CURRICULUM AND SYLLABUS

CHOICE BASED CREDIT SYSTEM

B.TECH ELECTRICAL AND ELECTRONICS ENGINEERING

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
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 –I	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 week ends	0	0	2	1

Total Number of Contact Hours = 35 **Total Number of Credits= 23**

#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)

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
BFI201	HS	Foreign/Indian Language	3	0	0	3
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 week ends	0	0	2	1

Total Number of Contact Hours = 35 **Total Number of Credits= 29**

*Syllabus is same as that of first semester.

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

SEMESTER – III						
Course Code	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BMA301	HS	Mathematics – III	3	2	0	4
BEE301	PC	Circuit Theory	4	0	0	4
BEE302	PC	Electrical machines – I	3	0	0	3
BEE303	PC	Electron Devices	3	0	0	3
BEE304	PC	Electromagnetic Theory	3	0	0	3
BEE306	PC	Digital Electronics	3	0	0	3
PRACTICAL						
BEE3L2	PC	Electrical Machines Laboratory - I	0	0	3	2
BEE3L5	PC	Electron Devices Laboratory	0	0	3	2
BEE3L6	PC	Programming Language (C& C++) Laboratory	0	0	3	2
Total Number of Contact Hours = 35			**Total Number of Credits= 26**			

SEMESTER – IV						
Course Code	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BMA401	BS	Applied Probability and Statistics	3	2	0	4
BEE401	PC	Electrical Machines - II	3	0	0	3
BEE402	PC	Electrical Network analysis & Synthesis	3	0	0	3
BEE403	PC	Linear Integrated circuits	3	0	0	3
BME405	PC	Thermal Engineering & Fluid mechanics	3	0	0	3
BCE406	HS	Environmental Studies	3	0	0	3
PRACTICAL						
BEE4S1	PR	Technical Seminar - 1	0	0	2	1
BEE4L1	PC	Electrical machines Laboratory – II	0	0	3	2
BEE4L2	PC	Linear & Digital Integrated Circuits Laboratory	0	0	3	2
BME4L3	PC	Thermal Engineering & Fluid mechanics Laboratory	0	0	3	2
Total Number of Contact Hours = 35			**Total Number of Credits= 26**			

SEMESTER - V						
Course Code	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BMA502	HS	Numerical methods	3	2	0	4
BEE501	PC	Control System	4	0	0	4
BEE502	PC	Power Electronics	3	0	0	3
BEE504	PC	Electrical Machine design	4	0	0	4
BEE505	PC	Power Generation Systems	3	0	0	3
	CE	Core Elective-I	3	0	0	3
PRACTICAL						
BEE5C1	PR	Comprehension I	0	0	0	1
BEE5L1	PC	Control System Laboratory	0	0	3	2
BEE5L2	PC	Power Electronics Laboratory	0	0	3	2
Total Number of Contact Hours = 28			**Total Number of Credits= 26**			

SEMESTER – VI						
Course Code	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BEE601	PC	Transmission and Distribution	4	0	0	4
BEE603	PC	Microprocessor and Microcontroller	3	0	0	3
BEE604	PC	Digital Signal Processing	3	0	0	3
BEE605	PC	Measurement and Instrumentation	3	0	0	3
BSS601	HS	Value Education & Professional Ethics	3	0	0	3
	NE	Non –Major Elective-I	3	0	0	3
	CE	Core Elective-II	3	0	0	3
PRACTICAL						
BEE6L1	PC	Microprocessor and Microcontroller Laboratory	0	0	3	2
BEE6L2	PC	Measurement and Instrumentation Laboratory	0	0	3	2
Total Number of Contact Hours = 35			**Total Number of Credits= 26**			

SEMESTER – VII						
Course Code	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BMA701	PC	Operations Research for Engineers	4	0	0	4
BEE701	PC	Power System Analysis	4	0	0	4
BEE703	PC	Electrical Drives and Control	4	0	0	4
	NE	Non Major Elective-II	3	0	0	3
	CE	Core Elective-III	3	0	0	3
	OE	Open Elective-I	3	0	0	3
PRACTICAL						
BEE7P1	PR	Term paper	0	0	4	2
BEE7L1	PC	Power System Using PC Laboratory	0	0	3	2
BEE7L3	PC	Electrical Drives & Control Laboratory	0	0	3	2
BEE7V1	PR	In plant Training (End of 6thSem- 15 days)	0	0	0	1
Total Number of Contact Hours = 31			**Total Number of Credits= 28**			

SEMESTER – VIII						
Course Code	**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						
BEE8C1	PR	Comprehension II	0	0	0	1
BEE8P1	PR	Project Work	0	0	18	9
Total Number of Contact Hours = 35			**Total Number of Credits= 16**			

OVERALL CREDITS: 200

LIST OF ELECTIVES

CORE ELECTIVES-I (CE-I)						
SL.NO	**COURSE CODE**	**COURSE TITLE**	**L**	**T**	**P**	**C**
THEORY						
1.	BEE015	Electrical Special Machines	3	0	0	3
2.	BEE051	Distributed generation and Microgrid	3	0	0	3
3.	BEE012	Solid State Relays	3	0	0	3
4.	BEE053	Power System Protection and Switch Gear	3	0	0	3
5.	BEE013	High Voltage Engineering	3	0	0	3
CORE ELECTIVES-II (CE-II)						
SL.NO	**COURSE CODE**	**COURSE TITLE**	**L**	**T**	**P**	**C**
THEORY						
1.	BEE052	Electrical Machine Modeling and Analysis	3	0	0	3
2.	BEE016	Flexible AC Transmission Systems	3	0	0	3
3.	BEE048	Renewable Energy Sources	3	0	0	3
4.	BEE003	Advanced Control System	3	0	0	3
5.	BEE011	High Voltage DC Transmission	3	0	0	3
CORE ELECTIVES-III (CE-III)						
SL.NO	**COURSE CODE**	**COURSE TITLE**	**L**	**T**	**P**	**C**
THEORY						
1.	BEE047	Power System Operation and Control	3	0	0	3
2.	BEE044	Power Quality Management	3	0	0	3
3.	BEE019	Smart Grid	3	0	0	3
4.	BEE043	Solar Energy Utilization	3	0	0	3
5.	BEE033	Electric and Hybrid Vehicles	3	0	0	3
NON MAJOR ELECTIVES –I (NE-I)						
SL.NO	**COURSE CODE**	**COURSE TITLE**	**L**	**T**	**P**	**C**
THEORY						
1.	BEE045	Instrumentation and Control in power Plant Industries	3	0	0	3

2.	BEE049	Design of Embedded Systems	3	0	0	3
3.	BEE009	Robotics and Automation	3	0	0	3
4.	BEC612	Principles of communication Engineering	3	0	0	3
5.	BEE042	Electronic Integrated Circuits	3	0	0	3

NON MAJOR ELECTIVES –II (NE-II)

SL.NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	BEE007	Bio-Medical Instrumentation	3	0	0	3
2.	BEE014	Fuzzy Logic and Neutral Network	3	0	0	3
3.	BEE027	Micro Controller Based System Design	3	0	0	3
4.	BBM405	Biosensors and Transducer	3	0	0	3
5.	BEC013	Automotive Electronics	3	0	0	3

NON MAJOR ELECTIVES –III (NE-III)

SL.NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	BEI704	Virtual Instrumentation	3	0	0	3
2.	BEE026	Micro Electro Mechanical Systems	3	0	0	3
3.	BEE050	Process control Engineering	3	0	3	3
4.	BEE022	Fibre Optics and Laser Instrumentation	3	0	0	3
5.	BBA005	Energy Engineering And Management	3	0	0	3

OPEN ELECTIVES –I (OE-I)

SL.NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	BBA004	Engineering Economics and Financial accounting	3	0	0	3
2.	BBA008	Total Quality Management	3	0	0	3
3.	BBA001	Principles of Management and Organizational Behavior	3	0	0	3
4.	BEE031	Web Design	3	0	0	3
5.	BEE046	Java Programming	3	0	0	3

OPEN ELECTIVES –II (OE-II)						
SL.NO	**COURSE CODE**	**COURSE TITLE**	**L**	**T**	**P**	**C**
THEORY						
1.	BBA007	Engineering Economics and Cost Analysis	3	0	0	3
2.	BBA002	Entrepreneurship Development	3	0	0	3
3.	BBA003	Marketing Management	3	0	0	3
4.	BEE029	Cloud Computing	3	0	0	3
5.	BEE030	Cyber Security	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	Understand the importance of being responsible, logical, and thorough.
CO6	e 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	l
2	CO1	H	H	H	H	H	M	L	L	H	H	H	H
	CO2							L					
	CO3	H						H		H			H
	CO4	H	M				M	L	H	H			H
	CO5							L					
	CO6	H		H	H	H	H	L		H	H	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 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	l
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:

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

REFERENCES:

1. Ramana.B.V. "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2007.
2. Glyn James, "Advanced Engineering Mathematics", 7th Edition, Pearson Education, 2007.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John 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.

PH101	**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	l
2	CO1	H						M			H		
	CO2		L	H		M				M		L	H
	CO3												
	CO4	H		M	L						L		M
	CO5		L	L								L	L
	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 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	l
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 DEVICES9

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 – +2 level Physics				
	Course Designed by – Department of Physics				

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	l
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 culture 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, anothe culture and which acclimatize them to the authentic use of the French language through the exploitation of written and iconographic documents. The Indian context been used.
CO5	Grammatical and lexical notions as well as activities required for communication learnt by the students.
CO6	Interpreting skills and confidence in the language.
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	l
2	CO1	H	L										
	CO2			H	L				H	H	M	L	L
	CO3			H	L				H	H	M	L	L
	CO4			H					H	H	M	L	L
	CO5			H	L				H	H	M		L
	CO6			H					H	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 INTRODUCTION 8

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 8

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 8

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 7

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 7

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

UNIT VI REGULAR & IRREGULAR VERBS 7

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 read, 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	l
2	CO1	H	L										
	CO2			H	L				H	H	M	L	L
	CO3			H	L				H	H	M	L	L
	CO4			H					H	H	M	L	L
	CO5			H	L				H	H	M		L
	CO6			H					H	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							

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

BKR 101	**KOREAN**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	1	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	l
2	CO1	H	L										
	CO2			H	L				H	H	M	L	L
	CO3			H	L				H	H	M	L	L
	CO4			H					H	H	M	L	L
	CO5			H	L				H	H	M		L
	CO6			H					H	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 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 - 60	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	l
2	CO1	H	L										
	CO2			H	L				H	H	M	L	L
	CO3			H	L				H	H	M	L	L
	CO4			H					H	H	M	L	L
	CO5			H	L				H	H	M		L
	CO6			H					H	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 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	3	0	0	3
	Prerequisite – +2 Level Maths + Physical Science				
	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 visualize two dimensional graphic representation of three dimensional objects and buildings
CO2	To produce two dimensional graphic representation of three dimensional objects and buildings
CO3	To comprehend and visualize 3D views of objects.
CO4	To understand and generate the different curves used in engineering applications.
CO5	To learn and write program in “C”.
CO6	**:** To introduce the fundamental of CAD Graphics used in design.

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

UNIT II PROJECTIONSOFPLANES ANDSOLIDS 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

UNIT III ORTHOGRAPHICPROJECTIONS,ISOMETRIC PROJECTIONS& FREEHANDSKETCHING 9

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

UNIT IV PROJECTIONOFSECTIONEDSOLIDS AND DEVELOPMENT OF SURFACES 9

Sectioningofsolidsinsimpleverticalpositionwhenthecuttinglaneisinclinedtotheoneof the principal planes and perpendicular to the other-obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids-Prisms, pyramids cylinders and cones.

UNIT V PERSPECTIVEPROJECTION, BUILDINGDRAWING ANDCOMPUTERAIDEDDRAFTING 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 publishing house, 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.Prabhu Raja , "Engineering Graphics", New Age International Private limited, 2008.
3. Luzzader, Warren.J.,and Duff, John.M.,, "Fundamentals of Engineering Drawing with an introduction to Interactive computer graphics for design and production", Eastern economy edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005

BEE 101	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	2	0	0	2
	Prerequisite – Engineering Mathematics, Engineering Physics-I & II				
	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	l
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 & 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.

BCS 1L2	**COMPUTER PRACTICE LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	1
	Prerequisite – Fundamentals of Computer				
	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	l
2	CO1	H	H	L	H		H		L		H	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 – Basic Electrical and Electronics Engineering				
	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	l
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 make the students aware to different kinds of Learner-friendly modes of language to a variety of self- instructional learning (Computer based)
CO5	To achieve a reasonably good level of competency in group discussions
CO6	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	l
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	
	CO6			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 Mishra , 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	l
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	l
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	l
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 202	INTERNET PROGRAMMING	L	T	P	C
	Total Contact Hours - 30	2	0	0	2
	Prerequisite – Fundamentals of Computer				
	Course Designed by – Dept of Information Technology				

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	l
2	CO1	M	M	M	H	M		M			L	L	M
	CO2	H	M	M	H	H		M			L	L	M
	CO3	H	M		H	H		M			L	L	M
	CO4	H	M		H	H		M			L	L	M
	CO5	H	M	M	H	H		M			L	L	M
	CO6	H			H	H		M			L	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 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	1	1	0	2
	Prerequisite – +2 Level Knowledge				
	Course Designed by – Department of Management Studies				

OBJECTIVES

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

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	l
2	CO1	L		H				M					
	CO2		H	H				M					
	CO3							M	H				
	CO4									H	H		
	CO5							M			H	H	
	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 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 – 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	Graduates within the first five years will be able to grasp and apply biological engineering principles, procedures needed to solve real-world problems.
CO2	To understand the fundamentals of living things, their classification, cell structure and biochemical constituents
CO3	To apply the concept of plant, animal and microbial systems and growth in real life situations
CO4	To comprehend genetics and the immune system
CO5	To know the cause, symptoms, diagnosis and treatment of common diseases
CO6	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	l
2	CO1	H						M					
	CO2		H							H			
	CO3			H							M		
	CO4										H		
	CO5												
	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							

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

BME201	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	l
2	CO1	M	M	M	H	M		M			L	L	M
	CO2	H	M	M	H	H		M			L	L	M
	CO3	H	M		H	H		M			L	L	M
	CO4	H	M		H	H		M			L	L	M
	CO5	H	M	M	H	H		M			L	L	M
	CO6	H			H	H		M			L	L	M

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

UNIT II IC ENGINES 6

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

UNIT III REFRIGERATION AND AIR-CONDITIONINGSYSTEM 6

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

UNIT IV 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.

UNIT V MECHANICAL DESIGN 6

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

TEXT BOOKS:

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

REFERENCES:

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

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	l

2	CO1	H	H			H		L					
	CO2					H	H						
	CO3							H	L				
	CO4									L			
	CO5										H	L	
	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 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 McGraw Hill 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	3	0	0	3
	Prerequisite – Internet Programming				
	Course Designed by – Dept of Information Technology				

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

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.

BCM1L1	**BASIC CIVIL & MECHANICALENGINEERING PRACTICES LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	0	0	2	1

	Prerequisite – Basic Civil and Mechanical Engineering
	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	l
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. CIVIL ENGINEERING PRACTICE

Buildings:

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

Plumbing Works:

a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.

b) Study of pipe connections requirements for pumps and turbines.
c) Preparation of plumbing line sketches for water supply and sewage works.
d) Hands-on-exercise: Basic pipe 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 Hand tools and Power tools:

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

II MECHANICAL ENGINEERING PRACTICE

Welding:

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

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 – Production of hexagonal headed 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	1
	Prerequisite – Physics and Chemistry				
	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
CO6	Students understand the Determination of Band gap of a semiconductor

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
2	CO1	M	H	M			L		L	L	M	H	M
	CO2		H	M			L		L	L		H	
	CO3		H	M			L		L			H	
	CO4	M	H	M			L		L	L	M	H	M
	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 – 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's method)
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 – Maths I & II				
	Course Designed by – Department of Mathematics				
OBJECTIVES					
To equip students with adequate knowledge of Mathematics to formulate problems in Engineering, and solve them analytically					
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	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, and Electronic Engineering which are differential equations of linear or non-linear.				
CO5	Solve differential equations by Laplace transforms				

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

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

UNIT IV 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 upto 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.[Units I, II, & V]
2. Monty J.Strauss, Gerald L.Bradley, and Karl L.Smith. "Calculus" 3rd Edn.[Prentice Hall] University Bookstore, New Delhi. [Units III & IV]

REFERENCES:

1. Narayanan, S.Manicavachangam Pillay, T.K.Ramanaiah, G."Advanced Mathematics for Engineering Students", Volume2 and 3(2nd Edition), S.Viswanathan (Printers &Publishers Pvt, Ltd.,) 1992.
2. Venkataraman, M.K "Engineering Mathematics" Volumes3-A&B, 13th Edition National Publishing Company, Chennai, 1998.
3. Grewal, B.S.,"Higher Engineering Mathematics" (35thEdition), Khanna Publishers, Delhi, 2000.
4. George B. Thomas and Ross L.Finney. "Calculus and Analytical Geometry" 9th Edn. Narosa Indian Student Edition, New Delhi.
5. Dennis G.Zill and Warren S.Wright. "Advanced Engineering Mathematics". 3rd Edn. Jones & Bartlett Publishers, UK. 1992.

BEE301	**CIRCUIT THEORY**	**L**	**T**	**P**	**C**
	Total Contact Hours-60	4	0	0	4
	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	Introduce students to different methods involves in analysis both linear and non-linear 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	l
2	CO1	M	H	H	H	L	M	L			H	M	M
	CO2	M	H	H	M	M	H	M	M		L	M	M
	CO3	H	M		H	H		M			L	L	M
	CO4	H	M		H	H	L	M	M		L	M	M
	CO5	M	M	M	M	H		M			L	L	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)
					X				

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I BASIC CIRCUIT CONCEPTS 12

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 12

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.9+

UNIT III NETWORK THEOREMS (BOTH AC AND DC CIRCUITS) 12

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

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 12

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

UNIT V RESONANCE AND COUPLED CIRCUITS 12

Series and parallel 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, "Circuits and Network Analysis and Synthesis" Tata McGrew Hill Co. Ltd., New Delhi, 1994.
2. Hyatt W.H. and Kemmerlay J.E. „Engineering Circuits Analysis", McGrew Hill International Editions,1993.

REFRENCE BOOKS:

1. Edminister J.A. "Theory and Problems of Electric Circuits "Schaum's outline series, McGrew hill Book Company 2nd edition, 1983.
2. http://nptel.ac.in/courses/108102042/

BEE302	**ELECTRICAL MACHINES–I**	**L**	**T**	**P**	**C**
	TotalContactHours-45	3	0	0	3
	Pre requisite -Basic Electrical Engineering				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

Objective

To give the students a fair knowledge on the working of various DC machines & Transformers

COURSE OUTCOMES (COs)

CO1	To familiarize the constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer connections.
CO2.	To introduce the principles of electromechanical energy conversion in singly and multiply excited systems.
CO3.	To study the working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
CO4.	To study the working principles of DC machines as Generator and Motor, types, determination of their no-load/load characteristics, starting and methods of speed control of motors.
CO5.	To estimate the various losses taking place in D.C. machines and to study the different testing methods to arrive at their 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	l
2	CO1	H	H	L	L	H	M	M	L	L	L	L	L
	CO2	H	H	L	L	M	M	M	L	L	L	L	L

	CO3	H	H	L	L	H	M	M	L	L	L	L	L
	CO4	H	H	L	L	H	M	M	L	L	L	L	L
	CO5	H	H	L	L	H	M	M	L	L	L	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)Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I ELECTRO MAGNETIC INDUCTION & BASIC CONCEPTS IN ROTATING MACHINES 9

Introduction to magnetic circuits – Magnetically induced EMF and force – AC operation of magnetic circuits –. Energy in magnetic systems – Field energy & mechanical force – Single and Multiple excited systems. MMF of distributed windings – Magnetic fields in rotating machines – Generated voltages – Torque.

UNIT II DC GENERATORS 9

Constructional features of DC machine – Principle of operation of DC generator – EMF equation – Types of excitation – No load and load characteristics of DC generators – commutation – armature reaction – Parallel operation of DC generators.

