUSE.2009.
3. BruceA. Fette, "Cognitive RadioTechnology",Elsevier,2009.
4. IanF. Akyildiz, Won –Yeol Lee, Mehmet C. Vuran, Shantidev Mohanty, "Next generation/Dynamic spectrum access/cognitive radio wireless networks: A Survey" Elsevier Computer Networks, May2006.

REFERENCE BOOKS:

1. Simon Haykin, "Cognitive Radio: Brain–Empowered Wireless Communications", IEEE Journal on selected areas in communications, Feb 2005.
2. Hasari Celebi, Huseyin Arslan, "Enabling Location and Environment Awareness in Cognitive Radios", Elsevier Computer Communications, Jan 2008.
3. Markus Dillinger, Kambiz Madani, Nancy Alonistioti, "Software Defined Radio", John Wiley,2003.
4. Huseyin Arslan,"Cognitive Radio, SDR and Adaptive System", Springer, 2007.
5. Alexander M. Wyglinski, Maziarnekovee,Y. Thomas Hu, "Cognitive Radio Communication and Networks", Elsevier, 2010
6. www.nptel.ac.in

BEC005	BLUE TOOTH TECHNOLOGY	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite –Computer Communication & Networks				
	Course Designed by – Dept. of Electronics & Communication Engineering				

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

COURSE OUTCOMES (COs)

CO1	Understand Bluetooth's standards, architecture and operation.
CO2	Understand the APIs, radio interface 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 the Protocol layers used by Bluetooth..

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	

2	CO1	H			M		M			M	M		
	CO2	M	M	H					L				
	CO3	M		H	H	H		M		H			
	CO4	M						L				M	
	CO5		M			M				M			
	CO6		M	H		M	H				M		
3	Category	Humanities & Social Studies (HS)		Basic Sciences		Engg Sciences (ES)	Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
									√				
4	Approval	37th Meeting of Academic Council, May 2015											

UNIT I BASIC CONCEPTS 9

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

UNIT II BLUETOOTH MODULE 9

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 LINK CONTROLLER AND MANAGEMENT 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 BLUETOOTH HOST 9

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

UNIT V SECURITY 9

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

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
3. www.radio-electronics.com/info/.../**bluetooth**/**bluetooth**_overview.php

BEC705	CELLULAR MOBILE COMMUNICATION	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Computer Communication & Networks				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

- To understand the basic cellular system concepts.
- To have an insight into the various propagation models and the speech coders used in mobile communication.
- To understand the multiple access techniques and interference education techniques in mobile communication.

COURSE OUTCOMES (COs)

CO1	Discuss cellular radio concepts
CO2	Identify various propagation effects
CO3	To have knowledge of the mobile system specifications.
CO4	Classify multiple access techniques in mobile communication.
CO5	Outline cellular mobile communication standards.
CO6	Analyze various methodologies to improve the cellular capacity

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					M		H	M	H	
	CO2	M	L	M				H		L		
	CO3	M	H	M	L		M	L				H
	CO4	M	H		M	H		M	M		M	
	CO5		L				M			L		
	CO6				M	H	H			M		

3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
						√			

4	Approval	37th Meeting of Academic Council, May 2015

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.

TEXT BOOKS:

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

REFERENCE BOOKS:

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.
3.https://en.wikipedia.org/wiki/Cellular_network

BEC003	**SATELLITE COMMUNICATION**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite –Communication Engineering I & II				
	Course Designed by – Dept. of Electronics and Communication Engineering.				

OBJECTIVES

- To enable the student to become familiar with satellites and satellite services.
- Study of satellite orbits and launching.
- Study of earth segment and space segment components
- Study of satellite access by various users.

COURSE OUTCOMES (COs)

CO1	Define orbital mechanics and launch methodologies
CO2	Describe satellite subsystems
CO3	Design link power budget for satellites
CO4	Compare competitive satellite services

CO5	Explain satellite access techniques
CO6	DTH and compression standards

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H		M		M	M	M	H	M		L
	CO2	M	L	H				H		L	H	
	CO3	M	H	M				M	M	M		H
	CO4	M	H	H		M				M		M
	CO5		L			M	M	M		L		M
	CO6				M	M	H	M				

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
						√			
4	Approval	37th Meeting of Academic Council, May 2015							

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, The Parabolic 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, FDMA and CDMA.

UNIT V SATELLITE APPPLICATIONS 9

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

TEXT BOOKS:

1. Dennis Roddy, "Satellite Communication", 4th Edition, McGraw Hill International,2006.

REFERENCE BOOKS:

1.Wilbur L.Pritchard, Hendri G.Suyderhoud, Robert A. Nelson, "Satellite Communication Systems Engineering", PrenticeHall/Pearson, 2007.

2. N.Agarwal,"Design of Geosynchronous Space Craft", Prentice Hall,1986.

3. Bruce R. Elbert, "The Satellite Communication Applications", Hand Book, Artech House Bostan London,1997.

4. Tri T. Ha, "Digital Satellite Communication", IIndedition,1990.

5. Emanuel Fthenakis, "Manual of Satellite Communications", McGraw Hill BookCo.,1984.

6. Robert G.Winch, "Telecommunication Transmission Systems",McGraw-Hill Book Co., 1983.

7.BrianAckroyd,"World Satellite Communication and earth station Design", BSP professional Books,1990.

8. G.B. Bleazard,"Introducing Satellite communications", NCC Publication,1985.

9. www.sac.gov.in/SACSITE/Satcom_Overview.doc

NON MAJOR ELECTIVE-I

BBM054	**BIOINFORMATICS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite –Biology for Engineers.				
	Course Designed by – Dept. of Bio Medical Engineering.				