UNIT III DC MOTORS 9

Principle of operation of DC motors-Back EMF – Torque equation –Types of DC motors-Speed – Torque characteristics of DC motors – Starting of DC motors: 2 point starter, 3 point starter, 4 point starter – Speed control: Field control, Armature control, voltage control, Thyristor control – Losses and efficiency – Applications

UNIT IV TRANSFORMERS 9

Principle of operation – Constructional features of single phase and three phase transformers – EMF equation – Transformer on No load and Load –Phasor diagram --equivalent circuit – Regulation - three phase transformer connections- parallel operation of single phase and three phase transformer- Auto transformers

UNIT V TESTING OF DC MACHINES& TRANSFORMERS 9

Losses and efficiency –Condition for maximum efficiency – Testing of DC machines: Brake test, Swinburne's test, Retardation test, Hopkinson's test- Testing of transformer: polarity test, load test, open circuit and short circuit test, Sumpner's test – All day efficiency.

TEXT BOOKS

1. Kothari.D.P and Nagrath.I.J., "Electrical Machines", Tata McGraw Hill Publishing Co.Ltd, New Delhi, 5th edition 2002.
2. Bimbhra.P.S, Electrical Machinery, Khanna Publishers, IL
3. Stephen L. Herman"Electrical transformers and rotating machines " Prentice Hall of India. 1st edition 2012.
4. Theraja B.L. "Electrical Technology: Volume II. S. Chand and Co., New Delhi – 2012.

REFERENCES

1. Dr. Murugesh Kumar.K. "DC Machines & Transformers", Vikas Publishing House PvtLtd.,2nd edition 2003.
2. Fitgerald, A.E., Charles Kingsely Jr. Stephen D.Umans, "Electric Machinery" McGraw Hill Books Company, 6 th edition 2002.
3. Hill Stephen, Chapman.J, "Electric Machinery Fundamentals", McGraw Hill Book Co., New Delhi, 4th edition 2005.
4. Albert E Clayton and Hancock.N.N, "The performance and design of direct current Machines", Oxford and IBH publishing company Pvt. Ltd., New Delhi 1990.
5. http://nptel.ac.in/courses/108105017/

BEE303	**ELECTRON DEVICES**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite-NIL				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES	
Gain basic knowledge about low power semiconductor devices and its function.	
COURSE OUTCOMES (COs)	
CO1	To acquaint the students with construction, theory and characteristics of the p-n junction diode
CO2	Familiarize with the structure of basic electronic devices.
CO3	To acquaint the students with construction, theory and characteristics of the Field effect transistor
CO4	To acquaint the students with construction, theory and characteristics of the Power control / regulator devices
CO5	To acquaint the students with construction, theory and characteristics of the LED, LCD and other photo electronic 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	l
2	CO1	M									L		
	CO2			H	L	H	M	H	M	H	L		
	CO3		L									H	
	CO4	M				M			H	H			L
	CO5		L		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 ELECTRON DEVICES 9

Concept of electronic current in vacuum, gas and solid – Effect of electric and magnetic field on electron and other charged particles – Cathode ray tube – Electrostatic and magnetic deflection.

UNIT II SOLID STATE ELECTRONICS 9

Review of energy band structure of Ge, Si and GaAs –electron, hole generation and recombination – drift and diffusion currents – Continuity equation – Hall effect – PN junction – current equation – junction capacitance – breakdown characteristics – varactor, tunnel, fast recovery, scottkly and zener diodes.

UNIT III BIPOLAR JUNCTION TRANSISTOR 9

Ebers-Moll equation – Input / Output characteristics – Switching characteristics – 'h' parameters – low Frequency equivalent circuits – RF transistors – Power transistors.

UNIT IV FET, UJT AND SCR 9

Theory and characteristics of JFET and MOSFET – low frequency and high frequency equivalent circuits – theory and characteristics of UJT, SCR and TRIAC.

UNIT V CCD AND OPTOELECTRONIC DEVICES 9

Charge transfers and charge coupled devices – Theory and applications – semiconductor optoelectronic devices – LED, LASER diode, LCD, Photo diode, solar cell.

TEXT BOOKS:

1. Setha,''Applied Electronics",S.Chand,2006.

2. Malvino, “Electronic Principle”, Tata McGrew-Hill. 2008.

REFERENCES

1. Sze, SM, “Physics of Semiconductor Devices”, Wiley Eastem, 1981.
2. Boylestad and Nashelsky, “electronic Devices and Circuit Theory”, PHI 6th Edition, 1999.
3. Mothersheed, “Electronic Devices and Circuits”, Prentice Hall of India 1999.
4. Streetman, B, “Solid State Electronics Devices”, Prentice Hall of India, 4th Edition. 1995.
5. John D. Ryder, “Electronic Fundamentals And Applications, Integrated and Discrete System”, 5thEdition , Prentice Hall of India, 1999.
6. David Newman, “Semiconductor Physics and Devices – Basic Principles, Tata McGrew-Hill. 1999.
7. http://nptel.ac.in/courses/108106075/

BEE304	**ELECTROMAGNETIC THEORY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Engg Mathematics-I, Engg Physics -I, Engg Physics-II ,Basic Electrical Engineering				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

The purpose of this course is to enable the students to have a sound knowledge about the theory and problems in Electromagnetic Fields.

COURSE OUTCOMES (COs)

CO1	Apply vector calculus to understand the behavior of static electric fields in standard configurations.
CO2	To lay the foundations of electromagnetism and to understand the concepts of Electrostatics and their applications.
CO3	To understand the concepts of Magneto statics and their applications.
CO4	Apply the concepts of induction to evaluate inductance and applications.
CO5	To understand the concept of Electromagnetic Fields, waves and 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	l
2	CO1	H	M							M			M
	CO2	H	H							M			M
	CO3	H	H							M			M
	CO4	H	H							M			M
	CO5	H	H							M			M
	CO6	H	H							M			M

3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Core Elective (CE)	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 ELECTROSTATICS 9

The field concept – sources of electromagnetic fields – Co-ordinate Systems– Coulomb's law – electric field intensity – electric field due to point charge, line charge, surface charge and volume charge distribution – electric flux density – Gauss's law – electric potential – potential gradient – divergence theorem – Poisson's and Laplace equations.

UNIT II ELECTROSTATICSAPPLICATIONS 9

Conductor and dielectrics – field due to dipole – moment – boundary conditions and conductor surfaces – capacitor – capacitance of system of conductors – energy density and pressure in electric fields – force between charges – charge in motion – conduction current – displacement.

UNIT III MAGNETOSTATICS 9

Force on a current element – Biot Savart's law – force between current carrying conductors– Ampere's law – magnetic potential – boundary conditions at the magnetic surfaces – examples

UNIT IV MAGNETOSTATICS APPLICATIONS 9

Faraday's law of electromagnetic induction – induction of solenoids, toroids, transmission lines and cable – Mutual inductance of series and parallel circuits – energy stored in magnetic fields – electromagnets – forces and torques on closed circuits – magnetic circuits – examples.

UNIT V ELECTROMAGNETIC FIELDS AND WAVE PROPAGATION 9

Modified amperes circuital law – maxwell's equation in point and integral forms – wave equation – plane waves in free space – polarization – reflection and transmission of waves – pointing theorems and slepain vector – energy in electromagnetic fields.

TEXT BOOKS

1. K.A.Gangadhar, "Field Theory" – Khanna Publishers, New Delhi. 1997
2. William Hayt, "Engineering Electromagnetics" – McGraw Hill, New York 1996

REFERENCES

1. S. Selly, "Introduction to electromagnetic fields" – McGraw Hill, 1958
2. http://nptel.ac.in/downloads/115101005/

BEE306	DIGITAL ELECTRONICS	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite: Basic Electronics Engineering, Electron Devices				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

To develop a strong foundation in the field of Digital Electronics. The subject gives the students an in depth knowledge about Digital logic families, Combinational circuits and enable them to analyze and design any sequential circuits. Also this subject gives knowledge about various memory devices &VHDL

COURSE OUTCOMES (COs)

CO1	To study various number systems , simplify the logical expressions using Boolean functions
CO2	To study implementation of combinational circuits
CO3	To design various synchronous and asynchronous circuits
CO4	To introduce asynchronous sequential circuits and PLCs
CO5	To introduce digital simulation for development of application oriented logic 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	l
2	CO1	H	M	M	H	M		M		H	L	L	M
	CO2	H	M	M	H	H		M		H	L	L	M
	CO3	H	M		H	H		M		H	L	L	M
	CO4	H	M		H	H		M		H	L	L	M
	CO5	H	M	M	H	H		M		H	L	L	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 NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES 9

Review of number systems, binary codes, error detection and correction codes (Parity and Hamming code- Digital Logic Families, comparison of RTL, DTL, TTL, ECL and MOS families -operation, characteristics of digital logic family.

UNIT II COMBINATIONAL CIRCUITS 9

Combinational logic - representation of logic functions-SOP and POS forms, K-map representation minimization using K maps - simplification and implementation of combinational logic – multiplexers and demultiplexers - code converters, adders, subtractors.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Melay models- Counters, state diagram; state reduction; state assignment.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABLELOGIC DEVICES 9

Asynchronous sequential logic circuits-Transition table, flow table-race conditions, hazards &errors in digital circuits; analysis of asynchronous sequential logic circuits-introduction to Programmable Logic Devices: PROM – PLA –PAL.

UNIT V VHDL 9

RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages – Subprograms – Test bench. (Simulation /Tutorial Examples: adders, counters, flip flops, FSM, Multiplexers / Demultiplexers).

TEXT BOOKS:

1. Raj Kamal, ' Digital systems-Principles and Design', Pearson Education 2nd edition, 2007.
2. M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education, 2013.
3. Comer "Digital Logic & State Machine Design, Oxford, 2012.

REFERENCES:

1. Mandal "Digital Electronics Principles & Application, McGraw Hill,2nd edition,2013.
2. Floyd and Jain, 'Digital Fundamentals', Pearson Education, 8th edition, 2003.
3. Anand Kumar, "Fundamentals of Digital Circuits, PHI, 2nd edition ,2013.
4. Charles H.Roth,Jr,Lizy Lizy Kurian John, 'Digital System Design using VHDL, Cengage, 2nd edition,2013.
5. John M.Yarbrough, 'Digital Logic, Application & Design', Thomson, 3rd edition 2002.
6. Gaganpreet Kaur, VHDL Basics to Programming, Pearson, 1 st edition2013.
7. http://nptel.ac.in/courses/117106086/1

BEE3L6	**PROGRAMMING LANGUAGE(C and C++) LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2
	Prerequisite- Fundamentals of computing and programming, Programming Language.				

	Course designed by -Dept. of Electrical & Electronics Engineering

OBJECTIVES

To master the high level fundamental programming techniques in C language and C++. This will help you to write, debug and analyze the programs in C and C++.

COURSE OUTCOMES (COs)

CO1	Understand the basic terminology used in high level programming.
CO2	To learn all fundamental programming techniques in C language and C++.
CO3	To use different data types in a computer program.
CO4	To design programs involving decision structures, loops, functions and other aspects
CO5	To understand the difference between procedural oriented programming and object oriented programming.
CO6	To Gain knowledge in designing and troubleshooting various programming applications using C and 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	l
2	CO1	H	M	M	H	M		M	H		L	L	M
	CO2	H	L	M	L	H	H	M			M	H	H
	CO3	H	L	H	L	H	L	H	H	H	M	H	H
	CO4	H	M	H	L	M	L	H	H	H	M	M	
	CO5	H	H	M	H	M	M	M	M	L	H	L	M
	CO6	L	L		H	H		M	L		L	L	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. Manipulation of Matrices in C language: Inverse, Trace, Determinants ,Transpose and Multiplication of multi dimensional matrices

2. Manipulation of Strings in C language: Word searching, Concatenation of strings, Sorting of strings using Pointers, Upper case to Lower case conversion and vice versa
3. Manipulation of Linked Lists in C language: Adding, inserting, deleting, finding the element and displaying the elements of linked lists.
4. Manipulation of Structures in C language: Creation and Processing of Employee records in a firm consisting of Name, Date of Birth, Age, Gender, Address, Qualification, Designation and Salary
5. File Processing in C language: Concatenation of two files and Merging of two files into a third file.
6. Implementation of Class in C++: array with class, data swapping and nesting of member functions.
7. Implementation of Constructors and Destructors in C++: Dynamic initialization, Copy Constructors, Dynamic Constructors and Destructors.
8. Programming exercises on Operator overloading in C++: Unary and Binary overloading and overloading using Friend functions.
9. Programming exercises on Inheritances in C++: Single, Multiple, Multilevel and Hybrid Inheritances in C++
10. Programming exercises on Polymorphism: array of pointers, pointers to functions, pointers to objects and run time polymorphism in C++
11. Implementation of Class templates in C++: Multiple parameters and generic data types.
12. Implementation of Function templates in C++: Multiple parameters, generic data types and Bubble sort implementation.

TEXT BOOKS

1. Byron Gottfried, "Programming with C", 2nd edition, (Indian Adapted Edition), TMH publication-2006
2. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in 'C'"-First Edition, Oxford University Press-2009
3. Bjarne Stroustrop, "The C++ Programming Language" ,4th Edition,,Addison-Wesley Publishing Company-2013

REFERENCE BOOKS

1. Yashavant P. Kanetkar, "Let us C",13th Edition,BPB Publications- 2013.
2. Yashavant P. Kanetkar,"Let us C++"10th Edition, BPB Publications -2013.
3. http://www.tutorialspoint.com/cprogramming/

BEE3L2	**ELECTRICAL MACHINES LABORATORY – I**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2
	PREREQUISTIE-Basic Electrical and Electronics Engineering Practices Laboratory				
	Course designed by -Dept. of Electrical & Electronics Engineering				
OBJECTIVES					

To expose the students to the operation of D.C. machines and transformers and give them Experimental skill.													
COURSE OUTCOMES (COs)													
1.	To rig up circuits for testing a given machine.												
2.	To obtain the performance characteristics of machines												
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
2	CO1	H	H	L	L	H	M	M	L	L	L	L	L
	CO2	H	H	L	L	M	M	M	L	L	L	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											

LIST OF EXPERIMENTS

1. Open Circuit characteristics of DC shunt generator
2. Load characteristics of separately excited generator
3. Load characteristics of DC shunt generator
4. Load characteristics of DC shunt generator
5. Speed control of DC shunt motor
6. Swinburne's test
7. Hopkinson's test
8. Load test on single phase transformer
9. Open Circuit and short circuit test on single phase transformer
10. Sumpener's test
11. Parallel operation of single phase transformers
12. Three phase transformer connections, scott connections.
13. Field's test on DC series motor
14. Separation of no load losses In a single phase transformer
15. Study of DC starters

REFERENCES

1. DEPARTMENT LABORATORY MANUAL

BEE3L5	**ELECTRON DEVICES LABORATORY**	**L**	**T**	**P**	**C**
	Total contact hours 45	0	0	3	2
	Prerequisite- Basic Electronics Engineering				
	Course designed by -Dept. of Electrical & Electronics Engineering				

OBJECTIVES

This laboratory course will give a thorough knowledge about the basics of circuit analysis.

COURSE OUTCOME

1.	To provide practical experience with electrical circuits and verifying circuit theorems.
2.	To enable the students to understand the behavior of semiconductor device based on experimentation

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
2	CO1	H	H	L	L	H	M	M	L	L	L	L	L
	CO2	H	H	L	L	M	M	M	L	L	L	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							

LIST OF EXPERIMENTS

1. Vérification of superposition theorem
2. Vérification of reciprocity theorem
3. Verification of the Thevinin's and Norton's theorem
4. Verification of Maximum power transfer theorem
5. Power Measurement by three Ammeter and three voltmeter method
6. Power measurement by two wattmeter method
7. Characteristics of Semiconductor diode and Zener diode
8. Characteristics of a NPN Transistor under common emitter , common collector and common base configurations
9. Characteristics of JFET(Draw the equivalent circuit)

10. Characteristics of UJT and generation of saw tooth waveforms
11. Study of CRO
12. Phase Angle Measurement using CRO

REFERENCES

1. DEPARTMENT LABORATORY MANUAL

BMA 401	**APPLIED PROBABILITY AND STATISTICS**	**L**	**T**	**P**	**C**
	Total Contact Hours-75	3	2	0	4
	Prerequisite –Mathematics-II				
	Course Designed by – Dept. of Mathematics				

OBJECTIVES

To impart knowledge about important concepts of Probability and Reliability, tools in SQC to solve problems in Electrical & Electronics Engineering.

COURSE OUTCOMES (COs)

CO1	Solve Engineering problems in Electrical & Electronic Engineering by making use of Probability, Reliability and Hazard functions.
CO2	Use control charts to find tolerance limits in electric circuits.
CO3	How Design of Experiments are to be analysed.

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
2	CO1	H	H	L	L	H	M	M	L	L	L	L	L
	CO2	H	H	L	L	M	M	M	L	L	L	L	L
	CO3	H	H	L	L	H	H	M	L	L	L	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)
			X						
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I PROBABILITY AND RANDOM VARIABLES 9+6

Probability concepts, Random variables, MGF, Binomial, Poisson, Geometric, Normal, Uniform, and Exponential Distributions.

UNITII TWO DIMENSIONAL RANDOM VARIABLES 9+6

Marginal and Conditional distributions, covariance, correlation, regression and transformation of random variables, application of central limit theorem.

UNIT III RELIABILITY ENGINEERING 9+6

Concepts of Reliability, Hazard function, series and parallel systems, reliability and availability of Markov systems, maintainability, preventive maintenance.

UNIT IV CONTROL CHARTS 9+6

Control charts for measurements and attributes- $\overline{X}$ Chart , R-Chart , np-chart, p-chart, Control Charts for fixed sample size and variable sample size. Stability and Capability, Seven Quality Control tools and its applications.

UNIT V DESIGN OF EXPERIMENTS 9+6

Completely Randomised Design, Randomised Block Design and Latin Square Design. Factorial Experiment- 2^2 Experiment.

TEXT BOOKS

1. S.C.Gupta andV.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, New Delhi ,2003. [Units I & II]
2. S.C. Gupta and V.K. Kapoor, "Applied Statistics". Sultan Chand and Sons, New Delhi 2004 [Units IV & V]
3. Tirupathi R.Chandrupatta. "Quality and Reliability in Engineering". Book Vistas, New Delhi. [Unit III]

REFERENCE BOOKS

1. Miller U and Frieund JE. "Probability and Statistics for Engineers", PHI 1999
2. Douglas C.Montgomory and George C.Runger. "Applied Statistics and Probability for Engineers" 5th Edn. 2010. Wiley India Pvt Ltd. New Delhi.
3. Douglas C.Montgomory. "Design and Analysis of Experiments" 7th Edn. 2012. Wiley India Pvt Ltd. New Delhi
4. Albert Leon Garcia, "Probability and Random Processes for Electrical Engineering". 2nd Edn. Pearson Education, Chennai-600 113

BEE401	**ELECTRICAL MACHINES-II**	**L**	**T**	**P**	**C**
	TotalContactHours-45	3	0	0	3
	Prerequisite- Electrical Machines-I				
	Course designed by –Dept. of Electrical & Electronics Engineering				
OBJECTIVES					

To give the students a fair knowledge on the working of various Ac machines and the characteristics													
COURSE OUTCOMES													
CO1.	To impart knowledge on Construction and performance of salient and non – salient type synchronous generators.												
CO2.	To impart knowledge on Principle of operation and performance of synchronous motor.												
CO3.	To impart knowledge on Construction, principle of operation and performance of induction machines.												
CO4.	To impart knowledge on Starting and speed control of three-phase induction motors.												
CO5.	To impart knowledge on Construction, principle of operation and performance of single phase induction motors and special machines.												
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
2	CO1	H	H	M	L	L	H	M	M	L	L	L	L
	CO2	H	M	M	L	L	H	M	M	L	L	L	L
	CO3	H	M	M	L	L	H	M	M	L	L	L	L
	CO4	H	M	M	L	L	M	M	M	L	L	L	L
	CO5	H	M	M	L	L	L	M	M	L	L	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 SYNCHRONOUS GENERATOR 9

Constructional details – Types of rotors – emf equation – Synchronous reactance – Armature reaction – Voltage regulation – EMF, MMF, ZPF –Synchronizing and parallel operation – Synchronizing torque - Change of excitation and mechanical input – Two reaction theory – Determination of direct and quadrature axis synchronous reactance using slip test – Operating characteristics .

UNIT II SYNCHRONOUS MOTOR 9

Principle of operation – Torque equation – Operation on infinite bus bars - V-curves – Power input and power developed equations – Starting methods – Current loci for Constant power

input, constant excitation and constant power developed.

UNIT III THREE PHASE INDUCTION MOTOR 9

Constructional details – Types of rotors – Principle of operation – Slip – Equivalent circuit – Slip-torque characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests -Separation of no load losses – Double cage rotors – Induction generator – Synchronous induction motor.

UNIT IV SINGLE PHASE INDUCTION MOTOR AND STARTING METHOD 9

Constructional details of single phase induction motor – Double revolving field theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors .Need for starting – Types of starters – Rotor resistance, Autotransformer and Star-delta starters – Speed control method

UNIT V FRACTIONAL HORSE POWER MOTOR 9

Shaded pole induction motor - Linear reluctance motor - Repulsion motor - Hysteresis motor - AC series motor-variable reluctance motor -permanent magnet stepper motor –hybrid stepper motor- permanent magnet D.C motor- permanent magnet A.C motor .

TEXT BOOKS

1.D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.
2. P.S. Bhimbra, 'Electrical Machinery', Khanna Publishers, 7th Edition, 2011.
3. B.R Gupta," Fundamentals of Electric Machines ". New Age International (P) Limited 3rd Edition 2005

REFERENCES

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.
2. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons,2002.
3. K. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt Ltd, 2002.

BEE402	**ELECTRICAL NETWORK ANALYSIS & SYNTHESIS**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	3	0	0	3
	Prerequisite - Knowledge In Basic Electrical Circuit Analysis & Circuit Theory				
	Course Designed by – Dept of Electrical & Electronics Engineering				
OBJECTIVES					
The course provides a comprehensive knowledge to Maintain and improves their technical competence towards the control plant engineering.					
COURSE OUTCOMES (COs)					
CO1	To successfully understand the basics of Network Analysis & Synthesis theory.				

CO2	To make the students learn how to synthesize an electrical network from a given impedance/admittance function.
CO3	Students will be able to analyze the various electrical and electronic networks using the techniques they learn.
CO4	Students will be able to construct a circuit to suit the need.
CO5	Able to analyze resonant circuits both in time and frequency domains.

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
2	CO1	M	H	L	L	M		M			M	L	M
	CO2	H	H	L	L	M					L	L	
	CO3	H	M		H	H		M			L	L	
	CO4	H	M		H	H		M					
	CO5	H	M	M	H	H		M			L	L	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)
					X				
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I NETWORK THEORY 9

Network graph, tree and cut sets – tie sets and cut sets schedules – Y shift and I shift – Primitive impedance and admittance matrices.

UNIT II LAPLACE AND FREQUENCY DOMAIN ANALYSIS 9

S Domain network, Driving and Transfer impedence and their properties – Transform network analysis – Poles and Zeros of network functions – Time response from pole zero plots-Frequency response of RLC network – Frequency response from pole zero plots.

UNIT III TWO PORT NETWORKS 9

Characterization of two port networks in term of Z, Y, H, T parameters and A, B, C, D parameters – Network equivalence – relation between network parameters – analysis of T ladder bridge – T and lattice networks – Transfer function of terminated two port networks.

UNITIV ELEMENTSOFNETWORKSSYNTHESIS 9

Reliability of one port network – Hurwitz polynomial and properties – Positive and Real function and properties – synthesis of RL, RC and LC networks.

UNIT V DESIGN OF FILTERS 9

Filters and attenuator – Design of constant K, M – derived and composite filters – qualitative treatment of a active filters – Butterworth and Chebyshev filters.

TEXT BOOKS:

1. Sudhakar and Shyammohan,"Network Analysis & Synthesis".
2. Paranjothi S.R. "Electrical Circuit Analysis", New Age International, 2nd Edition 1994.
3. Van Valkenberg M.E. "network Analysis" – Prentice Hall of India Pvt Ltd. Delhi, 3rd edition 1994.

REFERENCE BOOKS:

1. EuoF.F."Network Analysis and Synthesis" – Wiley international Edition, 2nd edition – 1996.
2. http://www.mathworks.com/access/helpdesk/help/toolbox/Network theory/

BCE406	**ENVIRONMENTAL STUDIES**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite – Physical Sciences				
	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	Analyze the impact of engineering solutions in a global and societal context
CO3	Discuss contemporary issues that results in environmental degradation and would attempt to provide solutions to overcome those problems
CO4	Ability to consider issues of environment and sustainable development in his personal and professional undertakings
CO5	Highlight the importance of ecosystem and biodiversity

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
2	CO1			M		M	L	M	M		L	L	M
	CO2		M	H		H	M	M	H	M	L	L	M
	CO3		M	H		H	M	M	H	M	L	L	M
	CO4			M		H	M	M	M				M
	CO5			M		M	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)
							X						
4	Approval	37th Meeting of Academic Council, May 2015 38th Meeting of Academic Council, January 2016.											

UNIT I THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES9

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

BEE403	**LINEAR INTEGRATED CIRCUITS**	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite –nil				
	Course Designed by – Dept of Electrical & Electronics Engineering				

OBJECTIVES

Ability to understand and analyze linear and digital electronic circuits.

COURSE OUTCOMES (COs)

CO1	To study the IC fabrication procedure.
CO2	To study characteristics; realize circuits; design for signal analysis using Op-amp ICs.
CO3	To study the applications of Op-amp.
CO4	To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, ADCs.
CO5	To understand the applications of special function IC's

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
2	CO1	H	M	M	H	H		M	H	H	L	L	M
	CO2	H	M	M	H	H		M	H	H	L	L	M
	CO3	H	M		H	H		M	H	H	L	L	M
	CO4	H	M		H	H		M	H	H	L	L	M
	CO5	H	M	M	H	H		M	H	H	L	L	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 INTEGRATED CIRCUITS 9

Classification, chip size and circuit complexity, basic information of Op-amp, differential op-amp, ideal and practical Op-amp, Op-amp characteristics, DC and AC characteristics, 741 op-amp and its features, modes of operation-inverting, non-inverting, Slew rate- Methods of improving slew rate.

UNIT II OP-AMP APPLICATIONS 9

Basic application of Op-amp, instrumentation amplifier, V to I and I to V converters, Differentiators and Integrators, Comparators, Schmitt trigger, Multivibrators , Log and antilog amplifiers ,Non-Linear Function Generator, Triangle Wave Generator.

UNIT III TIMERS & PHASE LOCKED LOOPS 9

Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Voltage Controlled Oscillator, PLL - introduction, block schematic, Principles and description of individual blocks of 565- Applications.

UNIT IV D-A AND A- D CONVERTERS 9

Introduction ,High speed sample and hold circuit , basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC specifications, voltage to time and voltage to frequency converters.

UNIT V SPECIAL FUNCTION ICS 9

Voltage regulators-linear and switched mode types, Frequency to voltage converters, Tuned amplifiers, Power amplifiers, Video amplifiers, Fiber optics ICs and optocouplers

TEXT BOOKS

1. D. Roy Chowdhury , “Linear Integrated Circuits” , New Age International (p) Ltd, 2nd edition,2003.
2. Ramakanth A. Gayakwad “Op-Amps & Linear ICs”, PHI, 4th edition,1987.

REFERENCES:

1. R.F. Coughlin and Fredrick F. Driscoll, “Operational Amplifiers and Linear Integrated Circuits”,PHI, 6th edition 1977.
2. David A. Bell, “Operational Amplifiers & Linear ICs”, Oxford University Press, 2nd edition,2010.
3. Design with Operational Amplifiers and Analog Integrated Circuits - Sergio Franco, McGraw Hill,3rd edition,2002.
4.http://nptel.ac.in/video.php?subjectId=108106068

BME405	**THERMAL ENGINEERING &FLUID MECHANICS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite- Basic Mechanical Engineering				
	Course designed by- Dept. of Mechanical Engineering				

OBJECTIVES

To understand the concepts of Energy in general and Heat and Work in particular, to understand the fundamentals of quantification and grade of energy, to understand fluid statics and fluid dynamics and to study the applications of mass, momentum and energy equation in fluid flow.

COURSE OUTCOMES (COs)

CO1	To understand a thermodynamic system, closed and open systems, state, equilibrium, process, cycle and system properties, thermo dynamic laws and apply it to solve problems.
CO2	To study and analyze the efficiency of IC engines and compressor and to solve problems.
CO3	To understand the thermodynamics of refrigerators and heat pumps.
CO4	To study the fluid flow and the various theorems and concepts associated with that.
CO5	Ability to understand to identify, formulate, and to solve problems of dimensional analysis, pumps and turbines.

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
2	CO1	L		M		M		M			M		M
	CO2	L				H	H	M	M		M		H
	CO3	L	H			H	H	L	L		M		H

	CO4	M	H	L		H	H	L	M		M		H	
	CO5	L	M	M		H		M			M	L	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 BASIC CONCEPTS AND LAWS OF THERMODYNAMICS 9

Systems zeroth law, first law of thermodynamics – concept of internal energy and enthalpy applications of closed and open systems, second law of thermodynamics – concept of entropy – clausius inequality and principle of increase in irreversible processes.

UNIT II IC ENGINE AND COMPRESSORS 9

Basic IC engine and gas turbine cycles, compressors – single stage Multi stage, reciprocating, vane gear, roots, compressor(constructional features and applications only).

UNIT III THERMODYNAMICS OF REFRIGERATORS AND PUMPS 9

Properties of steam – Rankine cycle – one dimensional flow through nozzles and applications to jet and rocket propulsions – basic thermodynamics of refrigerators and heat pumps.

UNIT IV BASIC CONCEPTS AND FLOW OF FLUIDS 9

Introduction – classification – types of fluids – properties – properties – law of pressure – manometer – mechanical gauges – types of fluid flow – continuity equation – energy equation – Beroulli's theorem – orifice and mouth piece.

UNIT V DIMENSIONAL AND MODEL ANALYSIS 9

Introduction – dimensional analysis – Rayleigh's method and Bukingham's method – similitude dimensionless numbers – model studies, pump turbines – type of pumps – reciprocating pumps – constructional details – coefficient of discharge – slip – power required – centrifugal pump – working principle – working principle.

TEXT BOOKS:

1. Nag P.K, "Engineering Thermodynamics", Tata McGraw Hill, Fourth Edition, 1993.
2. Kothandaraman C.P, "Thermal Engineering", Dhanpat Rai and Co, 2013
3. Kumar K.L. "Fluid Mechanics" Eurasia Publishers, 1990.
4. Rajput R.K., "Fluid Mechanics and Hydraulic Machines", S. Chand & Co. India, 1998.

REFERENCE BOOKS

1. Shames I.H. “Mechanics of Fluids”, Kogakusha Publications. Tokyo 1998.
2. Reynolds, “Thermodynamics”, McGraw Hill Publications, 1996

BEE4S1	**TECHNICAL SEMINAR**	**L**	**T**	**P**	**C**
	Total Contact Hours – 30	0	0	2	1
	PREREQUISTIE- Professional courses				
	Course designed by -Dept of Electrical & Electronics Engineering				

OBJECTIVE

- The purpose of technical seminar is to train the students in preparing and presenting technical topics.
- The students are expected to give a presentation on their topics of interest which will be assessed by a Faculty in charge, for this purpose during the current semester as per the academic regulations.
- It is an Opportunity to clarify, deepen the understanding in the subject, and also increase confidence and presentation skills.
- The student shall be capable of identifying topics of interest related to the program of study and make presentation

BEE4L1	**ELECTRICAL MACHINES LABORATORY-II**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2
	PREREQUISTIE-Basic Electrical and Electronics Engineering Practices Laboratory				
	Course designed by -Dept. of Electrical & Electronics Engineering				

OBJECTIVE

To expose the students to the operation of synchronous machines and induction motors and give them experimental skill

COURSE OUTCOMES (COs)

1.	Understand the characteristics and performance of AC machines.
2.	Gain knowledge about speed control techniques of induction machines.

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
2	CO1	H	H	L	L	H	M	M	L	L	L	L	L
	CO2	H	H	L	L	M	M	M	L	L	L	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							

LIST OF EXPERIMENTS:

1. Regulation of alternator by EMP and MMF method
2. Regulation of alternator by potier ASA method
3. Regulation of salient pole alternator – slip test
4. Load test on alternator
5. Study of A.C. starters
6. V and inverted V curve of synchronous motor.
7. Brake test of three phase squirrel cage induction motor.
8. No load and blocked rotor tests on three phase induction motor and circle diagram and equivalent circuit
9. Load test on single phase induction motor.
10. Equivalent circuit and predetermination of performance of single phase induction motor.
11. Load test on three phase induction motor
12. Load test on three phase slip ring induction motor
13. Synchronizing and parallel operation by dark lamp, bright lamp and synchronoscope methods

REFERENCES

1. Departmental Lab Manual

BME4L3	**THERMAL ENGINEERING & FLUID MECHANICS LAB**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2
	Prerequisite- Basic Mechanical Engineering				
	Course designed by Dept. of Mechanical Engineering				
OBJECTIVES					
To equip students with the knowledge of the initiation of combustion in Internal Combustion Engines, their classification, basic operating cycle and the functioning of					

various parts.	
COURSE OUTCOMES (COs)	
CO1	To apply theoretical concepts developed in course work of thermodynamics to hands-on experiments.
CO2	To apply theoretical concepts developed in course work of fluid mechanics to hands-on experiments.
CO3	To conduct thermodynamics experiments and analyze experimental data.
CO4	To understand the operation of all thermodynamic and fluid mechanic equipment's
CO5	To gain knowledge in designing and troubleshooting various problems in engines

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
2	CO1		S		M	S		M	H		S	S	M
	CO2				L	S	H	M				S	S
	CO3	S	L	S	S		L	S	H	H	M	H	S
	CO4	S	M	S	S		L	S	H	H	M	M	
	CO5	S	H	M	H	M	M	M	M	L	H	L	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. Load test on a diesel engine
2. Performance test on a refrigerator
3. Performance test on a reciprocating pump and on a centrifugal pump
4. Performance test on a air – compressor, air pressure measure and regulation
5. Plain turning and taper turning operation on a lathe
6. Drilling and tapping on a radial drilling machine
7. Round to hexagon on a milling machine.

BEE4L2	LINEAR & DIGITAL INTEGRATED CIRCUITS LABORATORY	L	T	P	C
	Total contact hours 45	0	0	3	2
	Prerequisite- Basic Electronics Engineering				
	Course designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVE

- Analyze and design various applications of Op-Amp
- Design and construct waveform generation circuits
- Design timer and analog and digital circuits using op amps.
- To design combinational logic circuits using digital IC's

COURSE OUTCOME

CO1	Ability to design the techniques of DC power supply suitable to electronic circuits.
CO2	Analyze the performance characteristics of linear ICs.
CO3	Design amplifier, oscillator, signal conditioning circuits, combinational circuits and Sequential circuits for given requirement

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
2	CO1	H	H			H	H		H	M		L	
	CO2			H		H		L		L			M
	CO3	H	H	H	M	H		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							

LIST OF EXPERIMENTS:

1. Inverting and non inverting amplifier.

2. Differentiator and Integrator.
3. Monostable multivibrator.
4. Astable multivibrator.
5. Adder and subtractor.
6. D/A and A/D converter.
7. Schmitt trigger.
8. Sine, rectangular and triangular wave generator.
9. Multiplexer and Demultiplexer using logic gates
10. Design and Implementation of code converters using logic gates.
11. Simulation of IC circuits using PSPICE/SIMULINK
12. Study of VCO and PLL ICs:
13. Voltage to frequency characteristics of NE/ SE 566 IC.
14. Frequency multiplication using NE/SE 565 PLL IC.

REFERENCES

1. Department Lab Manual

BMA502	**NUMERICAL METHODS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 75	3	2	0	4
	Prerequisite – Engg Mathematics-I, Engg Mathematics -III,				
	Course Designed by – Dept. of Mathematics				

OBJECTIVES

To train the students with Mathematical techniques to solve problems in Engineering with numerical data

COURSE OUTCOMES (COs)

CO1	Solve a single equation and a system of linear equations by different methods and get exact solution and iterative solution.
CO2	Interpolate a dependent variable based on a given set of values by a suitable method.
CO3	Find integral value and differential coefficient based on a given set of values.
CO4	Solve initial value problem of ODE and boundary value problems of PDE.

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
2	CO1	H	H	L	L	H	M	M	M	L	L	L	L
	CO2	H	H			H	M	M	M		L		
	CO3	H	H			H	M	M	M			L	L

	CO4	H	H	L	L	H	M	M	M	L	L	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-1 SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 9+6

Iterative method, Newton–Raphson methods for single variable- Solutions of linear system by Gaussian, Gauss-Jordan, Jacobian and Gauss-Siedel methods, Inverse of Matrix by Gauss Jordan method, Eigen value of a Matrix power and Jacobian methods.

UNIT-II INTERPOLATION (FINITE DIFFERENCES) 9+6

Newton's Divided Difference Formula, Lagrange's Interpolation-Forward and Backward Difference Formula-Stirling's and Bessel's Central Difference Formula.

UNIT-III NUMERICAL DIFFERENTIATION AND INTEGRATION 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 EQUATIONS 9+6

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

UNIT-V BOUNDARY VALUE PROBLEMS FOR ODE AND PDE 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[Units I to III]
2. Jain K.K. Iyengar, S.R.K and Jain, R.K. "Numerical Methods for Scientific and Engineering Computation" 3rd edition, New Age International Publications and Co. 1993.[Units IV & V]

REFERENCES

1. Grewal, B.S. "Higher Engineering Mathematics (36th edition)" Khanna Publication Delhi 2001.
2. Curtis F.Gerald. "Applied Numerical Analysis" 7th Edn. Pearson Education, Chennai-600113. 2007
3 Dennis G.Zill and Warren S.Wright. "Advanced Engineering Mathematics". 3rd Edn. Jones & Bartlett Publishers, UK. 1992.

BEE501	**CONTROL SYSTEMS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 60	4	0	0	4
	Prerequisite – Engg Mathematics-I, Engg Mathematics -III, Circuit Theory and Network Analysis and Synthesis				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

To provide an introduction to the analysis of linear control systems. This will permit to exploit time domain and frequency domain tools

COURSE OUTCOMES (COs)

CO1	To understand the concept of control components, Control system concept and Electrical analogy of mechanical systems
CO2	To understand the use of transfer function models for the analysis of physical systems.
CO3	To Gain knowledge in various time domain tools for analysis and design of linear control systems and compensators.
CO4	To Gain knowledge in various frequency domain tools for analysis and design of linear control systems and compensators.
CO5	To Understand the methods to analyze the stability of systems from transfer function forms.
CO6	To Understand the concept of state variable analysis and modeling of the system by the state variable technique.

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
2	CO1	M	H	M	H	M					L	L	M
	CO2	H	H	M	H	H					L	L	M
	CO3	H	M	M	H	H					L	L	M
	CO4	H	M	M	H	H					L	L	M
	CO5	H	M	M	H	H					L	L	M
	CO6	H	H	M	H	H					L	L	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 SYSTEMS AND THEIR REPRESENTATION 12

Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical systems – Transfer function – Synchros – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

UNITII TIME RESPONSE ANALYSIS 12

Test signals – step response of first order and second order systems – time domain specifications – response with P, PI, PID controller – type and order of a system – steady state error and generalized error coefficients.

UNIT III FREQUENCY RESPONSE ANALYSIS 12

Frequency domain specifications – estimation of the specification for a second order system – Bode plot – polar plot –— closed loop response from open loop response

UNIT IV STABILITY AND COMPENSATOR DESIGN 12

Definition – characteristics equation – Routh Hurwitz criterian – Nyquist stability criterion – gain margin and phase margin – root locus – compensator design using bode plot-matlab basics for control systems.

UNIT V STATE VARIABLE ANALYSIS 12

Concept of state variables – State models for linear and time invariant Systems – Solution of state and output equation in controllable canonical form – Concepts of controllability and observability– Effect of state feedback.

TEXT BOOKS:

1. Katsuhiko Ogata, "Modern Control Engineering" 5th Edition, Prentice Hall of India Private Ltd., New Delhi, 2012.
2. Nagrath I J and Gopal.M., "Control Systems Engineering", 5th Edition, New Age International (P) Ltd, Publishers 2012.

REFERENCE:

1. M. Gopal, "Control Systems: Principles and Design", 3rd Edition, McGraw, Hill, 2014
2. Benjamin C Kuo, "Automatic Control system", Prentice Hall of India Private Ltd., New Delhi 2012.