OBJECTIVES

- To introduce Bioinformatics-Elementary commands and Protocols, ftp, telnet, http. Primer on information theory

COURSE OUTCOMES (COs)	
CO1	To learn bioinformatics and the protocols.
CO2	To learn Strings-Edit distances two strings-string similarity local alignment gaps-parametric sequence alignments.
CO3	To have a clear view on Amino acid substitution matrices PAM and BLOSSUM.
CO4	To learn Ultrasonic trees-parsimony-Ultrametric problem-perfect phylogeny-phylogenetic alignment.
CO5	To DNA Mapping and sequencing-Map alignment-Large scale sequencing.
CO6	DNA Mapping and sequencing-Map alignment-Large scale sequencing and alignment.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1			H								
	CO2			H	H		M					
	CO3		M		H		H					
	CO4	H	M		H							
	CO5			H		H						
	CO6											

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
							√		
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT – I BIOINFORMATICS 9

Scope of Bioinformatics-Elementary commands and Protocols, ftp, telnet, http.Primer on information theory.

UNIT – II SEQUENCING ALIGNMENT AND DYNAMIC PROGRAMMING 9

Introduction-Strings-Edit distance two strings-string similarity local alignment gaps-parametric sequence alignments-suboptimal alignments-multiple alignment-common multiple alignment methods.

UNIT – III SEQUENCE DATABASE AND THEIR USE 9

Introduction to databases-database search-Algorithms issues in database search-sequence database search FASTA-BLAST-Amino acid substitution matrices PAM and BLOSSUM.

UNIT – IV EVOLUTIONARY TREES AND PHYLOGENY 9

Ultrasonic trees-parsimony-Ultrametric problem-perfect phylogeny-phylogenetic alignment-connection between multiple alignment and tree construction.

UNIT – V SPECIAL TOPICS IN BIOINFORMATICS 9

DNA Mapping and sequencing-Map alignment-Large scale sequencing and alignment-Shotgun-DNA sequencing-Sequence assembly-Gene predictions-Molecular predictions with DNA strings.

TEXT BOOKS:

1.R.D.Lele '"Computer in Medicine" Tata McGraw Hill, Newyork, 1999.

REFERENCE BOOKS:

1.S.K.Chauhan "PC Organisation", S.K.Kataria and Sons, Delhi 2000.
2. Harold Sackamn "Bio Medical Information Technology", Academic Press, New York.
3.**https://www.lehigh.edu/~inbios21/PDF/Fall2008/Lopresti_11142008.pdf**

BEI605	**EMBEDDED SYSTEM DESIGN**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite –Microprocessor and Microcontroller				
	Course Designed by – Dept of Electronics & Instrumentation Engineering				

OBJECTIVES

- To introduce the Building Blocks of Embedded System
- To Educate in Various Embedded Development Strategies

- To Introduce Bus Communication in processors, Input/output interfacing.
- To impart knowledge in various processor scheduling algorithms.
- To introduce Basics of Real time operating system and example tutorials to discuss on one real time operating system tool

COURSE OUTCOMES (COs)

CO1	Acquire a basic knowledge about fundamentals of microcontrollers
CO2	Acquire a basic knowledge about programming and system control to perform a specific task.
CO3	Acquire knowledge about devices and buses used in embedded networking
CO4	Develop programming skills in embedded systems for various applications.
CO5	Acquire knowledge about basic concepts of circuit emulators.
CO6	Acquire knowledge about Life cycle of embedded design and its testing

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M	M	M	H	M		M			L	L
	CO2	H	M	M	H	H		M			L	L
	CO3	H	M		H	H		M			L	L
	CO4	H	M		H	H		M			L	L
	CO5	H	M	M	H	H		M			L	L
	CO6	H			H	H		M			L	L

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Basic Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
							√		

4	Approval	37th Meeting of Academic Council, May 2015

UNIT-I EMBEDDED DESIGN WITH MICROCONTROLLERS 9

Product specification – Hardware / Software partitioning – Detailed hardware and software design – Integration – Product testing – Microprocessor Vs Micro Controller – Performance tools– RTOS Micro Controller -issues in selection of processors.

UNIT-II PARTITIONING DECISION 9

Hardware / Software duality – Hardware-Software portioning- coding for Hardware- software development – ASIC revolution – Managing the Risk – Co-verification – execution environment – memory organization –memory enhancement – Firmware-speed and code density -System startup.

UNIT-III FUNCTIONALITIES FOR SYSTEM DESIGN 9

Timers, Watch dog timers – RAM, Flash Memory basic toolset – Integration of Hardware & Firmware- in System Programming, in Application Programming, IDE-Target Configuration-Host based debugging – Remote debugging – ROM emulators – Logic analyzer.

UNIT-IV CIRCUIT EMULATORS **9**

Buller proof run control – Real time trace – Hardware break points – Overlay memory – Timing constraints – Usage issues – Triggers.

UNIT-V EMBEDDED DESIGN LIFE CYCLE & TESTING **9**

Objective, Need, different Phases & Modeling of the EDLC, choice of Target Architectures for Embedded Application Development-for Control Dominated-Data Dominated Systems-Software &Hardware Design, PCB Design, Manufacturing & PCB Assembly-Bug tracking – reduction of risks & costs – Performance – Unit testing – Regression testing – Choosing test cases – Functional tests – Coverage tests – Testing embedded software – Performance testing – Maintenance.

TEXT BOOKS:

1. James K.Peckol, "Embedded system Design", John Wiley & Sons, 2010

Reference:

1. Elicia White, "Making Embedded Systems", O'Reilly Series, SPD, 2011
2. Rajkamal,"Embedded Systems", TMH, 2009.
3. Lyla B Das," Embedded Systems-An Integrated Approach", Pearson2013 5. Arnold S. Berger –"Embedded System Design", CMP books, USA 2002

BCS002	**NEURAL NETWORKS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite –Mathematics-I, Mathematics-II, Numerical Methods				
	Course Designed by – Dept. of Computer Science and Engineering.				

OBJECTIVES

- Basic neuron models: McCulloch-Pitts model and the generalized one, distance or similarity based neuron model, radial basis function model, etc.
- Basic neural network models: multilayer perceptron, distance or similarity based neural networks, associative memory and self-organizing feature map, radial basis function based multilayer perceptron, neural network decision trees, etc.