3. R.C. Dorf and R.H. Bishop, "Modern Control Systems", 12th Edition, Prentice,Hall, 2010.
4. http://www.mathworks.com/access/helpdesk/help/toolbox/control/
5 http://nptel.ac.in/courses/108101037/

BEE502	**POWER ELECTRONICS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Basic Electrical Engineering, Basic Electronics Engineering & Electronic Integrated Circuits.				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

To enable the students to gain a fair knowledge on characteristics and applications of power electronic devices and circuits

COURSE OUTCOMES (COs)

CO1	To learn the characteristics of different types of power electronic devices
CO2	To understand the operation of controlled rectifiers
CO3	To understand the operation of choppers & its types
CO4	To understand the operation of inverters & its types
CO5	To learn the operation of control circuits and applications of power electronic 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	l
2	CO1	H				M	L						
	CO2	H				M	L						
	CO3	H				M	L						
	CO4	H				M	L						
	CO5	H				M	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 POWER SEMICONDUCTOR DEVICES 9

Construction, Principle of operation Power diodes , power transistors SCR, TRIAC, GTO, MOSFET, IGBT – driver circuit, turn – on method – commutation series and parallel connections

UNIT II PHASE CONTROLLED CONVERTERS 9

Converter inverters operation – Single phase and three phase controlled rectifiers(half and full converters) with R,RL and RLE load effect of source inductance and firing circuits – Dual converters – single phase & three phase dual converters

UNIT III DC TO DC CHOPPER 9

Voltage, current load commutated chopper – step-up chopper and firing circuits – one, two and four quadrant chopper application to DC driving control

UNIT IV INVERTERS 9

Series inverter – parallel inverter – current source inverter – voltage source inverter - Modified McMurray, auto sequential inverter– PWM inverter – UPS.

UNIT V AC CHOPPER,CYCLOCONVERTER&VOLTAGE CONTROLER 9

Single phase AC chopper, multistage sequence control – step up and step down cyclo-converter – three phase to single phase and single phase to three phase cyclo-converter – triggering circuit based on micro controller – single phase AC voltage controller with R, RL, RLE.

TEXT BOOKS:

1. P.S. Bhimbra “Power Electronics”, Khanna publishers
2. Singh, “Power Electronics”, TMH New Delhi.
3. Rashid M.H. “Power Electronics circuits, Devices and application” Prentice Hall International 1995.

REFERENCE BOOKS:

1. Sen P.C. “Power Electronics”. TMH, New Delhi.
2. Lander. W, “Power Electronics”, McGraw Hill.
3. http://www.ni.com/tutorial/14674/en/

BEE504	**ELECTRICAL MACHINE DESIGN**	**L**	**T**	**P**	**C**
	TotalContactHours-60	4	0	0	4
	Prerequisite- Basic Electrical and Electronics Engineering Practices Laboratory				
	Course Designed by – Dept. of Electrical & Electronics Engineering				
OBJECTIVE					

To provide sound knowledge about constructional details and design of various electrical machines.													
COURSE OUTCOME													
CO1	To study mmf calculation and thermal rating of various types of electrical machines.												
CO2	To design armature and field systems for D.C. machines												
CO3	To design core, yoke, windings and cooling systems of transformers.												
CO4	To design stator and rotor of induction machines												
CO5	To design stator and rotor of synchronous machines and study their thermal 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	l
2	CO1	H	H	L	L	H	M	M	L	L	L	L	L
	CO2	H	H	L	L	M	M	M	L	L	L	L	L
	CO3	H	H	L	L	H	M	M	L	L	L	L	L
	CO4	H	H	L	L	H	M	M	L	L	L	L	L
	CO5	H	H	L	L	H	M	M	L	L	L	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							

UNITI INTRODUCTION 12

Major considerations in Electrical Machine Design - Electrical Engineering Materials – Space factor – Choice of Specific Electrical and Magnetic loadings - Thermal considerations - Heat flow – Temperature rise - Rating of machines – Standard specifications.

UNIT-II DCMACHINES 12

Output Equations – Main Dimensions - Magnetic circuit calculations – Carter's Coefficient - Net length of Iron –Real & Apparent flux densities – Selection of number of poles – Design of Armature – Design of commutator and brushes – performance prediction using design values.

UNIT-III TRANSFORMERS 12

Output Equations – Main Dimensions - KVA output for single and three phase transformers – Window space factor – Overall dimensions – Operating characteristics – Regulation – No load current – Temperature rise in Transformers – Design of Tank - Methods of cooling of Transformers.

UNIT-IV INDUCTIONMOTOR 12

Output equation of Induction motor – Main dimensions – Length of air gap- Rules for selecting rotor slots of squirrel cage machines – Design of rotor bars & slots – Design of end rings – Design of wound rotor -– Magnetic leakage calculations – Leakage reactance of polyphase machines- Magnetizing current - Short circuit current – Circle diagram - Operating characteristics.

UNIT-V SYNCHRONOUS MACHINES 12

Output equations – choice of loadings – Design of salient pole machines – Short circuit ratio – shape of pole face – Armature design – Armature parameters – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field mmf – Design of field winding – Design of turbo alternators – Rotor design.

TEXT BOOKS

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 1984.
2. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

REFERENCES

1. A.Shanmugasundaram, G.Gangadharan, R.Palani, 'Electrical Machine Design Data Book', New Age Intenational Pvt. Ltd., Reprint 2007.

BEE505	**POWER GENERATION SYSTEMS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisites: Basic knowledge about working of alternators and electric power system				
	Course Designed by – Dept of Electrical & Electronics Engineering				
OBJECTIVES					
To understand the working of different types of power generation systems and to realize the necessity for interconnected operation of different power stations.					
COURSE OUTCOMES (COs)					
CO1	To learn generation of electrical power from different types of power plants like thermal ,nuclear and hydro power stations.				
CO2	To understand the concepts of generation of electrical power using non-conventional energy resources				

CO3	To learn the economics connected with power generation
CO4	To understand the measurement of various parameter in power plant and their control
CO5	To understand the significance of various components of the power generation plants

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
2	CO1	M	H	H		H	M	L	M	L	H	H	H
	CO2	H	H	M		H	M	M	M	M	H	M	H
	CO3	H	H	H		H	M	M	H	M	H	M	H
	CO4	H	H	M		H	H	M	M	L	H	H	H
	CO5	H	H	H		H	M	M	M	H	H	H	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)
		-	-	-	-	X	-	-	-
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I ECONOMICS OF GENERATION 9

Load and load duration curve – Load, demand and diversity factors – Plant capacity and plant use factors – choice of type of generation – choice of size and number of unit – cost of energy generated – Tariffs.

UNIT II THERMAL, NUCLEAR AND HYDRO POWER PLANTS 9

Location, Layout and working of steam ,diesel and gas power plants - Principles of nuclear power generation, Types of nuclear power plants and their comparison, Layout and working of nuclear power plants, Advantages and disadvantages of nuclear energy- Layout and working, Types of hydroelectric power plants, Advantages of hydro generation, Environmental issues.

UNIT III POWER PLANT INSTRUMENTATION 9

Importance of instrumentation in power plants, P & I diagram of boiler- Measurements of non-electrical parameters, flow of feed water, air, steam, radiation detector, smoke density measurement-analyzers, flue gas oxygen analyzer, chromatography, PH meter, pollution monitoring instruments.

UNIT IV BOILER, TURBINE-MONITORING AND CONTROL 9

Combustion control - furnace draft control-drum level control- deaerator control- boiler interlocks-speed, vibration, temperature monitoring control of turbine- lubrication and cooling system of turbine.

UNIT V NON CONVENTIONAL PLANTS 9

Introduction to the concept of distributed generation –basics on distributed generation Technologies- Effect on system operation. Basic concepts, Principle of working and layout of MHD, Solar, Wind, Tidal, Biomass and Geothermal Power Generation Systems.

TEXT BOOKS

1. Nagpal.G.R, "Power plant engineering",Khanna Publishers,New Delhi,2001.
2. Uppal.S.L, "Electrical Power", Khanna Publishers, New Delhi, 1997.

REFERENCES

1. Soni, Gupta, Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & Sons, Delhi.1992.
2. Sam.G,Dukelow, "The control of boilers", Instrument Society ofAmerica,1991
3. Nagrath.I.J, and Kothari.D.P, "Modern Power System Analysis", Tata McGraw Hill, 3rd Edition,2003.
4. Wadhwa, C.L., "Generation, Distribution and Utilization of Electric Energy", New Age International Ltd.,3rd Edition,2011
5. Gupta.B.R, "Generation of Electrical energy" , Eurasia Publishing House(p)Ltd,New Delhi,2003
6. Deshpande.M.V, "Elements of Electrical Power Station design", Pitman, NewDelhi.1991.
7. Anne-Marie Borbely, Jan F.Kreider, "Distributed Generation", CRC PressLLc, 2001.
8. Jain.R.K,"Mechanical and industrial Measurements", Khanna Publishers, New Del hi,1995.
9. http://nptel.ac.in/courses/108102047/

BEE5C1	**COMPREHENSION I**	**L**	**T**	**P**	**C**
	Total Contact Hours : Test will be conducted at the end of the semester	0	0	0	1
	Prerequisite – All the courses up to fifth semester				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

- To provide a complete review of Electrical &Electronics 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.

BEE5L1	CONTROL SYSTEMS LABORATORY	L	T	P	C
	Total Contact Hours – 45	0	0	3	2
	Prerequisite – Engg Mathematics-I, Engg Mathematics -III, Circuit Theory and Network Analysis and Synthesis				
	Course Designed by – Dept of Electrical & Electronics Engineering				

OBJECTIVES

To introduce control system lab experiments using hardware and software tools which provide path towards the engineering applications.

COURSE OUTCOMES (COs)

CO1	Ability to understand and analyse the impact of PID controllers on linear system.
CO2	Ability to conduct control system experiments and analyse the concepts
CO3	Ability to design compensators
CO4	Ability to determine control system's parameters and transfer function parameters.
CO5	Ability to use Matlab software for control system concepts.

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

LIST OF EXPERIMENTS

1. Determination of transfer function parameters of a DC servo motor.

2. Determination of transfer function parameters of AC servo motor.
3. Effect of P, PI and PID controllers on second order system.
4. Digital simulation of linear systems
5. Design of lag and lead compensators.
6. Closed loop control system
7. Stability analysis of linear systems.
8. Synchro Transmitter and Receiver characteristics.
9. MATLAB programming
   a. Determination of Transfer function from poles and zeros.
   b. Determination of Poles and zeros from transfer function.
   c. Step and ramp response of first order system.
10. Simulation of second order system using MATLAB
11. Bode, Root Locus, Nyquist plots of Linear Time Invariant system using MATLAB.

REFERENCE

1. LAB manual prepared by Department of Electrical & Electronics Engineering
2. http://www.mathworks.com/access/helpdesk/help/toolbox/control/

BEE5L2	**POWER ELECTRONICS LABARATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2
	Prerequisite – Concepts of Gate Firing, Theoretical concepts of SCR, TRIAC, DIAC and Inverters.				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

To study the characteristics of various power electronic devices & how it is interfaced with motors.

COURSE OUTCOMES (COs)

CO1	To learn the output characteristics of SCR, DIAC & TRIAC.
CO2	To observe and learn the output waveform of Choppers
CO3	To learn the output waveform of Series and Parallel Circuits.
CO4	To learn the interface with universal motor.
CO5	To learn the output waveform of single phase cycloconverter.

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

LIST OF EXPERIMENTS

1. DIAC Characteristics
2. SCR Characteristics
3. TRIAC Characteristics
4. Commutation Circuits Of SCR Trainer
5. Phase Controlled Characteristics Of SCR Trainer
6. MOSFET Based step up Chopper
7. MOSFET Based step down Chopper
8. Single phase Series Inverter
9. Single phase Parallel Inverter
10. Single Phase Cycloconverter
11. Speed control of Universal Motor

REFERENCES:

1. Manual prepared by Dept.of EEE

BEE601	**TRANSMISSION AND DISTRIBUTION**	**L**	**T**	**P**	**C**
	Total Contact Hours - 60	4	0	0	4
	Prerequisite – Engineering Mathematics, Electro Magnetic Theory, Circuit Theory and Network Analysis and Synthesis				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES	
To learn the usage of passive elements in various Power Transmission Systems, To design a Transmission and distribution electric power system.	
COURSE OUTCOMES (COs)	
CO1	To Describe transmission elements in power system network.
CO2	Summarize the modelling of transmission and distribution components and analyze its Performance.

CO3	Apply the concepts of transmission line into real time transmission networks.
CO4	Identify major components of power transmission and distribution systems.
CO5	Know and appreciate the key factors in equipment specification and network design.

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
2	CO1	M	M	H	H	M	M	M	M	L	M	L	M
	CO2	H	M	H	H	H	M	M	M	L	M	L	M
	CO3	H	M	H	H	H	H	M	M	L	M	L	M
	CO4	M	M	H	H	H	H	M	M	L	M	L	M
	CO5	H	M	M	H	H	M	M	M	L	M	L	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 STRUCTURE OF ELECTRICAL POWER SYSTEMS 12

Structure of AC power system- single line diagram- EHVAC and HVDC transmission advantages and disadvantages –comparison of AC and DC transmission- Substations- various bus bar arrangement in substations– Economic choice of conductor size- Kelvin's law

UNIT II ELECTRICAL DESIGN OF TRANSMISSION LINES 12

Resistance, inductance and capacitance calculations in single and three phase transmissions lines –stranded and bundled conductors – symmetrical and unsymmetrical spacing, transposition- self and mutual GMD – skin and proximity effect

UNIT III PERFORMANCE OF TRANSMISSION LINES 12

Equivalent circuit for short, medium and long transmission lines – analysis- efficiency and regulation – tuned power lines, attenuation and surge impedance loading – power circle diagram for receiving end and sending end –voltage control of line – shunt and series compensation.

UNIT IV CABLES AND INSULATORS 12

Underground cables – types, construction – capacitance of the cables – insulation resistance –

dielectric stresses and grading – dielectric losses – capacitance and inter sheath grading – thermal characteristics – capacitance of three core cable – Insulators – types - advantages –voltage distribution in suspension insulators – string efficiency – method of improving string efficiency.

UNIT V MECHANICAL DESIGN OF TRANSMISSION LINES 12

Sag and Tension- Sag calculation for equal and unequal level supports – effect of wind and ice – Consideration in mechanical design of lines – stringing chart- corona characteristics.

TEXT BOOKS:

1. Mehta V.K, Rohit Mehta "Power system" S. Chand & Co ltd, 2005.
2. D. P. Kothari and I J Nagrath, 'Modern Power System Analysis', Tata McGraw – Hill, 2nd Edition, 2008.
3. Singh S N, 'Electric Power Generation Transmission and distribution', PHI India, 2nd Edition, 2008.

REFERENCE:

1. C.L. Wadhwa: Electrical Power Systems, 3rd Edn, New Age International Publishing Co., 2001.
2. Turan Gonen, 'Electric Power Distribution system engineering', CRC Press INC, 2 nd Edition 2007.
3. http://nptel.ac.in/courses/108102047/

BEE603	**MICROPROCESSOR AND MICROCONTROLLER**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	3	0	0	3
	Prerequisite – Digital Electronics				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES	
To gain knowledge in microprocessor architecture, programming and its various applications.	
COURSE OUTCOMES (COs)	
CO1	To expertise the concepts of theory and programming of microprocessors
CO2	To achieve personal and professional success with awareness and commitment towards the social responsibility. To understand and work on 8bit and 16 bit microcontrollers
CO3	To Design microprocessor based systems along with I/O interfacing
CO4	To Understand the impact of microcontrollers in engineering applications
CO5	The student will be able to select an appropriate architecture and to apply to a particular situation
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
2	CO1	M	M	M	H	M	H		M				M
	CO2	M	M	M	H	M	M	M	H	H			M
	CO3		M	H	H	H	H		H	M			
	CO4		M	H	H	H	H	M	M	M			
	CO5			L	H		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)
					X				
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I 8085 PROCESSOR 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization –I/O ports and data transfer concepts– Timing Diagram – Interrupts.

UNIT II PROGRAMMING OF 8085 PROCESSOR 9

Instruction -format and addressing modes – Assembly language format – Data transfer, data Manipulation & control instructions – Programming: Loop structure with counting & Indexing – Look up table -Subroutine instructions - stack.

UNIT III 8051 MICRO CONTROLLER 9

Hardware Architecture, pin outs – Functional Building Blocks of Processor – Memory organization –I/O ports and data transfer concepts– Instruction set-Timing Diagram – Interrupts.

UNIT IV INTERFACING 9

Study on need, Architecture, and interfacing, with ICs: (a)8251 –USART; (b) 8256 –Direct memory access controller (c) 8259 programmable interrupt controller; (d) 8279 keyboard – display interface. A/D and D/A converters &Interfacing with 8085& 8051.

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS 9

Data Transfer, Manipulation, Control Algorithms& I/O instructions – Simple programming exercises, –Key board and Display interface- Stepper Motor control –Washing Machine Control- .Microprocessor vs Microcontroller.

TEXT BOOKS:

1. Krishna Kant, “Microprocessor and Microcontrollers”, Eastern Company Edition, Prentice Hall of India, New Delhi, 2007.

2. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', with 8085, Wiley Eastern Ltd., New Delhi, 2013.
3. Soumitra Kumar Mandal, Microprocessor & Microcontroller Architecture, Programming & Interfacing using 8085, 8086, 8051, McGraw Hill Edu, 2013.

REFERENCES:

1. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely 'The 8051 Micro Controller and Embedded Systems', PHI Pearson Education, 5th Indian reprint, 2003.
2. N.Senthil Kumar, M.Saravanan, S.Jeevananthan, 'Microprocessors and Microcontrollers', Oxford University Press, 2013.
3. http://nptel.ac.in/courses/108107029/

BEE604	**DIGITAL SIGNAL PROCESSING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Transmission and Distribution, Power System Analysis				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

- To classify signals and systems& their mathematical representation.
- To analyse the discrete time systems.
- To study various transformation techniques & their computation.
- To study about filters and their design for digital implementation.
- To study about a programmable digital signal processor & quantization effects.

COURSE OUTCOMES (COs)

CO1	Explain Properties and algorithms for implementation of DFT
CO2	Describe Filters and their structures
CO3	Illustrate the design of FIR and IIR filters
CO4	Describe the quantization effects
CO5	Relate the architectures and instruction set of a Digital Signal Processor

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
2	CO1	H	H	M	H	L	L	M	H	H	H	H	H
	CO2	H	H	H	H	H	L	M	H	H		H	H
	CO3	H	H	H	H	H			H	H	H	H	H
	CO4	M	M	L	H	M			H	H		H	M
	CO5	H	H	H	H	H	M	M	H	H			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 INTRODUCTION 9

Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation.

UNIT II DISCRETE TIME SYSTEM ANALYSIS 9

Z-transform and its properties, inverse z-transforms; difference equation – Solution byztransform, application to discrete systems - Stability analysis, frequency response – Convolution – Fourier transform of discrete sequence – Discrete Fourier series.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION 9

DFT properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT & DIF - FFT using radix 2 – Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS 9

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping – Frequency transformation.

UNIT V DIGITAL SIGNAL PROCESSORS 9

Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial Processors

TEXT BOOKS

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education/ PHI, 4th Edition, New Delhi, 2007.
2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', Tata McGrawHill, 3rd Edition, New Delhi, 2008.

REFERENCES

1. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, 'Discrete – Time Signal Processing', Pearson Education, New Delhi, 2003.
2. Emmanuel C Ifeachor and Barrie W Jervis ,"Digital Signal Processing – A Practical Approach" Pearson Education, Second edition, 2002.
3. Steven W. Smith, "The Scientist and Engineer's Guide to Digital Signal Processing", Second Edition, California Technical Publishing San Diego, California. www.DSPguide.com)
4. B. Venkataramani, M. Bhaskar, 'Digital Signal Processors, Architecture, Programming and Applications', Tata McGraw Hill, New Delhi, 2003

BEE605	MEASUREMENT AND INSTRUMENTATION	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Basics of Electrical and Electronic Systems.				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

To make the student have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working, Introduction to general instrument system, error, calibration etc.

COURSE OUTCOMES (COs)

CO1	Gain the knowledge of measuring various electrical and non electrical parameters.
CO2	Know the working and functions of Transducers and advanced sensors.
CO3	Gain the knowledge in digital measurement and data acquisition system.
CO4	Ability to measure frequency, phase with Oscilloscope
CO5	Ability to measure strain, displacement, Velocity, Angular Velocity, temperature, Pressure ,Vacuum, and Flow

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

Functional elements of measurement system – static characteristics – static calibration – accuracy, precision, resolution, linearity, dynamic, characteristics – performance characteristics of zero first, second order system – error in measurement.

UNIT II SENSORS AND TRANSDUCER 9

Basic requirement of sensors – classification of sensors – resistive, inductive and capacitive transducers –LVDT, piezoelectric, thermoelectric, optical and digital transducer – transducers application in force, torque, level, flow, pressure, speed, and temperature measurement – PH electrode – photoelectric transducer..