COURSE OUTCOMES (COs)

CO1	Be able to analyze a problem for NN solution in terms of these methods.
CO2	Have an awareness of the computational theory underlying NN.
CO3	Have a working knowledge of a typical neural network simulation
CO4	Experience in programming NN applications from scratch.
CO5	Have knowledge of sufficient theoretical background to be able to reason about the behaviour of neural networks.
CO6	Have knowledge of sufficient theoretical background to be able to reason about the behaviour of neural networks.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M	H		H							
	CO2		H		H							

	CO3	M	H		H								
	CO4		H	H	H								
	CO5	L	H		H		M						
	CO6												
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)		Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)	
									√				
4	Approval	37th Meeting of Academic Council, May 2015											

UNIT-I BACK PROPAGATION 9

Introduction to Artificial Neural systems - Perception - Representation - Linear Separability - Learning - Training algorithm - The back propagation network - The generalized data rule - Practical considerations - BPN applications.

UNIT-II STATISTICAL METHODS 9

Hopfield nets - Cauchy training - Simulated annealing-The Boltzmann machine. Associative memory - Bidirectional associative memory -Applications.

UNIT-III COUNTER PROPAGATION NETWORK & SELF ORGANISATION MAPS 9

CRN building blocks - CPN data processing. SQM data processing - Applications

UNIT-IV ART AND SPATIO TEMPORAL PATTERN CLASSIFICATION 9

ART network description - ART1 -ART2-Application. The formal avalanche -Architecture of station temporal networks - The sequential competitive avalanche field - Applications of STNs.

UNIT-V NEO-CONGNITRON 9

Cognitron - Structure & training - The neocognitron architecture - Data processing - Performance - Addition of lateral inhibition and feedback to the neocognitron. Optical neural networks - Holographic correlators.

TEXT BOOKS:

1. James Freeman A and David Skapura M. "Neural Networks – Algorithms, Applications & Programming Techniques", Pearson Education, 2005.
2. Yegnanarayana B., "Artificial Neural Networks", Prentice Hall of India Private Ltd, 2003

REFERENCE BOOKS:

1. Neural Network Design, Martin T Hagan, 2nd edition, 2014.
2. Principle of neural science, Eric R.Kandel, 5th edition, 2012.
3. http://hagan.okstate.edu/NNDesign.pdf

BCS702	MOBILE AND PERVASIVE COMPUTING	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite –Communication Engineering I				
	Course Designed by – Dept. of Computer Science and Engineering.				

OBJECTIVES

This course discuss about knowledge and skills about a new trend in mobile Computing.

COURSE OUTCOMES (COs)

CO1	Explain the concepts and features of mobile networks.
CO2	Explain the working of wireless communication protocols.
CO3	Compare the routing protocols of mobile networks.
CO4	Explain the transport and application layer protocols of mobile networks.
CO5	Outline the basics of pervasive computing.
CO6	Learn the Concept of GSM,GPRS.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M		H								
	CO2	M		H								
	CO3			H					M			
	CO4			H								
	CO5	M		M								
	CO6								M			

3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
							√		

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I MOBILE NETWORKS 9

Cellular Wireless Networks – GSM – Architecture – Protocols – connection establishment –Frequency Allocation – Routing – Mobility Management – Security – GPRS.

UNIT II WIRELESS NETWORKS 9

Wireless LANs and PANs – IEEE 802.11 Standard – Architecture – Services –Network – HiperLAN – BlueTooth- Wi-Fi – WiMAX.

UNIT III ROUTING 9

Mobile IP – DHCP – AdHoc– Proactive and Reactive Routing Protocols – MulticastRouting.

UNIT IV TRANSPORT AND APPLICATION LAYERS 9

Mobile TCP– WAP – Architecture – WWW Programming Model– WDP – WTLS – WTP – WSP – WAE – WTAArchitecture – WML – WMLScripts.

UNIT V PERVASIVE COMPUTING 9

Pervasive computing infrastructure applications- Device Technology - Hardware, Human machine Interfaces, Biometrics, and Operating systems– Device Connectivity – Protocols, Security, and Device Management- pervasive Web Application architecture Access from PCs and PDAs - Access via WAP.

TEXT BOOKS:

1. Jochen Schiller, "Mobile Communications", PHI, Second Edition, 2003.
2. Jochen Burkhardt, Pervasive Computing: Technology and Architecture of MobileInternet Applications, Addison Wesley Professional; 3rd edition 2007.

REFERENCE BOOKS:

1.Frank Adelstein, Sandeep KS Gupta, Golden Richard, Fundamentals of Mobile and Pervasive Computing, McGraw-Hill 2005

2. Debashis Saha, Networking Infrastructure for Pervasive Computing: EnablingTechnologies, Kluwer Academic Publisher, Springer; 1st edition, 2002

3. Introduction to Wireless and Mobile Systems by Agrawal and Zeng, Brooks/ Cole(Thomson Learning),1st edition, 2002

4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, Principles of Mobile Computing, Springer, New York, 2003.

5.http://media.techtarget.com/searchMobileComputing/downloads/Mobile_and_pervasive_computing_Ch06.pdf

NON MAJOR ELECTIVE-II

BCS701	GRID AND CLOUD COMPUTING	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite –Computer Communication & Networks.				
	Course Designed by – Dept. of Computer Science and Engineering.				

OBJECTIVES

- Identify the technical foundations of cloud systems architectures.
- Analyze the problems and solutions to cloud application problems.
- Apply principles of best practice in cloud application design and management.
- Identify and define technical challenges for cloud applications and assess their importance.

COURSE OUTCOMES (COs)	
CO1	Understand the fundamental principles of distributed computing.
CO2	Understand how the distributed computing environments known as Grids can be built from lower level services.
CO3	Understand the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing.
CO4	Analyze the performance of Cloud Computing.
CO5	Understand the concept of Cloud Security.
CO6	Learn the Concept of Cloud Infrastructure Model.

Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	
2	CO1		H	M	M	M						H	
	CO2			H					M	M			
	CO3	M											
	CO4		M	M								H	
	CO5				M	M							
	CO6	M	M	H					M			M	
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)				
							√						
4	Approval	37th Meeting of Academic Council, May 2015											

UNIT I GRID COMPUTING 9

Introduction - Definition and Scope of grid computing, Computational and Data Grids, Current Grid Activities – Overview of Grid Business Areas, Grid Applications, Grid Computing Anatomy- Concept of Virtual Organization, Grid Architecture- Fabric layer, Connectivity layer, Resource Layer, Collective Layer, Application Layer, Layered Grid Architecture

UNIT II CLOUD ARCHITECTURE AND MODEL 9

Technologies for Network Based system-System Models for Distributed and Cloud Computing-NIST Cloud Computing Reference ArchitectureCloud models: Characteristics-Cloud Services-Cloud Models (IaaS, PaaS, SaaS)-Public vs. Private Cloud-Cloud Solutions-Cloud ecosystem-Service Management-Computing on demand.

UNIT III CLOUD INFRASTRUCTURE 9

Architectural Design of compute and Storage Clouds-Layered Cloud Architecture Development-Design Challenges-Inter Cloud Resource Management-Resource Provisioning and Platform Deployment-Global Exchange of Cloud Resources.

UNIT IV PROGRAMMING MODEL 9

Parallel and Distributed Programming Paradigms-Map Reduce-Twister and Iterative Map Reduce-Hadoop Library from Apache-Mapping Applications-Programming Support-Google App Engine, Amazon AWS-Cloud Software Environments-Eucalyptus, Open Nebula, Open Stack, Aneka, CloudSim.

UNIT V SECURITY IN THE CLOUD 9

Security Overview-Cloud Security Challenges and Risks-Software-as-a-Service-Security Security Governance-Risk Management-Security Monitoring-Security Architecture Design-Data Security-Application Security-Virtual Machine Security-Identity Management and Access Control-Autonomic Security.

TEXT BOOKS:

1. Joshy Joseph & Craig Fellenstein, "Grid Computing", PHI, PTR-2003(UNIT I)

2.Kai Hwang, Geoffrey C Fox,Jack G Dongarra "Distributed and Cloud Computing ,From parallel processing to the Internet of Things" Morgan Kaufmann Publishers,2012(Unit-II to Unit-V)

REFERENCE BOOKS:

1. John W.Rittinghouse and James F.Ransome, "Cloud Computing Implementation, Management and Security", CRC Press, 2010

2. Toby Velte, Anthony Velte, Robert Elsenpeter,"Cloud Computing, A Practical Approach", TMH, 2009.

3. Kumar Saurabh,"Cloud Computing –Insights into New-Era Infrastructure ", Wiley India, 2011

4. George Reese, "Cloud Applications Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly.

5. https://benzology.files.wordpress.com/2013/05/grid-computing-joshy-joseph-ebook.pdf

6.http://cloudipedia.com/files/2009/11/cloud_computing_made_easy.pdf

BCS008	**DISTRIBUTED OPERATING SYSTEMS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite -Nil				
	Course Designed by – Dept. of Computer Science and Engineering.				

OBJECTIVES

- To provide hardware and software issues in modern distributed systems.
- To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
- To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.

COURSE OUTCOMES (COs)

CO1	To provide hardware and software issues in modern distributed systems.
CO2	To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
CO3	To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
CO4	To know about Shared Memory Techniques.
CO5	Have Sufficient knowledge about file access.
CO6	Have knowledge of Synchronization and Deadlock.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	
2	CO1	M		H									
	CO2		H	H	M								
	CO3	L	M	H									
	CO4												
	CO5		M	M	H								
	CO6	M	M	H	M								
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)	Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)	
										√			
4	Approval	37th Meeting of Academic Council, May 2015											

UNIT I MODES OF COMMUNICATION 9

System Process, Interrupt Handling, Handling Systems calls, Protection of resources &Resources Management Micro-Kernel Operating System.

UNIT II REVIEW OF NETWORK OPERATING SYSTEM 9

Distributed Operating System, Issue in the design of Distributed Operating System, Overview of Computer Networks. Inter process communication, Linux, IPC Mechanism, Remote Procedure calls, RPC exception handling, Security issues, RPC in Heterogeneous Environment (case study Linux RPC)

UNIT III RESOURCE MANAGEMENT 9

Clock Synchronization, Logical clocks, Physical clocks, clock synchronization algorithms, Mutual Exclusion, Election Algorithms, Dead locks in Distributed Systems. Thrashing, Heterogeneous DSM, Resource Management (Load Balancing approach, Load Sharing approach), Process Management: process Migration, Thread.

UNIT IV OVERVIEW OF SHARED MEMORY 9

Consistency model, Page based Distributed Shared Memory, Shared –variable Distributed Memory, Object -based Distributed Memory.

UNIT V FILE MODELS 9

File access, File sharing, file-caching, File Replication, fault Tolerance, Network File System, (Case study, 8NFS on Linux Directory Services, Security in Distributed File system).

TEXT BOOKS:

1. M. Beck et al," Linux Kernel Programming",3rd edition, 2002.
2. B.W. Kernighan and R Pide, "The Unix Programming Environment ", Prentice Hall of India-2000.

REFERENCE BOOKS:

1. Silberschatz,P.B.Garvin,Gagne," Operating System Concepts", 2009.
2. https://www.cs.columbia.edu/~smb/classes/s06-4118/l26.pdf

BCS603	ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Nil				
	Course Designed by – Dept. of Computer Science and Engineering.				

OBJECTIVES

The purpose of this course is to impart concepts of Artificial Intelligence and Expert System.

COURSE OUTCOMES (COs)

CO1	Describe the modern view of AI as the study of agents that receive percepts from the Environment and perform actions.
CO2	Demonstrate awareness of informed search and exploration methods.
CO3	Explain about AI techniques for knowledge representation, planning and uncertainty Management.
CO4	Develop knowledge of decision making and learning methods.
CO5	Describe the use of AI to solve English Communication problems.
CO6	Explain the concept Knowledge Representation.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1		H		H							
	CO2	M			H		M					
	CO3				H		M	M				
	CO4		M		H							
	CO5	M			H		H					
	CO6	L	M		M		M					

3	Category	Humanities & Social Studies (HS)	Basic Sciences & (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
							√		

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I PROBLEMS AND SEARCH 9

Searching strategies- Uninformed Search- breadth first search, depth first search, uniform cost seart, depth limited search, iterative deepening search, bidirectional search - Informed Search-

Best first search ,Greedy Best first search , A* search – Constraint satisfaction problem , Local searching strategies.