UNIT III SIGNAL CONDITIONING SYSTEM AND BRIDGE CIRCUIT 9

Bridges – instrumentation amplifier – operational amplifier – buffer amplifier – differential amplifier – active filter, V/F and F/V converters, PLL, sample and hold circuit, A/D and D/A converters, function generators, multiplexing and de-multiplexing system, data acquisition system.

UNIT IV ELECTRICAL AND ELECTRONICS MEASUREMENT AND TELEMETRY 9

Principle of ammeter and voltmeter – digital voltmeter – energy meter – wattmeter – current – voltage and position telemetry system – AC telemetry – wattmeter – current, voltage and position telemetry system – AC system

UNIT V INPUT – OUTPUT DEVICES AND DISPLAYS 9

Seven segment display – LED, LCD, mixie tube, alphanumeric display – CRT, CRO – Magnetic tape recorder – digital printer – X-Y recorder.

TEXT BOOKS

1. Doebeline, E.O., “Measurement Systems – Application and Design”, McGraw Hill Publishing compeney, 1990.
2. H.S. Kalsi, “Electronic instrumentation”, Tata McGraw Hill Co., 1995.
3. Shawney A.K., “Electronic Instrumentation”, Dhanpat Rai & Sons, New Delhi, 2008.

4. Moorthy.D.V.S, ”Tranducers and Instrumentation”, Prentice Hall of India Pvt Ltd 1995.

REFERENCE BOOKS

1. Stout M.B., ‘Basic electric Measurement, Prentice Hall of India. 1986
2. Dalley, J.W. Riely, W.F and Meconnel, K.G., “Instrumentation for Engineering Measurement”, John Wiley & Sons, 1993 J.B Gupta, Measurements and Instrumentation”.
3. http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Bombay/Electrical%20and%20Electronic%20Measurements.htm

BSS601	**VALUE EDUCATION AND PROFESSIONAL ETHICS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Professional Courses				
	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	l
2	CO1			M		H		M	H	M	L	L	M
	CO2			M		H		M	H	M	L	L	M
	CO3			M		H		M	H	M	L	L	M
	CO4			H		H		M	H	M	L	L	M
	CO5			H		H		M	H	M	L	L	M
	CO6			H		H		M	H	M	L	L	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 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'S RESPONSIBILITIES 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 RIGHTSAND GLOBAL ISSUES 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:

1. Philosophy of Universal Magnetism (Bio - magnetism, Universal Magnetism) The WorldCommunity Service Centre Vethathiri Publications (for Unit III)
2. Thirukkural with English Translation of Rev. Dr. G.U. Pope, Uma Publication, 156, SerfojiNagar, Medical College Road,Thanjavur 613 004 (for Units I - III)
2. R S Nagaarazan, Textbook On Professional Ethics And Human Values, New Age International Publishers, 2006 (for Units IV-V)
3. Charles D Fledderman, Engineering Ethics,Prentice Hall,New Mexico,2004(for Units IV,V)

BEE6L1	**MICROPROCESSOR AND MICROCONTROLLER LABORATORY**									**L**	**T**	**P**	**C**
	Total Contact Hours - 45									0	0	3	2
	Prerequisite – Digital Electronics, Electron Devices												
	Course Designed by – Dept. of Electrical & Electronics Engineering												
OBJECTIVES													
To gain knowledge in programming microprocessor and microcontroller and to learn about various Interfacing concepts.													
COURSE OUTCOMES (COs)													
CO1	Write Assembly Language Programmes for various operations using 8085 microprocessor												
CO2	Able to perform 8051 programming.												
CO3	Execute Interface Programs in 8085 microprocessor												
CO4	Execute Interface Programs in 8051 microcontroller												
CO5	Able to apply the concepts of microprocessor and microcontroller to perform related projects.												
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
2	CO1	H	M		H	L				M			H
	CO2	H	M		H	L				M			H
	CO3	M	M		H	M				M			H
	CO4	M	M		H	M				H			H
	CO5	M	M		H	M				H			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						

LIST OF EXPERIMENTS:

8085 Programming

1 (a) 8 bit Addition. (b) 8 bit Subtraction.
2 (a) Multiplication. (b) Division.
3 (a) 16 bit Addition (b) 16 bit Subtraction.
4 (a) Largest Element in an array. (b) Smallest Element in an array.
5 (a) Ascending order. (b) Descending order.

8085 Interfacing

6. Traffic Light control
7. Keyboard Interface.
8. 8251 USART interface

8051 programming

9. Demonstration of basic instructions with 8051 micro controller execution including Conditional jumps, looping and calling subroutines.

8051 Interfacing

10. Stepper motor control.
11. A/D & D/A Interface.

REFERENCE

1. LAB manual prepared by Department of Electrical & Electronics Engineering
2. http://nptel.ac.in/courses/108107029/

BEE6L2	**MEASUREMENT AND INSTRUMENTATION LABAROTARY**	**L**	**T**	**P**	**C**
	Total contact hours 45	0	0	3	2
	Prerequisite-NIL				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

To acquire skills on using different measuring devices and mathematical modeling of machines and use of control system components

COURSE OUTCOME													
1.	To Understand the operation of DC and AC bridges												
2.	To Calibrate the different types of meters and special type of instruments												
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
2	CO1	H	H	L	L	H	M	M	L	L	L	L	L
	CO2	H	H	L	L	M	M	M	L	L	L	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											

LIST OF EXPERIMENT:

1. Study of temperature measurement Transducer (thermocouple).
2. Study of displacement and pressure transducer (LVDT).
3. AC Bridges.
4. DC bridges .
5. Instrumentation amplifiers.
6. Linerization using microprocessors.
7. A/D and D/A converters .
8. Hystersis loss measure using CRO.
9. Torque and angle measurement.
10. Calibration of single phase energy meter.
11. Calibration of three phase energy meter.
12. Measurement of three phase power and power factor

REFERENCES

1.Department lab Manual

BMA 701	**OPERATIONS RESEARCH FOR ENGINEERS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 60	4	0	0	4
	Prerequisite - Engineering Mathematics –I and Engineering Mathematics – III				

	Course Designed by – Dept. of Electrical & Electronics Engineering

OBJECTIVES

To impart knowledge about various tools in Operations Research to apply and solve real life problems in Engineering.

COURSE OUTCOMES (COs)

CO1	Apply linear programming model and assignment model to domain specific situations
CO2	Analyze the various methods under transportation model and apply the model for testing the closeness of their results to optimal results
CO3	Apply the concepts of PERT and CPM for decision making and optimally managing projects
CO4	Analyze the various replacement and sequencing models and apply them for arriving at optimal decisions
CO5	Analyze the inventory and queuing theories and apply them in domain specific situations.

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
2	CO1	H											M
	CO2	L		M		L		M		M	H		
	CO3					H			H				L
	CO4		H	H					H	L	H		
	CO5	M				H				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 LINEAR PROGRAMMING 12

Introduction to phases of Operations Research – Linear programming – formulation of the problem – graphical method – simplex method – two phase method – Assignment problems – Transportation models – Vogel's approximation method – Modi method – unbalanced transportation problem – degeneracy in transportation models.

UNIT – II RESOURCE SCHEDULING AND NETWORKS 12

Resource scheduling – Sequencing n jobs through 2 machines and 3 machines. Networks – PERT and CPM – Network diagrams – shortest route – minimum spanning tree – probability of achieving completion date – crash time – cost analysis – resource smoothing and resource levelling.

UNIT – III INVENTROY AND REPLACEMENT MODELS 12

Inventory models- Types of Inventory and variables in the Inventory problem – deterministic models- Replacement models – Replacement of items that deteriorate with time – equipment that fails completely and their analysis – factors for evaluation of proposals of capital expenditures and comparison and alternatives – present value average investment – rate of return pay off period – individual and group replacement policy.

UNIT – IV QUEUEING MODELS 12

Queuing theory – queuing system and structure – Kendalls's notation– Poisson arrival and exponential service time – characteristic of queuing models – single channel and multiple models – simulation.

UNIT –V DECISION MODELS 12

Game theory –Saddle point-Maximin-Minimax principle-Two person zero sum games (mixed Strategies)-Graphical method for 2×n or m×2 games-Dominance Property-Oddment method.

TEXT BOOKS:

1. Kanti Swarup, Gupta, P.K and Manmohan, "Operations Research", Sultan Chand & Sons 1997

REFERENCES:

1 Handy A. Taha, "Operations Research", 7th Edn. Prentice Hall of India. 2007.
2 Gupta and Hira DS " Operations Research", S. Chand & Co, New Delhi, 2006
2. http://www.nptel.ac.in/syllabus/111107064/

BEE701	**POWER SYSTEM ANALYSIS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 60	4	0	0	4
	Prerequisite – Linear Algebra , Partial Differential Equations, Knowledge in circuit theory, Transmission and Distribution				
	Course Designed by – Dept. of Electrical & Electronics Engineering				
OBJECTIVES					
To model various power system components and carry out load flow, short circuit and stability studies.					
COURSE OUTCOMES (COs)					
CO1	Create computational models for analysis power systems and able to understand per unit system				

CO2	Perform load flow computations and analyze the load flow results
CO3	Analyse a power system network under Symmetrical Conditions
CO4	Understand Positive Sequence, Negative & zero sequence system and fault analysis
CO5	Analyze power system operation and stability control

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
2	CO1	H	H	M	H	M	M	M	M	L	L	L	M
	CO2	H	H	M	H	H	H	M	M	L	M	L	M
	CO3	H	H	H	H	H	H	M	H	L	M	L	M
	CO4	H	H	H	H	H	M	M	H	L	M	L	M
	CO5	H	H	M	H	H	H	M	M	L	M	L	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 POWER SYSTEM COMPONENTS 12

Power System Model: Representation-Single Line Diagram-Per unit Quantities-Per unit impedance diagram-Primitive network and its matrices, Network formulation using bus admittance matrix and bus impedance matrix-Symmetrical Components-Sequence impedance and networks.

UNIT II LOAD FLOW STUDIES 12

Primitive network equation-Incidence Bus Matrix. Power flow studies: Formulation of Power flow equations using Y-bus matrix-power flow analysis-Guass-Seidal and Newton Raphson Methods-Handling of Voltage Controlled Buses Off nominal transformer ratios and phase shifting transformer-Fast Decoupled Method.

UNIT III SYMMETRICAL FAULT ANALYSIS 12

Symmetrical Short Circuit Analysis: Types of faults in power systems-Analysis of Symmetrical faults-short circuit capacity-symmetrical fault analysis through Z-bus.

UNIT IV UNSYMMETRICAL FAULT ANALYSIS 12

Unsymmetrical Short Circuit Analysis: Unsymmetrical faults in Power Systems-Analysis of single line to ground, line to line and double line to ground faults power systems using Z-bus.

UNIT V POWER SYSTEM STABILITY 12

Stability Analysis: Steady state and transient Stability limits-Swing equation for single machine infinite bus system-Equal area criterion- Critical clearing angle and time-Solution of swing equation by modified Euler and Runge-kutta methods Stability analysis of multi machine power system. Techniques for stability Improvement

TEXT BOOKS:

1. J.J Nagrath& D.P Kothari, 'Modem Power System Analysis', Tata McGraw Hill, New Delhi, 1989.
2. John J. Graigner and Stevenson Jr.W.D., 'Power System Analysis'. McGraw Hill International Edition, 1994.

REFERENCE BOOKS:

1. Stevenson WD , 'Elements of Power System Analysis', Tata McGraw Hill, 1952.
2. MA Pai, 'Computer Techniques in Power System Analysis', Tata McGraw Hill. New Delhi, 1979.
3. http://nptel.ac.in/courses/108105067/

BEE703	**ELECTRICAL DRIVES AND CONTROL**	**L**	**T**	**P**	**C**
	Total Contact Hours - 60	4	0	0	4
	Prerequisite – Electrical Machines – I & Electrical Machines – II & Concepts of Power Electronics				
	Course Designed by – Dept of Electrical & Electronics Engineering				

OBJECTIVES	
To enable the students to gain a fair knowledge on characteristics and applications of electrical drives and how to control the speed of the AC & DC Motors.	
COURSE OUTCOMES (COs)	
CO1	To learn the General characteristics of different types of electrical AC & DC Motors with respect to the applications.
CO2	To understand the operation of different types of DC electrical drives
CO3	To understand the operation of Three Phase Induction Motors Drive
CO4	To understand the operation of Three Phase Synchronous Motor Drives
CO5	To learn the operation of control circuits and applications of Digital Control And Drive Application
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
2	CO1	M					M	M		M			
	CO2	M					M	M		M			
	CO3	M					M	M		M			
	CO4	M					M	M		M			
	CO5	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 CHARACTERISTICS OF ELECTRICAL DRIVES 12

Speed – torque characteristics of various types of loads and drives motors-joint speed –torque characteristics – selection of power rating for drives motors with regard to thermal over loading and load variation factors – load equalization – starting, breaking and reversing operation.

UNIT II DC DRIVES 12

Speed control of DC motors- Ward Leonard scheme - Closed loop operation - speed regulation and speed loop - current loop , tracing of waveforms , speed reversal , torque reversal , with/ without braking and regeneration.

UNIT III THREE PHASE INDUCTION MOTORS DRIVES 12

Speed control of three phase induction motors- Stator control o stator voltages and frequency control-AC chopper, inverter and cyclo converter fed induction motor drives' Rotor control-Rotor resistance control and slip power frequency recovery schemes- Static control of rotor resistance using DC chopper- Static Kramer and scherbius drives.

UNIT IV THREE PHASE SYNCHRONOUS MOTOR DRIVES 12

Speed control of the phase synchronous motor- Voltage source and current source inverts fed synchronous motor- Commutator less DC motor- closed loop control of drives motors. .Marginal angle control - torque angle control - power factor control of synchronous motor

UNIT V DIGITAL CONTROL AND DRIVE APPLICATION 12

Digital techniques in speed control-advantages and limitations-Microprocessor based control of drives-selection of drives and control schemes for steel rolling mills,paper mills,lifts and cranes.

TEXT BOOKS

1. S.K Pillai'A First Course On Electrical Drives', Wiley eastern Ltd., Bombay 1989.
2. Gopal,K.Dubey,' Power Semiconductor Controlled Drives,'Prentics Hall, Englewood Cliffs, New Jersey 1989.
3. N.K.De, P.K.SEN, "Electrical Drives", PHI, New Delhi.

REFERENCE BOOKS

1. P.C. Sen,'Thyristor DCdrives', John Whey and Sons, New York, 1981.
2. B.K. Bose,'Power electronics and AC drives', Prentice Hall, Englewood cliffs, New Jersey, 1986.
3. Vedhamsubramanyam, Thyristor control of electric drives',Tata McGraw hill publishing company Ltd. New Delhi, 1991.
4. http://www.motioncontrolonline.org/content-detail.cfm/Motion-Control-News/Electric-Drives-Concepts-and-Applications/content_id/1082

BEE7P1	**TERM PAPER**	**L**	**T**	**P**	**C**
	Total Contact Hours –60	0	0	4	2
	Prerequisite – Professional Courses				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

1. Application of theory learned so far in Electrical and Electronics Engineering
2. Make use of research tools and material
3. Consolidation of Hardware/Software skills for a real world /research problem
4. Improve problem solving skills
5. Improve report writing, word processing skills and documentation skills

COURSE OUTCOMES (COs)

CO1	Trace and Analyse the engineering problems effectively.
CO2	Use modern engineering tools effectively for the system design, and simulate the problem identified.
CO3	Function effectively as an individual, and as a member or leader in teams which will enhance the communication and leadership capabilities.
CO4	Present project findings effectively, produce technical thesis and use software applications to write technical reports and oral presentations.

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
2	CO1	H	H	M	H	M		M		M	M	M	M
	CO2	H	H	M	H	H	M	M		M	M	M	M
	CO3	M	M	L	M	M		M		H	H	H	M
	CO4	M	M	L	H	M		M		M	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		38th Meeting of Academic Council, January 2016						

DESCRIPTION

The Term Paper may be a precursor to the project work to be done in the VIII semester of the final year B.Tech, EEE program. This may be a team work.

PURPOSE

This helps to supplement the final year project work of the B.Tech students. It helps to identify their research area/topic and complete the groundwork and preliminary research required for it comfortably. It trains the students to make use of research tools and material available both in print and digital formats.

PROCEDURE

The topic of Term Paper is chosen from the B.Tech EEE curriculum. The students are then required to collect literature and support information from standard reference books, journals, and magazines both printed and online. Each student should refer to a minimum of 5 reference sources outside their prescribed textbooks. The students also present their Term Paper with the help of Power Point slides/ OHP.

The Term Paper contains

1. The Aim and Object of the study
2. The need for Rationale behind the study
3. Identify the work already done in the field
4. Hypothesis and Discussion
5. Conclusion
6. Appendix with support data (Illustrations, Tables, Graphs, etc.,)

BEE7L1	**POWER SYSTEM USING PC LABAROTORY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	0	0	3	2
	Prerequisite – Power system analysis, power system operation and control, Basics of Mat Lab Software				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES													
To provide better understanding of power system analysis through MATLAB simulation													
COURSE OUTCOMES (COs)													
CO1	Acquire skills of using computer packages MATLAB coding in power system studies												
CO2	Model and simulate power system network with stable and unstable situation												
CO3	Analyse the performance of Power System Network using MATLAB tools.												
CO4	To perform the dynamic analysis of power system												
CO5	To have hands on experience on various system studies and different techniques used for system planning.												
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
2	CO1	M	M		H	H				M			M
	CO2	M	H		H	H				M			M
	CO3	M	H		H	H				M			M
	CO4	H	H		H	H				M			M
	CO5	M	M		H	H				H			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											

LIST OF EXPERIMENTS

1. Per Unit Computation
2. Formation of Y Bus Matrix by Inspection Method
3. Formation of Z Bus Matrix
4. Gauss Seidal Method
5. Load Flow Solution using Fast Decouple Method
6. Load Flow Solution by Newton Raphson Method
7. Short Circuit Analysis
8. Economic dispatch using MATLAB Software
9. Swing equation

10. Load frequency control
11. Study of Programmable Logic Controller

REFERENCE

1. LAB manual prepared by Department of Electrical & Electronics Engineering
2. http://www.mathworks.com/access/helpdesk/help

BEE7L3	**ELECTRICAL DRIVES & CONTROL LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**0**	**0**	**3**	**2**
	Prerequisite – Concepts of Special Electrical Machines				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

To enable the students to design gating circuits, PWM inverters and SMPS

COURSE OUTCOMES (COs)

CO1	To design various types of gate pulse generating circuits.
CO2	To interface motors with DSP for speed control applications
CO3	To simulate various types of converters
CO4	To design PWM Inverters
CO5	To design various types of SMPS – BUCK,BOOST & BUCK-BOOST

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
2	CO1		H		H		L			M			
	CO2		H		H		L			M			
	CO3		H		H		L			M			
	CO4		H		H		L			M			
	CO5		H		H		L			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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LIST OF EXPERIMENTS:

1. Gate Pulse Generation using R,RC and UJT.
2. IGBT based single phase PWM inverter.
3. IGBT based three phase PWM inverter.
4. Single Phase AC Voltage controller with R & RL Load.
5. Simulation of 1Φ Semi-converter.
6. Simulation of 1Φ Full-converter.
7. Simulation of dc-dc converters.
8. Simulation of cyclo-converter.
9. Design of Switched Mode Power Supply.
10. DSP based Stepper Motor Controller using 8051 Micro-controller.
11. DSP Based DC Servo motor position control system

REFERENCES:

1. Manual prepared by Dept. of EEE.

BEE7V1	**INPLANT TRAINING (Training to be undergone after VI semester)**	**L**	**T**	**P**	**C**
	(END OF VI SEM-15 DAYS)	0	0	0	1
	Prerequisite – NIL				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

Students have to undergo 15 day practical training in Electrical and Electronics Engineering related project at industry or a company so that they become aware of the practical application of theoretical concepts studied in the class rooms.

COURSE OUTCOMES (COs)

CO1	To have extensive training with practical exposure on real time scenarios.
CO2	Function effectively as an individual, and as a member or leader in teams which will enhance the communication and leadership capabilities.
CO3	To have work experience which enhances the technical and professional skills and employment prospects.
CO4	To learn about the skill set required, demands of the industry and also work ethics.

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
2	CO1	H	M	M	H	H	M		M	M			M
	CO2	H	M	M	M	H			M	H	M	M	M
	CO3	M	M		H	M	M		M	M	M	M	M

	CO4	M	M		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/
													√
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- Students have to undergo three-week practical training in Electrical and Electronics Engineering related project at industry or a company of their choice but with the approval of the department. At the end of the training student will submit a report as per the prescribed format to the department.