UNIT II REASONING 9

Symbolic Reasoning Under Uncertainty- Statistical Reasoning - Weak Slot-And-Filler-Structure - Semantic nets – Frames- Strong Slot-And-Filler Structure-Conceptual Dependency-Scripts-CYC.

UNIT III KNOWLEDGE REPRESENTATION 9

Knowledge Representation - Knowledge representation issues - Using predicate logic - Representing Knowledge Using Rules. Syntactic- Semantic of Representation – Logic & slot and filler - Game Playing – Minimal search- Alpha beta cutoffs –Iteratic deepening planning – component of planning system – Goal stack planning.

UNIT IV NATURAL LANGUAGE PROCESSING 9

Natural Language Processing –Syntactic processing, semantic analysis-Parallel and Distributed AI-Psychological modeling- parallelism and distributed in reasoning systems – Learning - Connectionist Models – Hopfield networks, neural networks

UNIT V EXPERT SYSTEMS 9

Common Sense –qualitative physics, commonsense ontologies- memory organization -Expert systems –Expert system shells- explanation – Knowledge acquisition -Perception and Action – Real time search- robot architecture.

TEXT BOOKS:

1. Elaine Rich, Kevin Knight, "Artificial Intelligence", 3/e, Tata McGraw Hill, 2009.
2.Russell , " Artificial intelligence :A modern Approach , Pearson Education ,3rd edition,2013

REFERENCE BOOKS:

1.Artificial Intelligence and Expert system by V.Daniel hunt, Springer press,2011.
2. Nilsson N.J.,"Principles of Artificial Intelligence", Morgan Kaufmann.1998.
3**.** http://www.ggu.ac.in/download/Class-Note13/Artificial%20Intelligence %20and%20Expert%20System24.10.13.pdf

NON MAJOR ELECTIVE-III

BBM405	BIOSENSORS AND TRANSDUCER	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite –Biology for Engineers.				
	Course Designed by – Dept. of Bio Medical Engineering.				

OBJECTIVES

- Understand the purpose of measurement, the methods of measurements, errors associated with measurements.
- Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications.

COURSE OUTCOMES (COs)

CO1	Describe the purpose and methods of measurements.

CO2	Explain different display and recording devices for various applications.
CO3	Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications
CO4	Remember and understand the concepts, types, working and practical applications of important biosensors.
CO5	Know some of the commonly used biomedical transducers.
CO6	Know the different display and recording devices.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M	H	M	H	H	M	H			L	M
	CO2	M	H	M	H	H	M	H			L	M
	CO3	M	H	M	H	H	M	H			L	M
	CO4	M	H	M	H	H	M	H			L	M
	CO5	M	H	M	H	H	M	H			L	M
	CO6	M	H	M	H	H	M	H			L	M

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
							√		
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I SCIENCE OF MEASUREMENT 9

Units and Standards - calibration methods - statics calibration - classification of errors, error analysis - statistical methods - odds and uncertainity.

UNIT II CHARACTERISTICS OF TRANSDUCERS 9

Static characteristics - accuracy, precision, sensitivity, linearity etc - mathematical model of transducers - zero first - order and second - order transducers - response to impulse step, ramp and sinusoidal inputs.

UNIT III VARIABLE RESISTANCE TRANSDUCERS 9

Principle of operation, construction details, characteristics and applications of resistance potentiometers, strain gauges, resistance thermometers, thermistors, hot-wire aneometer, piezoresistive sensors and humidity sensors.

UNIT IV BIOSENSORS - PHYSIOLOGICAL RECEPTORS - J RECEPTORS 9

Chemoreceptors, Baroreceptors, Touch receptors, Biosensors - Working Principle and Types, Applications.

UNIT V OTHER TRANSDUCERS 9

Piezoelectric tranducers, magnetostrictive transducer, IC sensor digital transducers - smart sensor - fibre optic transducers.

TEXT BOOKS:

1. Doeblin. E. O, Measurment Systems, McGraw Hill Book Co. 1998

REFERENCE BOOKS:

1. Renganathan S, Transducer Engineering, Allied Publishers, Chennai,2000.
2. https://www1.ethz.ch/lbb/Education/Biosensors/Lecture_1_overview.pdf

BEI704	VIRTUAL INSTRUMENTATION	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Electronic Instrumentation				
	Course Designed by – Dept. of Electronics & Instrumentation Engineering				

OBJECTIVES

- To provide knowledge on design of process control by using virtual instrumentation techniques
- To provide knowledge in process analysis by VI tools.
- To give basic knowledge in describing function analysis.
- Get adequate knowledge VI tool sets

COURSE OUTCOMES (COs)

CO1	To describe about virtual instrumentation.
CO2	Get adequate knowledge VI tool sets
CO3	To describe data acquisition
CO4	To get introduced to VI programming techniques
CO5	To understand VI programming techniques
CO6	To get an adequate knowledge application of virtual instrumentation

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M	M	M	H	M		M			L	L
	CO2	H	M	M	H	H		M			L	L
	CO3	H	M		H	H		M			L	L
	CO4	H	M		H	H		M			L	L
	CO5	H	M	M	H	H		M			L	L
	CO6	H			H	H		M			L	L

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Basic Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
							√		

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I INTRODUCTION 9

Virtual Instrumentation: Historical perspective - advantages - block diagram andArchitecture of a virtual instrument - Conventional Instruments versus TraditionalInstruments - data-flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT II VI PROGRAMMING TECHNIQUES 9

VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequenceStructures, formula nodes, local and global variables, State machine, string and file I/O,Instrument Drivers, Publishing measurement data in the web.

UNIT III DATA ACQUISITION 9

Introduction to data acquisition on PC, Sampling fundamentals, Input/output techniquesAnd buses. Latest ADCs, DACs, Digital I/O, counters and timers, DMA, Software andHardware installation, Calibration, Resolution, Data acquisition interface requirements –Issues involved in selection of Data acquisition cards – Data acquisition cards with serialCommunication - VI Chassis requirements. SCSI, PCI, PXI system controllers, EthernetControl of PXI. Networking basics for office & Industrial applications, VISA and IVI.

UNIT IV VI TOOLSETS 9

Use of Analysis tools, Fourier transforms, power spectrum, correlation methods,Windowing and filtering. Application of VI in process control designing of equipments like oscilloscope, Digital multimeter, Design of digital Voltmeters with transducer input Virtual Laboratory, Web based Laboratory

UNIT V APPLICATIONS 9

Distributed I/O modules- Application of Virtual Instrumentation: Instrument Control,Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control. Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, HMI / SCADA software, Active X programming.

TEXT BOOKS:

1. Gary Johnson, Lab VIEW Graphical Programming, Second edition, McGraw Hill, Newyork, 1997.
2. Lisa K. wells & Jeffrey Travis, Lab VIEW for everyone, Prentice Hall, New Jersey, 1997.

REFERENCE BOOKS:

1. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newness, 2000.

BET603	**TELECOMMUNICATION SWITCHING SYSTEMS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite –Computer Communication & Networks				
	Course Designed by – Dept. of Electronics and Telecommunication Engineering.				
OBJECTIVES • To learn about the concepts of switching system and networks in detail.					
COURSE OUTCOMES (COs)					
CO1	To learn about the various switching systems				

CO2	To learn in detail about time division switching.
CO3	To know about traffic management.
CO4	To understand about various signaling in telecommunication systems
CO5	To analyse various telecommunication networks
CO6	To estimate the performance of telecommunication networks.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M	M	M				M				
	CO2	H	H	L	L							
	CO3	M	M	H	M	M					M	
	CO4	M		L						M		M
	CO5	H	M					M		M		
	CO6	M		M		M	M		H	M	M	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
							√		

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I SWITCHING SYSTEMS 9

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

UNIT II TIME DIVISION SWITCHING 9

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

UNIT III TELECOMMUNICATION TRAFFIC 9

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

UNIT IV TELECOMMUNICATION SIGNALLING 9

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

UNIT V TELECOMMUNICATION NETWORKS 9

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1. T.V.SWAMINATHAN, telecommunication switching system &networks, PHI.
2.**http://www.newagepublishers.com/samplechapter/000969.pdf**

OPEN ELECTIVE-I

BBA008	TOTAL QUALITY MANAGEMENT	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Professional Courses				
	Course Designed by – Dept. of Management studies				

OBJECTIVES

- To introduce to the student about the basic terms related to quality and concepts of quality management
- To familiarize the student about the basic principles of total quality management
- To acquaint the student with the basic statistical tools used in process control
- To introduce to the student about the various tools used in implementing and checking total quality management

COURSE OUTCOMES (COs)

CO1	By understanding about various quality terms, it will be helpful for the student to maintain quality in his/her organization
CO2	The student will be able to formulate new plans/procedures to be implemented to achieve the desired quality status by knowing about the various principles of quality management
CO3	The student will be able to analyze the periodical data in quality control using statistical tools
CO4	The total quality management tools will help the student to understand the procedures in measuring the quality of the organization/process and will also enable him/her to identify the parameters that are improving/depriving the quality
CO5	By knowing about the quality ISO systems, the student will be maintain processes/documentation properly so that the quality maintained by his/her

	organization gets recognized
CO6	To familiarize the student about the different quality systems used in auditing the quality of a company/industry/organization

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1			M		H		M	H	M	L	L
	CO2			M		H		M	H	M	L	L
	CO3			M		H		M	H	M	L	L
	CO4			H		H		M	H	M	L	L
	CO5			H		H		M	H	M	L	L
	CO6			H		H		M	H	M	L	L

3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
								√	

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I INTRODUCTION 9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs – Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation

UNIT II TQM PRINCIPLES 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership –Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT III STATISTICAL PROCESS CONTROL (SPC) 9

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT IV TQM TOOLS 9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, and FMEA –Stages of FMEA.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System –Elements, Implementation of Quality System, Documentation, Quality Auditing, TS16949, ISO 14000 – Concept, Requirements and Benefits

TEXT BOOKS:

1. Dale H.Besterfiled, et al., "Total Quality Management", Pearson Education, Inc.2003. (Indian reprint 2004). ISBN 81-297-0260-6.

REFERENCE BOOKS:

1. Evans. J. R. & Lindsay. W,M "The Management and Control of Quality", (5th Edition), South Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Feigenbaum.A.V. "Total Quality Management", McGraw-Hill, 1991.
3. Oakland.J.S. "Total Quality Management", Butterworth Heinemann Ltd., Oxford, 1989.
4. Narayana V. and Sreenivasan, N.S. "Quality Management – Concepts and Tasks", New Age International 1996.
5. Zeiri. "Total Quality Management for Engineers", Wood Head Publishers, 1991.

BBA001	PRINCIPLES OF MANAGEMENT AND ORGANIZATIONALBEHAVIOUR	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Professional Courses				
	Course Designed by – Department of Management Studies				

OBJECTIVES

- Familiarize the students with the fundamental concepts of Management and to highlight the approaches in organization behavior

COURSE OUTCOMES (COs)

CO1	Understanding the concepts of Management
CO2	Knowledge on Management Functions
CO3	Understanding the Organization Theory & Approach.
CO4	Knowledge on the Concepts of Motivation
CO5	Clear insight on the factors contributing to discipline
CO6	In-depth Understanding about the concepts of Group Behavior

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					H					H
	CO2		H		M					H		
	CO3	M							M		H	
	CO4			M	H							H
	CO5							M				
	CO6				H							

3	Category	Humanities & Sciences(HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
								√	
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT -I NATURE OF MANAGEMENT 9

Definition – theory and practice – effective management – Management : Science of Art – Management in India. Development of Management thoughts – Taylor's – Henry Fayol – Hawthrone experiment – Barnard & Social system – Herbert Simon – Peter Drucker – Various approaches – Management thoughts.

UNIT- II MANAGEMENT PROCESS 9

Co-ordination – Functions of management – Managers and environment – External and internal Business Ethics – Planning – Fundamentals – Definitions & Features – Steps in planning – types of planning – Objectives – Concepts and features – Hierarchy of objectives – role – Process of MBO – Policy & Strategy – Decision making process – Individual Vs Group Decisions.