Assessment process

- This course is mandatory and a student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made. Marks will be awarded out of 100and appropriate grades assigned as per the regulations.

BEE8C1	**COMPREHENSION II**	**L**	**T**	**P**	**C**
	Total Contact Hours : Test will be conducted at the end of the semester	0	0	0	1
	Prerequisite – All the courses up to eighth semester				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

- To provide a complete review of Electrical &Electronics 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.

BEE8P1	**PROJECT WORK**	**L**	**T**	**P**	**C**
	Prerequisite – Professional Courses	**0**	**0**	**18**	**9**

	Course Designed by – Dept. of Electrical & Electronics Engineering

OBJECTIVES

1. Implementation of the problem identified in Term Paper
2. Application of theory learned so far in Electrical and Electronics Engineering
3. Make use of research tools and material
4. Consolidation of Hardware/Software skills for a real world /research problem
5. Improve problem solving skills
6. Improve report writing, word processing skills and documentation skills

COURSE OUTCOMES (COs)

CO1	Use modern engineering tools effectively for the system analysis, design and simulate the problem identified.
CO2	Develop a prototype Model.
CO3	Present project findings effectively, use software applications to write technical thesis and oral presentations.
CO4	Function effectively as an individual, and as a member or leader in teams which will enhance the communication and leadership capabilities.

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
2	CO1	M	M	M	H	H	H	M		M	L	L	M
	CO2	H	M	M	H	H		M		M	L	M	M
	CO3	H	M		H	H	M	M		M	M	M	M
	CO4	H	M		H	H		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/ Term Paper Seminar/ Internship (PR)
									√

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- Project work, in general, means design and development of a system with clearly specified objectives. The project is intended to be a challenge to intellectual and innovative abilities and to give students the opportunity to synthesize and apply the knowledge and analytical skills learned in the different Subjects.
- The project shall be a prototype; backed by analysis and simulation etc. No project can be deemed to be complete without having an assessment of the extent to which the objectives

are met. This is to be done through proper test and evaluation, in the case of developmental work, or through proper reviews in the case of experimental investigations.

- Project work is to be done by student groups. Maximum of four students only are permitted in any one group.
- Projects are expected to be proposed by the students. They may also be advised by faculty member. Students are expected to finalize project titles with the assistance of an identified faculty member as project guide during the first week of the eighth semester.
- The progress from concept to final implementation and testing, through problem definition and the selection of alternative solutions is monitored. Students build self confidence, demonstrate independence, and develop professionalism by successfully completing the project.

CORE ELECTIVES-I (CE-I)

BEE015	**ELECTRICAL SPECIAL MACHINES**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite –Electrical Machines I&II				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

The student gains detailed skills related to the subject of special type of electrical machines.

COURSE OUTCOMES (COs)

CO1	Construction, principle of operation and performance of synchronous reluctance motors.
CO2	Construction, principle of operation, control and performance of stepping motors.
CO3	Construction, principle of operation, control and performance of switched reluctance motors.
CO4	Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors.
CO5	Construction, principle of operation and performance of permanent magnet synchronous 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	l
2	CO1	M				M		M			M	L	M
	CO2			L									L
	CO3	M			L	M		M					
	CO4	H	M								M		
	CO5			M		M					L	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							

UNIT I SYNCHRONOUS RELUCTANCE MOTORS 9

Constructional features – Types – Axial and Radial flux motors – Operating principles – Variable Reluctance and Hybrid Motors – Voltage and Torque Equations - Phasor diagram - Characteristics.

UNIT II STEPPING MOTORS 9

Constructional features – Principle of operation – Variable reluctance motor – Hybrid motor – Single and multi stack configurations – Torque equations – Modes of excitations – Characteristics – Drive circuits – Microprocessor control of stepping motors – Closed loop control.

UNIT III SWITCHED RELUCTANCE MOTORS 9

Constructional features – Rotary and Linear SRMs - Principle of operation – Torque production – Steady state performance prediction- Analytical method -Power Converters and their controllers – Methods of Rotor position sensing – Senseless operation –Closed loop control of SRM - Characteristics.

UNIT IV PERMANENT MAGNET BRUSHLESS D.C. MOTORS 9

Constructional features of PMBLDC Motor - Permanent Magnet materials – Magnetic Characteristics –Principle of operation – Types – Magnetic circuit analysis – EMF and torque equations –Commutation - Power converters – Motor characteristics and control.

UNIT V PERMANENT MAGNET SYNCHRONOUS MOTORS 9

Principle of operation – Ideal PMSM – EMF and Torque equations – Armature reaction MMF – Synchronous Reactance – Sine wave motor with practical windings – Phasor diagram – Torque/speed characteristics - Power controllers - Converter Volt-ampere requirements.

TEXT BOOKS

1.T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989.

2. T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984.

3. Venkataraman,"Special Electrical machines".

REFERENCES

1. R. Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.
2. P.P. Aearnley, 'Stepping Motors – A Guide to Motor

BEE051	**DISTRIBUTED GENERATION AND MICROGRID**										**L**	**T**	**P**	**C**
	Total Contact Hours – 45										3	0	0	3
	Prerequisite –													
	Course Designed by – Dept. of Electrical & Electronics Engineering													
OBJECTIVES														
• To illustrate the concept of distributed generation • To analyze the impact of grid integration. • To study concept of Microgrid and its configuration														
COURSE OUTCOMES (COs)														
CO1	Review the conventional power generation													
CO2	Analyze the concept of distributed generation and installation													
CO3	Design the grid integration system with conventional and non-conventional energy sources													
CO4	Design the dc and ac micro grid													
CO5	Analyze power quality issues and control operation of micro grid													
	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	
2	CO1	M	M	M		M		M			M	L	M	
	CO2	H		H		H						M	M	
	CO3	M			H	M		M						
	CO4	H	M		H	M					M			
	CO5		M	M		M					L	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

UNIT I INTRODUCTION 9

Conventional power generation: advantages and disadvantages, Energy crises, Non - conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.

UNIT II DISTRIBUTED GENERATIONS (DG) 9

Concept of distributed generations, topologies, selection of sources, regulatory standards/ framework, Standards for interconnecting Distributed resources to electric power systems: IEEE 1547. DG installation classes, security issues in DG implementations. Energy storage elements: Batteries, ultra-capacitors, flywheels. Captive power plants

UNIT III IMPACT OF GRID INTEGRATION 9

Requirements for grid interconnection, limits on operational parameters,: voltage, frequency, THD, response to grid abnormal operating conditions, islanding issues. Impact of grid integration with NCE sources on existing power system: reliability, stability and power quality issues.

UNIT IV BASICS OF A MICROGRID 9

Concept and definition of microgrid, microgrid drivers and benefits, review of sources of microgrids, typical structure and configuration of a microgrid, AC and DC microgrids, Power Electronics interfaces in DC and AC microgrids,

UNIT V CONTROL AND OPERATION OF MICROGRID 9

Modes of operation and control of microgrid: grid connected and islanded mode, Active and reactive power control, protection issues, anti-islanding schemes: passive, active and communication based techniques, microgrid communication infrastructure, Power quality issues in microgrids, regulatory standards, Microgrid economics, Introduction to smart microgrids.

REFERENCES

1. Amirnaser Yezdani, and Reza Iravani, "Voltage Source Converters in Power Systems: Modeling, Control and Applications", IEEE John Wiley Publications, 2009.
2. DorinNeacsu, "Power Switching Converters: Medium and High Power", CRC Press, Taylor & Francis, 2006.
3. Chetan Singh Solanki, "Solar Photo Voltaics", , PHI learning Pvt. Ltd., New Delhi, 2009
4. J.F. Manwell, J.G "Wind Energy Explained, Theory Design and Applications,". McGowan Wiley publication, 2nd Edition, 2009.
5. D. D. Hall and R. P. Grover, "Biomass Regenerable Energy", , John Wiley, New York, 1987.
6. John Twidell and Tony Weir, "Renewable Energy Resources", Taylor and Francis Publications, Second Edition, 2006.

BEE012	SOLID STATE RELAYS	L	T	P	C
	Total Contact Hours - 45	3	0	0	3

	Prerequisite-power system protection and switch gear,
	Course Designed by – Dept. of Electrical & Electronics Engineering

OBJECTIVES

- To educate the basic concepts and new developments in solid state relays and power system protection
- To educate the theory and applications of the main components used in power system protection for electric machines, transformers, bus bars, overhead and underground feeders.

COURSE OUTCOMES (COs)

CO1	Gain Knowledge On Different Protective Equipment's Or Power Relays, Know About Various Protective Systems- How It Works And Where It Works?
CO2	Different Applications Of The Relays, Circuit Breakers, Grounding For Different Elements Of Power System Is Also Discussed In The Subject.
CO3	Ability To Understand Various Power, Frequency And Impedance Relays
CO4	Ability To Understand Protective Schemes ,Transient Behavior ,Testing And Tripping Schemes
CO5	Ability To Understand Relays Using Microprocessor

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

UNIT I INTRODUCTION OF RELAYS 9

Comparators: phase and amplitude comparators-types-Direct and integrating rectifier bridge, circulating current, opposed voltage coincident type phase comparator-Direct or block spike

phase comparator, phase splitting technique, integrating type phase comparator with transistor AND gate, hybrid comparator with transistor AND gate. Hybrid comparator- Hall effect type and magneto resistivity type, vector product type - zener diode phase comparators-Multi input-Three input coincidence comparators

UNIT II RELAY CIRCUIT 9

Static relay circuit (using analog and digital ic's) for over current, inverse time characteristics, differential relay.

UNIT III RELAY CIRCUIT 9

Static relay circuits fort generator loss of field, under frequency, distance relay, impedance, reactance, reverse power relays.

UNIT IV TRANSIENT BEHAVIOR OF RELAYS 9

Static relay circuits for carrier current protection-steady state and transient behavior of static relay-testing and maintenance - tripping circuits using thyristors.

UNIT V MICROPROCESSOR BASED RELAYS 9

Microprocessor based relays: hardware and software for the measurement of voltage, current, frequency, phase angle-microprocessor implementation of over current relays-inverse time characteristics-impedance relay-directional relay-mho relay.

TEXT BOOKS

1. Badri Ram, D. N. Vishwakarma 'power system protection and switchgear',22nd Edition, Tata Mcgraw Hill, 2001.
2. Rao, T.S.M. Power System Protection And Switch Gear, 2nd Edition, Wiley Eastern Ltd,1979.

REFERECE BOOKS:

1. Van. C.Wamngton. 'Protective Relays- their theory and practice', 2nd Edition, Chapman and hall
2. Russel c. Mason, "The art and science of protective relays" 1st Edition. John Wiley and Sons Ltd
3. www.electromagneticrelays.in

BEE053	**POWER SYSTEM PROTECTION AND SWITCHGEAR**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Transmission and Distribution, Power System Analysis				
	Course Designed by – Dept. of Electrical & Electronics Engineering				
OBJECTIVES					
To develop an ability and skill to design the feasible protection systems needed for each main part of a power system in students.					

COURSE OUTCOMES (COs)	
CO1	Understand the basic concepts of power system protection and relays.
CO2	Design the relevant protection systems for the main elements of a power system.
CO3	Understand the theory of arcing phenomenon.
CO4	Analyze the purpose and working principle of different circuit breakers and tests.
CO5	Understand the overvoltage protection methods.

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
2	CO1	H	M	H	H	M	L	M	L	H	M	L	M
	CO2	H	M	H	H	M	L	M	L	H	M	L	M
	CO3	H	M	H	H	M	M	M	L	H	M	L	M
	CO4	H	M	H	H	M	M	M	M	H	M	L	M
	CO5	H	M	H	H	M	M	M	M	H	M	L	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/
						√			

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UNIT I PROTECTIVE RELAYS 9

Relay construction and characteristics-over current relays - Directional over current relays Directional relays-Differential relays-COMPARATORS-Under frequency and negative sequence relays-Electromagnetic and solid relay comparison.

UNIT II APPARATUS PROTECTION 9

Protection of generator &-transformer protection-Bus zone protection-Feeder protection carrier current scheme for transmission line-Relay co-ordination for a sample system- Substation layout and arrangement of equipment's.

UNIT III THEORY OF ARC QUENCHING 9

Arcing phenomena- Theory and methods of arc quenching- Circuit interruption in AC circuits- Recovery voltage- Restriking voltage- Resistance switching- Current chopping- Capacitive breaking characteristics of fuses and HRC fuses- DC circuit breaking.

UNIT IV CIRCUIT BREAKERS 9

Fault clearing process- Classification of circuit breakers- Construction and operation of circuit breakers- Oil minimum circuit breakers-air blast circuit breaker- Vacuum circuit breaker-SF_6, circuit breaker- Circuit breaker rating- Circuit breaker testing.

UNIT V OVER VOLTAGE PROTECTION 9

Cause for over voltages- Lighting surges insulation failure and arcing grounds- Method of protection- ground wires, Peteron coils, surge absorbers and diverters- location of protective apparatus- Insulation co-ordination- neutral earthing.

TEXT BOOK

1. Sunil S. Rao. 'Switchgear and Protection', Khanna publisher,NewDelshi.1986
2. C.L Wadhwa,'Electrical Power System',Witey eastern Ltd, New Delhi 1983.
3. Ravindranath& M. Chandar," Protection & switch gear"New Age International.

REFERENCE BOOK:

1. S L Uppal. 'ELECTRIAL POWER', Khanna publishers. New Delhi. 1981
2. Son Bhatnagar $ Gupta,' A cource in electrical power', Dhanpat Rai & Sons, New Delhi,1976
3. B Ravindranath N chander, 'Power system protection and switch gear'. Wiley eastern Ltd, NEW Delhi, 1997
4. http://www.nptel.ac.in/downloads/108101039/

BEE013	**HIGH VOLTAGE ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite-Basic Physics & chemistry, PS Switchgear,				
	Course Designed by – Dept of Electrical & Electronics Engineering				

OBJECTIVES

To get a fair knowledge about the generation, measurements of high voltages and currents, testing of high voltage apparatus

COURSE OUTCOMES (COs)

CO1	To understand the various types of over voltages in power system and protection methods.
CO2	Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.
CO3	To understand the concept of solid, liquid and gaseous dielectrics.
CO4	To understand the generation and measurement of high voltages and currents
CO5	To gain knowledge in testing of high voltage equipments.

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
2	CO1	M	H	H		M	H	L	M	H	H		H
	CO2	L	H			H	M	M	M	H	H		M
	CO3	L	H	H		M	H	M	M	H	H		M
	CO4	L	M			M	H	M	M	H	H		H
	CO5	L	H	M		M	H	M	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)
		-		-		-	-		X	-		-	-
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UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 9

Causes of over voltages and their effects on power system – Lightning, switching and temporary over voltages – protection against over voltages - Insulation coordination

UNIT II ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUIDS 9

Gaseous breakdown in uniform and non-uniform fields – corona discharges – Vacuum breakdown – conduction and breakdown in pure and commercial liquids – breakdown mechanisms in solid and composite dielectrics.

UNIT III GENERATION OF HIGH VOLTAGE AND CURRENTS 9

Generation of high DC voltages - multiplier circuits –Van de Graff generator – high alternating voltage generation using cascade transformers-production of high frequency AC high voltages-standard impulse wave shapes-Marx circuit- generation of switching surges - impulse current generation-tripping and control of impulse generators.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND CURRENTS 9

HVDC measurement techniques – measurement of power frequency A.C voltages- sphere gap measurement technique-potential divider for impulse voltage measurements – measurement of high D.C, A.C and impulse currents

UNIT V HIGH VOLTAGE TESTING 9

Tests on insulators-testing of bushings-testing of isolators and circuit breakers- cable testing- testing of transformers-surge diverter testing -radio interference measurement-use of I.S for testing.

TEXT BOOKS

1. Naidu.M.S, and Kamaraju, "High Voltage Engineering", Tata McGraw Hill, 2009.
2. Wadhwa.C.L, "High Voltage Engineering", Wiley Eastern Limited, 2007.

REFERENCES

1. Kuffel.E and Abdullah. M, "High Voltage Engineering", Pergamon Press, 2000.
2. Dieter Kind, "An Introduction to High Voltage Experimental Techniqu Eastern Limited, 1978.
3. Ravindra Arora, Wolfgang Mosh, "High Voltage and Electrical Insulation e", Wiley Engineering", Wiley-VCH Publishers, 2011.
4. http://nptel.ac.in/courses/108104048/ui/TOC.htm

CORE ELECTIVES-II(CE-II)

BEE052	**ELECTRICAL MACHINE MODELING AND ANALYSIS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – ELECTRICAL MACHINES I AND MACHINES II				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

To master the various fundamentals, machine design, machine modeling of various types of electrical machines. This will help you to gain knowledge and to do research in the area of electrical machine modeling.

COURSE OUTCOMES (COs)

CO1	To learn about the basic concepts of AC/ DC machine modeling.
CO2	To study about the dynamic modeling and phase transformation.
CO3	To analyze various methodologies in small signal machine modeling.
CO4	To understand the modeling of synchronous machine modeling.
CO5	To learn the performance and dynamic modeling of synchronous machines

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
2	CO1		H	M	M	M	M	M	L	M	M	L	M
	CO2		H		M	H	M	M	L	M	M	L	M
	CO3	H	H							M	M		
	CO4	H		M			H	M			M		H
	CO5	H	H	M	H	H	H	M	M	M	M	L	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 BASIC CONCEPTS OF MODELING 9

Basic Two - pole Machine representation of Commutator machines, 3 phase synchronous machine with and without damper bars and 3 - phase induction machine, Kron's primitive Machine - voltage, current and Torque equations. DC Machine modeling: Mathematical model of separately excited D.C motor –Steady State analysis - Transient State analysis - Sudden application of Inertia Load - Transfer function of Separately excited D.C Motor - Mathematical model of D.C Series motor, Shunt motor - Linearization Techniques for small perturbations

UNIT II REFERENCE FRAME THEORY 9

Reference frame theory Real time model of a two phase induction machine-Transformation to obtain constant matrices - three phase to two phase transformation - Power equivalence. Dynamic modeling of three phase Induction Machine Generalized model in arbitrary reference frame - Electromagnetic torque - Derivation of commonly used Induction machine models - Stator reference frame model - Rotor reference frame model Synchronously rotating reference frame model -Equations in flux linkages - per unit model

UNIT III SMALL SIGNAL MODELING 9

Small Signal Modeling of Three Phase Induction Machine Small signal equations of Induction machine – derivation - DQ flux linkage model derivation - control principle of Induction machine. Symmetrical and Unsymmetrical 2 phase Induction Machine Analysis of symmetrical 2 phase induction machine - voltage and torque equations for unsymmetrical 2 phase induction machine - voltage and torque equations in stationary reference frame variables for unsymmetrical 2 phase induction machine - analysis of steady state operation of unsymmetrical 2 phase induction machine - single phase induction motor - Cross field theory of single - phase induction machine.

UNIT IV MODELING OF SYNCHRONOUS MACHINE 9

Synchronous machine inductances – voltage equations in the rotor's dq0 reference frame - electromagnetic torque - current in terms of flux linkages - simulation of three phase synchronous machine- modeling of PM Synchronous motor.

UNIT V DYNAMIC ANALYSIS OF SYNCHRONOUS MACHINE 9

Dynamic performance of synchronous machine, three -phase fault, comparison of actual and approximate transient torque characteristics, Equal area criteria

TEXT BOOKS:

1. R. Krishnan, "Electric Motor Drives - Modeling, Analysis& control", Pearson Publications, First edition, 2002.
2. P.C.Krause, Oleg Wasynczuk, Scott D.Sudhoff, "Analysis of Electrical Machinery and Drive systems", IEEE Press, Second Edition.

REFERENCE BOOKS:

1. P.S.Bimbra, "Generalized Theory of Electrical Machines" Khanna publications, Fifth edition - 1995
2. Chee Mun Ong –"Dynamic simulation of Electric machinery using MATLAB / Simulink", Prentice Hall of India Publications
3. Online courses on Modeling of Electrical Machines -http://nptel.ac.in/courses/108106023/

BEE016	FLEXIBLE AC TRANSMISSION SYSTEMS	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Power System Analysis Power Conversion techniques				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

This course introduces the application of a variety of high power-electronic controllers for active and reactive power in transmission lines. Students are exposed to the basics, modeling aspects, control and scope for different types of FACTS controllers.

COURSE OUTCOMES (COs)

CO1	Ability to understand and analyze power system operation, stability, control and protection.
CO2	Choose proper controller for the specific application based on system requirements
CO3	Understand various systems thoroughly and their requirements
CO4	Interpret the control circuits of Shunt Controllers SVC & STATCOM for various functions
CO5	To learn the concept of coordination of FACTS controllers.