UNIT- III ORGANIZATION STRUCTURE 9

Organizing – Theory & Approach –Authority & Responsibility – Delegation – Centralization & Decentralization – Line & Staff Relationship – Staffing – Fundamentals – System approach – Manpower Planning – Recruitment & Selection – Training and development – Performance appraisal – Direction – Fundamentals Motivation – Theories of Motivation-Maslow's Hersberg's MaClelland's theory X,Y & Z leadership – Theories and Styles – Communication – Type – Controlling – System and Process.

UNIT- IV ORGANIZATIONAL BEHAVIOUR 9

Definition – Organization – Managerial Role and Functions – Organizational Approaches, Individual behaviour – Causes – Environmental effect – Behaviour and performance, perception – Organizational implications, Personality – Contributing factors – Dimension, Motivation – Need Theories – Process Theories – Job satisfaction, Learning and Behaviour – Learning Curves, Work Design and Approaches.

UNIT -V GROUP BEHAVIOUR 9

Groups – Contributing factors –Group Norms, types – Causes – Intergroup relations – Conflict and Resolution – Change Process –Resistance to change.

TEXT BOOKS:

1. Herald Knootz and Heinz weihrich, 'Essentials of Management', McGraw Hill Publishing Company, Singapore International Edition, 2004.
2. Ties AF, Stoner and R. Edward Freeman, "Management" Prentice Hall of India Pvt. Ltd., New Delhi -110011, 1995.

REFERENCE BOOKS :

1. Joseph I. Massie 'Essentials of Management', Prentice Hall of India Pvt. Ltd, New Delhi - 110011, 2004.
2. L.M. Prasad "Principles and Practice of Management", Sultan Chand & Sons.2001
3. Uma Sekaran, "Organizational Behaviour", Tata McGraw Hill, 2007.

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BBA004	ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite –Professional Courses				
	Course Designed by – Dept. of Management Studies				

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 (COs)

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
CO6	Understand the impact of inflation, taxation, depreciation. Financial planning, economic basis for replacement, project scheduling, and legal and regulatory issues are introduced and applied to economic investment and project-management problems.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H					M				M	
	CO2	M	L	H					L			
	CO3	H			H					H		
	CO4	M				H		M				M
	CO5		L									
	CO6						H					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
								√	

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I ECONOMICS, COST AND PRICING CONCEPTS 9

Economic theories – Demand analysis – Determinants of demand – Demand forecasting – Supply – Actual cost and opportunity cost – Incremental cost and sunk cost – Fixed and variable cost – Marginal costing – Total cost – Elements of cost – Cost curves – Breakeven point and breakeven chart – Limitations of break even chart – Interpretation of break even chart – Contribution – P/V-ratio, profit-volume ratio or relationship – Price fixation – Pricing policies – Pricing methods.

UNIT II CONCEPTS ON FIRMS AND MANUFACTURING PRACTICES 9

Firm – Industry – Market – Market structure – Diversification – Vertical integration – Merger – Horizontal integration

UNIT III NATIONAL INCOME, MONEY AND BANKING, ECONOMIC ENVIRONMENT 9

National income concepts – GNP – NNP – Methods of measuring national income – Inflation – Deflation – Kinds of money – Value of money – Functions of bank – Types of bank – Economic liberalization – Privatization – Globalization

UNITIV CONCEPTS OF FINANCIAL MANAGEMENT 9

Financial management – Scope – Objectives – Time value of money – Methods of appraising project profitability – Sources of finance – Working capital and management of working capital

UNITV ACCOUNTING SYSTEM, STATEMENT AND FINANCIAL ANALYSIS 9

Accounting system – Systems of book-keeping – Journal – Ledger – Trail balance – Financial statements – Ratio analysis – Types of ratios – Significance – Limitations .

TEXT BOOKS:

1. Prasanna Chandra, ―Financial Management‖ (Theory & Practice) TMH
2. Weston & Brigham, ―Essentials of Managerial Finance‖

REFERENCE BOOKS:

1.Pandey, I. M., ―Financial Management‖
2.Fundamentals of Financial Management‖- James C. Van Horne.
3. http://stanford.edu/dept/MSandE

OPEN ELECTIVE-II

BEI701	LOGIC AND DISTRIBUTED CONTROL SYSTEM	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite –Control Systems				
	Course Designed by – Dept of Electronics & Instrumentation Engineering				

OBJECTIVES

- To give an introductory knowledge on Programmable Logic Controller (PLC) and their Programming languages
- To give adequate knowledge about applications of PLC
- To give basic knowledge about Computer Controlled Systems
- To give basic knowledge on the architecture and local control unit of Distributed Control System(DCS)
- To give adequate information with respect to interfaces used in DCS

COURSE OUTCOMES (COs)

CO1	To get an introductory knowledge on PLC and Programming Languages
CO2	To get Adequate knowledge about application of PLC
CO3	To get basic knowledge about computer controlled systems
CO4	To get basic knowledge on the architecture and local control unit of Distributed Control System(DCS)
CO5	To get an adequate knowledge application of PLC
CO6	To understand the systems used in distributed control systems

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	
2	CO1	M	M	M	H	M		M			L	L	
	CO2	H	M	M	H	H		M			L	L	
	CO3	H	M		H	H		M			L	L	
	CO4	H	M		H	H		M			L	L	
	CO5	H	M	M	H	H		M			L	L	
	CO6	H			H	H		M			L	L	M

3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Basic Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
								√	

4	Approval		37th Meeting of Academic Council, May 2015

UNIT I PROGRAMMABLE LOGIC CONTROLLER 9

Evolution of PLCs – Components of PLC – Architecture of PLC – Discrete and analog I/O modules – Programming languages -Ladder diagram – Function block diagram (FBD) - Programming timers and counters

UNITII APPLICATIONS OF PLC 9

Instructions in PLC – Program control instructions, math instructions, data manipulation Instructions, sequencer and shift register instructions – Case studies in PLC

UNIT III COMPUTER CONTROLLED SYSTEMS 9

Basic building blocks of computer controlled systems – Data acquisition system – Supervisory control – Direct digital control- SCADA: - Hardware and software, Remote terminal units, MasterStation and Communication architectures.