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

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

UNIT I INTRODUCTION 9

Reactive power control in electrical power transmission lines -Uncompensated transmission line - series compensation – Basic concepts of Static Var Compensator (SVC) – Thyristor Controlled Series capacitor (TCSC) – Unified power flow controller (UPFC).

UNIT II STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS 9

Voltage control by SVC – Advantages of slope in dynamic characteristics – Influence of SVC on system voltage – Design of SVC voltage regulator –Modelling of SVC for power flow and fast transient stability – Applications: Enhancement of transient stability – Steady state power transfer – Enhancement of power system damping.

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS 9

Operation of the TCSC – Different modes of operation – Modelling of TCSC – Variable reactance model – Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit – Enhancement of system damping.

UNIT IV VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS9

Static Synchronous Compensator (STATCOM) – Principle of operation – V-I Characteristics. Applications: Steady state power transfer-enhancement of transient stability - prevention of voltage instability. SSSC-operation of SSSC and the control of power flow–modelling of SSSC in load flow and transient stability studies.

UNIT V CO-ORDINATION OF FACTS CONTROLLERS 9

Controller interactions – SVC – SVC interaction – Co-ordination of multiple controllers using linear control techniques – Control coordination using genetic algorithms.

TEXT BOOKS

1. R.Mohan Mathur, Rajiv K.Varma, “Thyristor – Based Facts Controllers for Electrical Transmission Systems”, IEEE press and John Wiley & Sons, Inc, 2002.
2. Narain G. Hingorani, “Understanding FACTS -Concepts and Technology of Flexible ACTransmission Systems”, Standard Publishers Distributors, Delhi- 110 006, 2011.
3. K.R.Padiyar,” FACTS Controllers in Power Transmission and Distribution”, New Age International (P) Limited, Publishers, New Delhi, 2008.

REFERENCES

1. A.T.John, "Flexible A.C. Transmission Systems", Institution of Electrical and Electronic Engineers (IEEE), 1999.
2. V.K.Sood, HVDC and FACTS controllers – Applications of Static Converters in Power System, APRIL 2004 , Kluwer Academic Publishers, 2004.
3. Xiao – Ping Zang, Christian Rehtanz and Bikash Pal, "Flexible AC Transmission System:Modelling and Control" Springer, 2012.
4. http://nptel.ac.in/courses/108104052/26

BEE048	**RENEWABLE ENERGY SOURCES**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	3	0	0	3
	Prerequisite - Nil				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

To create awareness among the students about the different types of non-conventional energy resources and emphasize its importance

COURSE OUTCOMES (COs)

CO1	Able to gain a good knowledge of renewable energy sources.
CO2	Able to understand how renewable energy can be used to help reduce greenhouse gases.
CO3	To educate scientifically the new developments in non-conventional and renewable energy studies.
CO4	To emphasize the significance of Green Energy Technologies.
CO5	Able to understand various energy generation technologies.

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
2	CO1		H	M		M	M	H	H	M	H	H	M
	CO2		M	M		H	H	M	M			L	M
	CO3		H	H		H	H	H	H	M	M	H	M
	CO4		M	H		H	H	H	H		M	H	M
	CO5		M	M		L	M	M	M	M	L	L	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)
						X			
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I INTRODUCTION ABOUT ENERGY RESOURCES 9

General primary and commercial energy resources- study of availability-energy consumption pattern and growth rath in India- non –commercial energy sources –availability, economics and efficiency

UNIT II SOLAR ENERGY AND APPLICATIONS OF SOLAR ENERGY 9

Solar energy and application; solar radiation-principles of solar energy collections- types of collectors-characteristics and principles of different types of collectors- their efficiencies-solar energy applications water heaters, air heaters, solar cooking, solar drying and power generation-tower concept (solar plant)-solar pump

UNIT III WIND ENERGY 9

Wind energy: energy from wind-general theory of wind mills - types of wind mills-performance of wind machines-wind power - efficiency

UNIT IV TIDAL AND GEOTHERMAL ENERGY 9

Tidal Energy from tides and waves- working principles of tidal plants-tidal power generations – geothermal energy-principle of working of geothermal power plants

UNIT V BIOMASS ENERGY 9

Bio energy: energy from bio mass-biogas plants-various types-industrial wastes-municipal wastes-burning plants-energy from the agricultural wastes- applications

TEXT BOOKS:

1. Rai.G.D, “Non-conventional resources of energy”, Khanna publishers, Fourthedition, 2010.
2. Khan.B.H, “Non-Conventional Energy Resources”, The McGraw Hills, Second edition, 2009.

REFERENCE BOOKS :

1. S.P.Sukhatme,’ Solar Energy,(principles of thermal collection and storage), Tata McGraw-Hill Publishers, Fourth print-February 1989

2. Ronald Shaw, 'Wave Energy – (A Design Challenge)',Ellis Horwood Limited publishers, first edition- 1982
3. http://nptel.ac.in/courses/113104058/mme_pdf/Lecture1.pdf

BEE003	**ADVANCED CONTROL SYSTEM**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Control System				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

To provide knowledge on design in state variable form and in phase plane analysis.

COURSE OUTCOMES (COs)

CO1	To develop mathematical models and understand the mathematical relationships between the sensitivity functions and how they govern the fundamentals in control systems.
CO2	To understand the phase plane analysis.
CO3	To give basic knowledge in describing function analysis.
CO4	To study the design of optimal controller.
CO5	To design of optimal estimator including Kalman Filter

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
2	CO1	H	M	M	H	H		L		H	L	L	M
	CO2	H	M	M	H	H		L		H	L	L	M
	CO3	H	M		H	H		L		H	L	L	M
	CO4	H	M		H	H		L		H	L	L	M
	CO5	H	M	M	H	H		L		H	L	L	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 STATE VARIABLE DESIGN 9

Introduction to state Model- effect of state Feedback- Necessary and Sufficient Condition for Arbitrary Pole-placement- pole placement Design- design of state Observers- separation principle- servo design: -State Feedback with integral control.

UNIT II PHASE PLANE ANALYSIS 9

Features of linear and non-linear systems - Common physical non-linearities – Methods of linearization Concept of phase portraits – Singular points – Limit cycles – Construction of phase portraits – Phase plane analysis of linear and non-linear systems – Isocline method.

UNIT III DESCRIBING FUNCTION ANALYSIS 9

Basic concepts, derivation of describing functions for common non-linearities –Describing function analysis of non-linear systems – limit cycles – Stability of oscillations.

UNIT IV OPTIMAL CONTROL 9

Introduction - Time varying optimal control – LQR steady state optimal control – Solution of Ricatti's equation – Application examples.

UNIT V OPTIMAL ESTIMATION 9

Optimal estimation – Kalman Bucy Filter-Solution by duality principle-Discrete systems-Kalman Filter- Application examples..

TEXT BOOKS

1. K. P. Mohandas, "Modern Control Engineering", Sanguine Technical Publishers, 2006.
2. G. J. Thaler, " Automatic Control Systems", Jaico Publishing House, 1993.
3. M.Gopal, "Modern Control System Theory", New Age International Publishers, 2002.

REFERENCES

1. William S Levine, "Control System Fundamentals," The Control Handbook, CRC Press, Tayler and Francies Group, 2nd edition, 2011.
2. Ashish Tewari, 'Modern Control Design with Matlab and Simulink', John Wiley, New Delhi, 2002.
3. K. Ogata, 'Modern Control Engineering', 4th edition, PHI, New Delhi, 2002.
4. T. Glad and L. Ljung,"Control Theory –Multivariable and Non-Linear Methods", Taylor& Francis, 2002.
5. D.S.Naidu, "Optimal Control Systems" First Indian Reprint, CRC Press, 2009.
6. http://nptel.ac.in/courses/101108047/

BEE011	**HIGH VOLTAGE DC TRANSMISSION**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite-Transmission and Distribution, Power System Protection				
	Course designed by Dept. of Electrical & Electronics Engineering				

OBJECTIVES

To master the various fundamentals, converter design, protection schemes of HVDC transmission systems. This will help you to gain knowledge and to do research in the area of HVDC transmission systems.

COURSE OUTCOMES (COs)

CO1	To learn about the historical development and emergence of HVDC transmission.
CO2	To study about the various thyristor converters used in HVDC transmission.
CO3	To analyze various control methodologies and characteristics of converters.
CO4	To understand the principle of protection schemes used in HVDC transmission.
CO5	To learn the fundamentals of ground return, filters and harmonics.

Mapping of Course Outcomes (COs) 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
2	CO1	M	M	M	H	M	M	M	H		H	L	M
	CO2	H	M	M	H	H		M	H	H	H	L	M
	CO3	L	H		H	H	M	L	H	H	H	L	H
	CO4	L	H	M	H	H	M	L	M	H	L	H	H
	CO5	H	M	M	H	H		M			L	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 GENERAL ASPECTS 9

Historical development HVDC and HVDC link – Comparison of AC and DC Transmission – Application of DC Transmission – Types of DC link – Converter Station - HVDC projects in India and abroad – Advantages and disadvantages of HVDC transmission Principal application of dc transmission – Economical factor – Development of power devices for HVDC transmission – Thyristors - switching and steady state characteristics.

UNIT II INTRODUCTION TO CONVERTERS 9

Line Commutated Converter – Analysis of Graetz Bridge Neglecting Overlap – Choice of

Converter Configurations for any Pulse Number – Analysis of a 12 Pulse Converter – Voltage Source Converter – Basic Two level Converter (Graetz Bridge) – A Three Level Voltage Source Converter – Converter Using Pulse Width Modulation – capacitor Commutated Converter.

UNIT III CONTROL OF CONVERTERS 9

Principles of DC Link Control – Converter Control Characteristics – Firing Angle Control – Current and Extinction Angle Control – Starting and Stopping of DC Link - Power Control - Higher Level Controllers – SVC and STATCOM.

UNIT IV FAULTS AND PROTECTION 9

Converter Faults – commutation failure – Arc through – Misfire – Current extinction – Short Circuit in a Bridge – Protection against Over currents – Over voltages in a converter station – Disturbance on the DC side – Surge Arrestors – Protection Against Overvoltage – Protection against faults in a voltage Source Converter – DC Breakers.

UNIT V HARMONICS AND FILTERS 9

Generation of Harmonics - Characteristics and Non-Characteristic Harmonics - Troubles caused by harmonics – Means of Reducing Harmonics - .Design of AC Filters – Passive AC Filters – DC Filters – Active Filters – Carrier Frequency and RI Noise.

Total periods: 45

TEXT BOOKS

1. K.R. Padiyar ,"HVDC Power Transmission System Technology and System Interaction"- Willey Eastern Ltd. 1991.
2. E.W Kimbark, "DirectCurrent Transmission", Vol. Willey Inter Science. New York 1971.

REFERENCES

1. Colin Adamson and N.G. Hingorani. "High Voltage Direct Current Power Transmission", Garraway limited. England 1960.
2. B.J Kor(ed), "High Voltage Direct Current Converters and Systems", Macdonald and Co, London 1965.
3. B.M Wedy Bectric "Power Systems", John Wiley and Sons, London 1979.
4. Arrillaga, J., "High Voltage Direct Current Transmission", Peter Pregrinus, London, 1983.
5. Online courses on HVDC Transmission systems-http://nptel.ac.in/courses/108104013/

CORE ELECTIVES-III (CE-III)

BEE047	**POWER SYSTEM OPERATION AND CONTROL**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Optimization Techniques Advanced Power System Analysis				
	Course Designed by – Dept. of Electrical & Electronics Engineering				
OBJECTIVES					
To understand the economics of power system operation with thermal and hydro units, To realize the requirements and methods of real and reactive power control in power system and to be familiar with the power system security issues and contingency					

COURSE OUTCOMES (COs)	
CO1	An overview of power system operation and control.
CO2	Basics of speed governing mechanism, modelling and speed-load characteristics
CO3	Generation and absorption of reactive power.
CO4	Formulation of economic dispatch problem and incremental cost curve coordination equations without and with loss (No derivation of loss coefficients)
CO5	Know the concept of energy control centre

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

An overview of power system operation and control - system load variation - load characteristics load curves and load-duration curve - load factor - diversity factor - Importance of load forecasting and quadratic and exponential curve fitting techniques of forecasting – plant level and system level controls.

UNIT II REAL POWER - FREQUENCY CONTROL 9

Basics of speed governing mechanism and modelling - speed-load characteristics – load sharing between two synchronous machines in parallel - control area concept - LFC control of a singlearea system - static and dynamic analysis of uncontrolled and controlled cases - two-area system modelling - static analysis of uncontrolled case - tie line with frequency bias control - state variable model - integration of economic dispatch control with LFC.

UNIT III REACTIVE POWER–VOLTAGE CONTROL 9

Generation and absorption of reactive power - basics of reactive power control - excitation systems – modelling - static and dynamic analysis - stability compensation - methods of voltage control: tap changing transformer, SVC (TCR + TSC) and STATCOM – secondary voltage control.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH 9

Formulation of economic dispatch problem – I/O cost characterization – incremental cost curve – coordination equations without and with loss (No derivation of loss coefficients) - solution by direct method and λ-iteration method - statement of unit commitment problem – priority-list method – forward dynamic programming.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 9

Need for computer control of power systems - concept of energy control centre - functions – system monitoring - data acquisition and control - system hardware configuration – SCADA and EMS functions - network topology - state estimation – WLSE - Contingency Analysis - state transition diagram showing various state transitions and control strategies.

TEXT BOOKS

1. Olle.I.Elgerd, 'Electric Energy Systems theory - An introduction', Tata McGraw Hill Education Pvt.Ltd., New Delhi, 34th reprint, 2010.
2. Allen. J. Wood and Bruce F. Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003.
3. Abhijit Chakrabarti, SunitaHalder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

REFERENCES

1. Nagrath I.J. and Kothari D.P., 'Modern Power System Analysis', Tata McGraw-Hill, Fourth Edition,2011.
2. Kundur P., 'Power System Stability and Control, Tata McGraw Hill Education Pvt. Ltd., New Delhi,10th reprint, 2010.
3. HadiSaadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21streprint, 2010.
4. http://nptel.ac.in/courses/108104052/

BEE044	**POWER QUALITY MANAGEMENT**	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Power Systems, Signals and Systems.				
	Course Designed by – Dept. of Electrical & Electronics Engineering				
OBJECTIVES					
To study the various issues affecting Power Quality, their production, monitoring and Suppression**.**					
COURSE OUTCOMES (COs)					

CO1	To study various methods of power quality monitoring.
CO2	To Study the production of voltages sags, interruptions and harmonics and methods of control.
CO3	Investigate different power quality phenomena causes and effects.
CO4	Understand different techniques for power quality problems mitigation.
CO5	Understand power quality monitoring and classification 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	l
2	CO1	M	H	M	H	M	L	M	L	M	M	L	M
	CO2	M	H	H	H	H	H	M	L	M	M	L	M
	CO3	M	H	H	H	H	H	M	L	M	M	L	M
	CO4	M	H	H	H	H	H	M	L	M	M	L	M
	CO5	M	H	M	M	H	M	M	L	M	M	L	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 POWER QUALITY 9

Power Quality phenomenon-Terms and definitions-Various Power events in power quality - causes for reduction in power quality

UNIT II VOLTAGE SAGS 9

Sources of sags – Magnitude & duration of sag-effect of sag on computer and consumer Electronics- Monitoring and mitigation of voltage sag.

UNIT III INTERRUPTIONS 9

Origin of Long & Short interruption –influence on various equipments-Basic reliability indices - monitoring and mitigation of interruption

UNIT IV HARMONICS 9

Harmonic distortion: Voltage and current distortion- harmonic indices- harmonic sources from commercial and industrial loads- Effects of harmonics on various equipments- harmonic distortion evaluation- Devices for controlling harmonic distortion

UNIT V POWER QUALITY MONITORING 9

Monitoring considerations: Power line disturbance analyzer, power quality measurement equipment, harmonic spectrum analyzer, flicker meters, disturbance analyzer.

TEXT BOOKS

1. Arindam Ghosh, "Power Quality Enhancement Using Custom Power Devices Power Quality Enhancement Using Custom Power Devices", Springer, 2002.
2. Roger.C. Dugan, Mark .F. McGranagham, Surya Santoso, H.Wayne Beaty, "Electrical Power Systems Quality" McGraw Hill, 2003.

REFERENCES

1. Math H.J.Bollen, "Understanding Power Quality Problems-Voltage sag &Interruptions", IEEE Press, 2000.
2. http://nptel.ac.in/courses/108106025/

BEE019	**SMART GRID**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite-HVDC, Power Quality, Power Systems, Computer Knowledge.				
	Course Designed by – Dept of Electrical & Electronics Engineering				

OBJECTIVES

To enable the students acquire knowledge on smart grid, different options of architectural design and communication technology for various aspects of smart grid , System analysis and stability analysis in smart grid, renewable energy sources and storage integration with smart grid.

COURSE OUTCOMES (COs)

CO1	To understand the concepts and design of Smart grid
CO2	To understand the various communication and measurement technologies in smart grid.
CO3	To understand the analysis and stability of smart grid.
CO4	To learn the renewable energy resources and storages integrated with smart grid
CO5	To familiarize the high performance computing for Smart Grid applications

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

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

3	Category	es & Social Studies	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Major Elective	Open Elective (OE)	Term Paper Seminar/ Internshi
		-	-	-	-	X	-	-	-
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I INTRODUCTION TO SMART GRID 9

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, Concept of Resilient &Self Healing Grid, Present development & International policies in Smart Grid, Diverse perspectives from experts and global Smart Grid initiatives.

UNIT II SMART GRID TECHNOLOGIES 9

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation ,Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/VAr control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).

UNIT III SMART METERS 9

Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit(PMU), Intelligent Electronic Devices(IED) & their application for monitoring & protection.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID 9

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

UNIT V HIGH PERFORMANCE COMPUTING 9

Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN),Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

TEXT BOOK:

1. Vehbi C. Güngör, Dilan Sahin, Taskin Kocak, Salih Ergüt, Concettina Buccella, Carlo Cecati, and Gerhard P. Hancke, Smart Grid Technologies: Communication Technologies and

Standards IEEE Transactions On Industrial Informatics, Vol. 7, No. 4, November 2011.

REFERENCES:

1. Xi Fang, Satyajayant Misra, Guoliang Xue, and Dejun Yang "Smart Grid – The New and Improved Power Grid: A Survey" , IEEE Transaction on Smart Grids, 2011.
2. Stuart Borlase "Smart Grid :Infrastructure, Technology and Solutions", CRC Press 2012.
3. https://www.youtube.com/watch?v=JwRTpWZReJk&list=PLzcxA4YJjE1s6NOlhCA34vrsFCeokjs9_
4. https://iit.edu/news/iittoday/?tag=smart-grid

BEE043	**SOLAR ENERGY UTILIZATION**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Renewable Energy Sources				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

To enable the students to acquire knowledge of solar energy fundamentals and various applications.

COURSE OUTCOMES (COs)

CO1	Analyze Solar radiation data and its measurement
CO2	Understand Operation of solar thermal energy systems
CO3	Understand the working of solar concentrators and their applications to produce energy
CO4	Understand the photovoltaic theory and implementation process.
CO5	Understand the design of Solar conscious buildings

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

UNIT I SOLAR RADIATION 9

Sun and earth geometry, solar radiation-beam and diffuse radiations, measurement of solar radiation – pyranometer, pyrheliometer, sunshine recorder. Solar collectors and applications.

UNIT II SOLAR THERMAL SYSTEMS 9

Flat plate and evacuated tube collectors, domestic hot water and process heat systems, solar cooker, solar dryer, solar desalination and solar pond.

UNIT III SOLAR POWER PLANT 9

Principles of solar parabolic concentrators-trough and dish types, compound parabolic concentrators, Fresnel lens collectors, central receiver plant, direct steam generation systems, solar furnaces.

UNIT IV SOLAR PHOTOVOLTAICS 9

Solar photo voltaic theory, mono and polycrystalline silicon technologies, PV modules and integrated systems, implementation and maintenance.

UNIT V SOLAR-CONSCIOUS BUILDINGS 9

Orientation and design of buildings, passive solar heat- thermal capacity, insulation, solar cooling-refrigeration and air-conditioning, space heating, sensible and latent heat energy storages in buildings.

TEXT BOOKS:

1. Sukhatme.K, Suhas P. Sukhatme, "Solar energy: Principles of thermal collection and storage", Tata McGraw Hill publishing Co. Ltd, 8th edition,2008.
2. Soteris A. Kalogiru, "Solar Energy Engineering: Processes and systems", 1st edition, Academic press, 2009.