UNIT IV DISTRIBUTED CONTROL SYSTEM 9

DCS – Various Architectures – Comparison – Local control unit – Process interfacing issues – Communication facilities

UNIT V INTERFACES IN DCS 9

Operator interfaces - Low level and high level operator interfaces – Displays - Engineering interfaces – Low level and high level engineering interfaces – Factors to be considered in selecting DCS – Case studies in DCS

TEXT BOOKS:

1. F.D. Petruzella, Programmable Logic Controllers, Tata Mc-Graw Hill, Third edition, 2010
2. Michael P. Lukas, Distributed Control Systems: Their Evaluation and Design, Van Nostrand Reinhold Co., 1986
3. D. Popovic and V.P.Bhatkar,' Distributed computer control for industrial Automation'Marcel Dekker, Inc., Newyork, 1990.

REFERENCE BOOKS:

1. T.A. Hughes, Programmable Controllers, Fourth edition, ISA press, 2005
2. Krishna Kant, Computer Based Industrial Control, Second edition, Prentice Hall of India,New Delhi, 2010.
3. John W. Webb and Ronald A. Reis, 'Programmable Logic Controllers, Fifth edition, Prentice Hall of India, New Delhi, 2010.
4. John R. Hackworth and Frederick D. Hackworth Jr, Programmable Logic Controllers,Pearson, New Delhi, 2004.
5. Clarke, G., Reynders, D. and Wright, E., "Practical Modern SCADA Protocols: DNP3,4. 60870.5 and Related Systems", Newnes, 1st Edition, 2004.
6.E.A.Parr, Programmable Controllers, An Engineer's Guide, Elsevier, 2013.

BEI012	**ANALOG INTEGRATED CIRCUIT DESIGN**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Linear Integrated Circuits				
	Course Designed by – Dept of Electronics & Instrumentation Engineering				

OBJECTIVES

To have an adequate knowledge in the measurement techniques for power and energy, power and introduce the meters used to measure current & voltage.

COURSE OUTCOMES (COs)

CO1	To describe about single stage amplifier.
CO2	To analyse high frequency and noise characteristics of amplifiers
CO3	To analyse about feedback circuits and about Op-Amp performance characteristics.
CO4	To learn about frequency compensation techniques
CO5	To understand the stability of an Op-Amp
CO6	To analyse Band gap references

Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low												
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	M	M	M	H	M		M			L	L
	CO2	H	M	M	H	H		M			L	L
	CO3	H	M		H	H		M			L	L
	CO4	H	M		H	H		M			L	L
	CO5	H	M	M	H	H		M			L	L
	CO6	H			H	H		M			L	L
3	Category	Humanities & Social Studies (HS)		Basic Sciences & Maths (BS)		Basic Sciences (ES)		Professional Core (PC)		Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)
												√	
4	Approval	37th Meeting of Academic Council, May 2015											

UNIT I SINGLE STAGE AMPLIFIERS 9

Basic MOS physics and equivalent circuits and models, CS, CG and Source Follower cascade and folded cascade configurations, differential amplifiers and current mirror configurations.

UNIT II HIGH FREQUENCY AND NOISE OF CHARACTERISTICS AMPLIFIERS 9

Current mirrors, cascade stages for current mirrors, current mirror loads for differential pairs. Miller effect, association of poles with nodes, frequency response of CS, CG and source follower, cascade and differential pair stages Statistical characteristics of noise, noise in single stage amplifiers, noise in differential amplifiers.

UNIT III FEEDBACK AND OPERATIONAL AMPLIFIERS 9

Properties and types of negative feedback circuits, effect of loading in feedback networks, operational amplifier performance parameters, One-stage Op Amps, Two-stage Op Amps, Input range limitations, Gain boosting, slew rate, power supply rejection, noise in Op Amps.

UNIT IV STABILITY AND FREQUENCY COMPENSATION 9

General considerations, multiple systems, Phase Margin, Frequency Compensation, and Compensation of two stage Op Amps, Slewing in two stage Op Amps, and Other compensation techniques.

UNIT V BANDGAP REFERENCES 9

Supply independent biasing, temperature independent references, PTAT current generation, Constant-Gm Biasing.

TEXT BOOKS:

1. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", Tata McGraw Hill, 2001
2. Willey M.C. Sansen, "Analog Design Essentials", Springer, 2006.

REFERENCE BOOKS:

1.Grebene, "Bipolar and MOS Analog Integrated circuit design", John Wiley & sons, Inc., 2003.

2.Phillip E.Allen, DouglasR.Holberg, "CMOS Analog Circuit Design", Second edition, OxfordUniversity Press, 2002

3.Recorded lecture available at http://www.ee.iitm.ac.in/~ani/ee5390/index.html

4.Jacob Baker "CMOS: Circuit Design, Layout, and Simulation, Third Edition", Wiley IEEEPress 2010 3rd Edition

BET008	INTEGRATED SERVICES DIGITAL NETWORK	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite –Computer Communication and Networks				
	Course Designed by – Dept. of Electronics & Tele Communication Engineering				

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 have knowledge in Network performance Modeling and Estimation

COURSE OUTCOMES (COs)

CO1	To know the basics of ISDN,
CO2	Protocols involved in ISDN
CO3	To learn about Broad Band ISDN
CO4	To understand about network Management
CO5	To Empower knowledge in Network Traffic Management
CO6	To Estimate the Network Performance.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k
2	CO1	H			M		M				M	
	CO2	M	M	H					L			
	CO3	M		H	H	H		M		H		
	CO4	M						L				M
	CO5		M			M				M		
	CO6		M	H			H				M	

3	Category	Humanities & Social Studies (HS)	Basic Sciences	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/ Seminar/ Internship (PR)

								√	
4	Approval	37th Meeting of Academic Council, May 2015							

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 data link 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, Internetprotocol over ISDN frame relay and ATM.

UNIT IV NETWORK TRAFFIC MANAGEMENT 9

ATM 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

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.

REFERENCE BOOKS:

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
3. www.faadooengineers.com