REFERENCES:

1. Duffie.J.A, & Beckman.W.A, *"Solar Engineering of Thermal Processes"*, 3rd edition, John Wiley & Sons, Inc., 2006.
2. Martin A. Green, *"Third generation Photovoltaics: Advanced energy conversion"*, 1st edition, 2005.
3. Garg.H.P, Prakash.J, *"Solar energy fundamentals and applications"*, Tata McGraw Hill publishing Co. Ltd, 2006.
4. http://nptel.ac.in/courses/112105051/22

BEE033	ELECTRIC AND HYBRID VEHICLES	L	T	P	C
	Total Contact Hours - 45	3	0	0	3

	Prerequisite – Power Systems, Signals and Systems.
	Course Designed by – Dept of Electrical & Electronics Engineering

OBJECTIVES

This course introduces the fundamental concepts, principles, analysis and design of hybrid, electric and fuel cell vehicles.

COURSE OUTCOMES (COs)

CO1	Understand working of different configurations of electric vehicles,
CO2	Understand hybrid vehicle configurationand its components, performance analysis.
CO3	Understand the properties of batteries and its types
CO4	Understand of electric vehicle drive systems.
CO5	Understand of hybrid electric vehicles.

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
2	CO1	M	M	M	H	M	L	M	L	H	M	L	M
	CO2	H	H	H	H	H	L	M	L	H	M	L	M
	CO3	H	H	H	H	H	L	M	M	H	M	L	M
	CO4	M	M	H	H	H	L	M	M	H	M	L	M
	CO5	H	H	H	H	H	L	M	M	H	M	L	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 ELECTRIC VEHICLES 9

Introduction, Components, vehicle mechanics – Roadway fundamentals, vehicle kinetics, Dynamics of vehicle motion - Propulsion System Design.

UNIT II BATTERY 9

Basics – Types, Parameters – Capacity, Discharge rate, State of charge, state of Discharge, Depth of Discharge, Technical characteristics, Battery pack Design, Properties of Batteries.

UNIT III DC & AC ELECTRICAL MACHINES 9

Motor and Engine rating, Requirements, DC machines, Three phase A/c machines, Induction machines, permanent magnet machines, switched reluctance machines.

UNIT IV ELECTRIC VEHICLE DRIVE TRAIN 9

Transmission configuration, Components – gears, differential, clutch, brakes regenerative braking, motor sizing.

UNIT V HYBRID ELECTRIC VEHICLES 9

Types – series, parallel and series, parallel configuration – Design – Drive train, sizing of components.

TEXT BOOK:

1. Iqbal Hussain, "Electric & Hybrid Vehicles – Design Fundamentals", Second Edition, CRC Press, 2011.
2. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003.

REFERENCES

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
2. Sandeep Dhameja, "Electric Vehicle Battery Systems", Newnes, 2000
3. http://nptel.ac.in/courses/108103009/

NON MAJOR ELECTIVES-I (NE-I)

BEE045	**INSTRUMENTATION AND CONTROL IN POWER PLANT INDUSTRIES**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite-Measurement, Control System				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

We can know about the various methods of power generation and its control methods.

COURSE OUTCOMES (COs)

CO1	Familiarize about different power generation process
CO2	To be familiar about the important parameters that has to be monitored and controlled
CO3	To be familiar about the various parameters that has to be analyzed and measured analytically.
CO4	To understand about the boilers.
CO5	To get an detailed knowledge about Nuclear Power Plant 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	l
2	CO1	H	H	H	H	H		H	H	H	H	M	M
	CO2	M			M	M	M	L	L				H
	CO3	L	L	H									H
	CO4		H	H	H								H
	CO5	H	M	H					H		H		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 OVERVIEW OF POWER GENERATION 9

Brief survey of methods of power generation-Wind, Solar, Tidal, Geothermal, MHD, Fuel cells, Biomass-Conventional energy resources-Hydro, Nuclear, Gas, Thermal-Comparison of various conventional power plants-Importance of Instrumentation and control in power generation-P&I diagrams-P&I diagram of boiler-co-generation

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UNIT II TURBINE MONITORING AND CONTROL 9

Electrical parameters-Current, Voltage, Power, Energy, Frequency, Power factor etc-Non-electrical parameters-Flow of feed water, fuel, air and steam with correction factor for temperature and pressure-Speed, vibration, shell temperature monitoring and control-Steam pressure control-Lubricant oil temperature control- cooling system.

UNIT III ANALYTICAL MEASUREMENT 9

Oxygen measurement in flue gas-CO2 in flue gas-Combustibles analyzers-Infrared flue gas analyzers-Smoke detector-Dust monitor-Closed Circuit Television-Fuel analyzers-Pollution monitoring instruments

UNIT IV CONTROL LOOPS IN BOILERS 9

Combustion control-air-fuel ratio control-furnace draft control-drum level control- main steam and reheat steam temperature control-super heater control- attemperator- deaerator control-Distributed Control System in power plant interlocks in boiler operation. 188 IC-2013 SRM(E&T)

UNIT V NUCLEAR POWER PLANT INSTRUMENTATION 9

Introduction-Nuclear physics-Classification of nuclear reactors-Basic reactor systems-P&I diagram of Nuclear power plant-Radiation detection instruments- nuclear reactor control systems

and allied instrumentation

TEXT BOOKS

1. P. K. Nag, "Power Plant Engineering" 2nd Edition, Tata McGraw-Hill Education, 2002
2. Sam G. Dukelow, "The control of boilers" 2nd Edition, Research Triangle Park, 1991.

REFERENCES

1. R.K.Jain, "Mechanical and Industrial Measurements", 10th Edition, Khanna Publishers, New Delhi,1995.
2. Bela G Liptak, "Instrumentation in the processing industries"1st edition, Chilton Book Co, Chilton Book Co; 1973.
3. https://app.knovel.com/web/toc.v/cid:kpPCITCBH4

BEE049	**DESIGN OF EMBEDDED SYSTEMS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite-NIL				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

To introduce students to the design issues of embedded systems.

COURSE OUTCOMES (COs)

CO1	Design simple embedded systems.
CO2	Choose effective communication Protocols for embedded systems.
CO3	Analyze real-time scheduling algorithms.
CO4	Analyzing different case studies of PIC microcontroller.
CO5	To be familiar about different operating system concepts.

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
2	CO1	L	L	H	H	H	L	L	L	H	H	M	H
	CO2	L	H	M	H	H	H	H	H	L	M	H	M
	CO3	H	H	M	H	M	H	M	M	H	H	H	H
	CO4	H	M				H						
	CO5	L	L	H	H	H	H	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 OVERVIEW OF EMBEDDED SYSTEMS 9

Basics of Developing for Embedded Systems – Embedded System Initialization- I/O Devices – Types and Examples – Synchronous, Iso-synchronous and Asynchronous Communication – Serial Communication Devices – Parallel Device Ports- Reset Circuitry – Serial Communication Protocols : I2C, CAN,USB – Parallel Bus device Protocols: ISA, PCI, ARM bus

UNIT II CPU ARCHITECTURE OF PIC MICROCONTROLLER 9

PIC Microcontroller – Architecture of PIC 16F8xx – FSR – Reset action – Oscillatory Circuit – Program Memory Consideration- Register File Structure and Addressing Modes – Instruction Set- Simple Assembly Language Programming

UNIT III PIC PROGRAMMING 9

Interrupts – Constraints – Interrupt Servicing – Interrupt Programming – External Interrupts – Timers – Programming - I/O ports – LCD Interfacing– ADC – MPLAB IDE – Hex file format – Programming Tools

UNIT IV CASE STUDIES OF PIC MICROCONTROLLER 9

Driving a Multiplexed LED and LCD Display –Washing Machine control: actuators and sensor interfacing-Closed loop control of servo motor .

UNIT V REAL-TIME OPERATING SYSTEM CONCEPTS 9

Architecture of the Kernel – Task and Task Scheduler – Interrupt Service Routines – Semaphore – Mutex – Mailbox – Message Queue – Other Kernel Objects – Memory Management – Priority Inversion Problem

TEXT BOOKS:

1. Raj Kamal, “Embedded Systems Architecture Programming and Design”, 2 nd Edition, Tata McGraw Hill, 2008, New Delhi.
2. Dr. K.V.K Prasad, “Embedded /Real-Time Systems: Concepts, Design and Programming”, 1st Edition, Dream tech Press, 2009.

REFERENCES:

1. Ajay V Deshmukh, “Microcontroller Theory and Applications”, 1st Edition, Tata McGraw Hill, 2007, New Delhi.
2. Daniel .W Lewis, “Fundamentals of Embedded Software”, 1st Ed., Pearson Education, 2005.
4. John B Peatman, “Designing with PIC Micro Controller”, 1st Ed., Pearson,1998.
5. C. M. Krishna, Kang. G. Shin, “Real-time systems”, 1st Ed., Tata McGraw Hill, 2009.
6. Steve yeath, “Embedded system design”, 2 nd Edition, Elsevier, 2008.
7. http://hdl.handle.net/123456789/520

BEE009	**ROBOTICS AND AUTOMATION**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite-Basic Electronics, Control Systems				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES

To provide comprehensive knowledge of robotics in the design, analysis and control point of view.

COURSE OUTCOMES (COs)

CO1	To study the various parts of robots and fields of robotics.
CO2	To study the various kinematics and inverse kinematics of robots.
CO3	To study the Euler, Lagrangian formulation of Robot dynamics
CO4	To study the trajectory planning for robot.
CO5	To study the control of robots for some specific applications

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
2	CO1	M	H	H		H	M	H	M	H	M	H	H
	CO2	M	M	M									H
	CO3	M	H	M		M	M	H	M		M		H
	CO4	M	H	M						H		H	H
	CO5	M	H	M			M	H	M		H		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)
		-	-	-	-	-	X	-	-

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I BASIC CONCEPTS 9

Robotics – basic components – classification - performance characteristics- drives and control systems – electric , hydraulic and pneumatic actuators – control loops using current amplifiers and voltage amplifiers**.**

UNIT II SENSORS AND TRANSDUCERS 9

Sensors and vision systems; Transducers and sensors – tactile sensors –Proximity and range sensors –Acoustics sensors- visition systems – image Processing and analysis – image data reduction – segmentation feature

UNIT III ROBOTIC PROGRAMMING AND GRIPPER 9

End effectors –type –mechanical gripper –vacuum cup- magnetic grippers – robot to end effectors interface –software for industrial robots – positive stop program-Point to point program and continuous path program.

UNIT IV KINEMATICS AND PATH PLANNING 9

Robot motion analysis and control manipulation kinematics – homogeneous Transformation and robot dynamics configuration of a robot controller

UNIT V INDUSTRIALROBOT 9

Industrial robots –Robots for welding ,painting and assembling –remote Controlled robots for nuclear ,thermal and chemical plants –industrial Automation – typical examples of automated industries .

TEXT BOOKS

1. Mikell P Groover, ”Industrial robotics : technology, programming, and applications” McGraw Hill New Delhi, 1996.
2. Ghosh, ”Control in Robotics and Automation: Sensor Based Integration”, Allied Publishers, Chennai, 1998.

REFERENCES

1. Deb.S.R, ”Robotics technology and flexible Automation”, John Wiley1992.
2. Asfahl. C.R, “Robots and manufacturing Automation”, John Wiley, USA ,1992.
3. https://www.youtube.com/watch?v=DaWMvEY3Qgc&list=PLED9EB384E656C007
4. http://www.nptel.ac.in/downloads/112101098/

BEC612	**PRINCIPLE OF COMMUNICATION ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	3	0	0	3
	Prerequisite - Nil				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

OBJECTIVES													
To create awareness among the students about the different types of non-conventional energy resources and emphasize its importance													
COURSE OUTCOMES (COs)													
CO1	To introduce different methods of analog communication and their significance												
CO2	To introduce the concepts of source and line coding techniques for enhancing rating of transmission of minimizing the errors in transmission.												
CO3	To introduce MAC used in communication systems for enhancing the number of users.												
CO4	Ability to understand and analyze analog and digital communication												
CO5	To introduce various media for digital communication.												
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
2	CO1		M	M		M		M			M		M
	CO2			L		H	M				L	L	
	CO3		M			H		M				L	
	CO4		M			M	M	M			M	L	M
	CO5			M		H					L		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)				
							X						
4	Approval	37th Meeting of Academic Council, May 2015											

UNIT 1 RADIO COMMUNICATION SYSTEM 9

Frequency spectrum-Principle of AM and FM-AM and transmitters and receivers-Introduction to microwave communication systems-Principle Of satellite communication.

UNIT II PULSE COMMUNICATION SYSTEM 9

PAM, PPM, PDM, PCM-Delta Modulation-Differential PCM-Merit and demerits-Comparison Of pulse modulation schemes.

UNIT III DATA TRANSMISSION 9

Base band signal receiver-Error probability-Optimum and matched filter techniques coherent reception-Digital modulation system, FS, PSK-Comparison Of data transmission systems.

UNIT IV TRANSMISSION MEDIUM 9

Characteristics Of cables-Optical fibers-Effects Of EM radiation – Bandwidth and noise restrictions-Statistical and measurement of random noise-Concept of multiplexing-FDM and TDM.

UNIT V TELEVISION 9

Scanning methods-B/W and Color Systems-Camera and picture tubes-Synchronization-Transmitters and receivers.

TEXT BOOKS:

1. 'Kennedy, G , 'Electronic Communication Systems', McGraw Hill, 4th Edition, 1987
2. Simon Haykins, 'Communication systems', 3rd Edition, John Wiley, Inc., 1995.

REFERENCES:

1. Taub and Schilling, 'Principle of Communication system', 2nd Edition, McGraw Hill, 1987.
2. Bruce Carlson, A., 'Communication Systems', 3rd Edition, Tata McGraw Hill, 1986.
3. Roddy and Coolen ,'Electronic communication', 4th Edition Prentice Hall of India.1999.
4. http://www.mathworks.com/access/helpdesk/help/toolbox/signal & systems/

BEE042	**ELECTRONIC INTEGRATED CIRCUITS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite- Circuit theory, Electron Devices				
	Course designed by Dept of Electrical & Electronics Engineering				

OBJECTIVES

To master the various biasing techniques, small and large signal analysis and design, wave shaping, regulating and rectification using electronics devices. This will help you to gain knowledge in the electronic integrated circuits

COURSE OUTCOMES (COs)

CO1	To understand the biasing techniques of various electronics devices.
CO2	To learn the small signal low frequency analysis and design of various electronic devices.
CO3	To analyze various large signal amplifier and to study their design.
CO4	To understand the principle of various wave shaping, triggering and oscillating circuits
CO5	To learn the fundamentals of rectification, filter design and regulating power supplies

Mapping of Course Outcomes (COs) 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

2	CO1	M	M	M	H	M	M	M	H		H	L	M
	CO2	H	M	M	H	H		M	H	H	H	L	M
	CO3	L	H		H	H	M	L	H	H	H	L	H
	CO4	L	H	M	H	H	M	L	M	H	L	H	H
	CO5	H	M	M	H	H		M			L	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 BASIC STABILITY AND DEVICES STABILIZATION 9

Biasing Circuits for BJT, DC and AC load lines-Stability factor analysis-Temperature compensation methods-Biasing circuits for FET's and MOSFETs

UNIT II SMALL SIGNAL LOW FREQUENCY ANALYSIS AND DESIGN 9

Transistor, FET and MOSFET Amplifier, Equivalent circuit, input and output characteristics, calculation of Mid band gain input and output impedance of various amplifier, cascade amplifier, Darlington bootstrapping, differential amplifier, CMRR measurement, use of current source in emitter.

UNIT III LARGE SIGNAL AMPLIFIER 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 amplifier, Complementary symmetry amplifiers, MOSFET power amplifier, Thermal stability of power amplifiers heat sink design.

UNIT IV PULSE CIRCUITS 9

RC wave shaping circuits – Diode clampers and clippers – multi vibrators – Schmitt trigger – UJT triggering circuits – Saw tooth oscillators.

UNIT V RECTIFIERS AND POWER SUPPLIES 9

Half and full wave rectifiers ripples factor calculation for C, L, L-C and "Pi" symbol filters-Switch mode power supplies- Linear electronic voltage regulators - Power control using SCR.

TEXT BOOKS:

1. Albert Paul Malvino, "Electronic Principles", Sixth Edition, Tata McGraw Hill Edition, 1998
2. R.S Sedha, "Applied Electronics", Third edition, S Chand Publishing, 2008

REFERENCE BOOKS:

1. David A. Bell, “Electronic Devices and Circuits”, Prentice Hall of India, 1998
2. Donald L. Schilling Chartes Beloue, “Electronic Circuits”, Third Edition, 1989
3. Online courses on electronic circuits-http://electronicsforu.com/newelectronics/default.asp

NON MAJOR ELECTIVES-II(NE-II)

BEE007	**BIO-MEDICAL INSTRUMENTATION**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite -NIL				
	Course Designed by – Dept of Electrical & Electronics Engineering				

OBJECTIVES

Discuss the internal circuitry of medical instruments and its maintenance.

COURSE OUTCOMES (COs)

CO1	Describe the physiology and anatomy of human system.
CO2	Recognize the technical concepts and operation of medical instrumentation.
CO3	With widespread use and requirements of medical instruments, this course gives knowledge of the principle of operation and design of biomedical instruments.
CO4	It attempts to render a broad and modern account of biomedical instruments.
CO5	It gives the introductory idea about human physiology system which is very important with respect to design consideration

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

UNIT I PHYSIOLOGY AND TRANSDUCERS 9

Electrophysiology: cell and its functions- Neuron-Axon-Synapse-Action Potential -Propagation of electrical impulses along the axon-Sodium sump-Salutatory condition- Electrophysiology and Cardiopulmonary systems- Respiration and nervous system and peripheral nervous system

UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENTS 9

Sensors and recorders: psychological transducer-general consideration for electronic recording systems- basic recording systems-pre amplifiers-direct writing recorders- UV recorders-electrostatic recorders-instrumentation tape recorders

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENTS 9

Modem imaging systems: X- ray machines and computed Tomography-magnetic resonance imaging systems--ultrasonic imaging systems-medical thermography-electron microscope

UNIT IV MEDICAL IMAGING AND PMS 9

Diagnostic equipments: electrocardiograph-electroencephalograph-electromyograph-blood flow meters-blood gas analyzers-computer applications in medical field- ultrasonic equipments-bio telemetry-transmission of physiological data

UNIT V ASSISTING AND THERAPEUTIC EQUIPMENTS 9

Therapeutic equipments: pace makers- defibrillators-dialysers-surgical diathermy machines-later applications-physiotherapy and electrotherapy equipments

TEXT BOOKS

1. Arumugam M. 'BioMedical Instrumentation ', Anumdhaa Agencies ,1992
2. Gedders L.A. and Baker L.E. ' principles of Applied Bio- Medical instrumentation', john Wiley, 1989.

REFERENCES

1. Bertill Jacobson and john G. Webster 'Medical and clinical Engineering' Prentice Hall India , 1977

2. Gedders L.A and Baker L.E 'principles of applied Bio- medical instrumentation', John Wiley-Interscience, 3rd Edition, 1989.

BEE014	**FUZZY LOGIC AND NEURAL NETWORK**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite- Engineering Mathematics, Fundamentals of Computing and Programming				
	Course designed by -Dept of Electrical & Electronics Engineering				

OBJECTIVES

To master the various fundamental concepts of fuzzy logic and artificial neural networks. This will help you to get sufficient knowledge to analyze and design the various intelligent control systems

COURSE OUTCOMES (COs)

CO1	To understand the basic concepts of fuzzy sets, fuzzy logic and defuzzification
CO2	To learn the basics of Artificial Neural Networks and its algorithms
CO3	To analyze various techniques in feedback and feed forward neural networks.
CO4	To understand the principle of competitive neural networks and adaptive resonance theory
CO5	To learn the architecture and algorithm of Cognitron, Neo cognitron and the concepts of fuzzy associative memory and fuzzy systems.

Mapping of Course Outcomes (COs) 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
2	CO1	M	M	M	H	M	M	M	H		H	L	M
	CO2		M	M	H	H		M	H	H	H	L	M
	CO3		H			H	M	L	H	H		L	H
	CO4		H	M		H	M	L	M	H	L	H	H
	CO5	H	M	M	H	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 FUNDAMENTALS OF FUZZY LOGIC 9

Basic concepts: fuzzy set theory- basic concept of crisp sets and fuzzy sets- complements- union-intersection- combination of operation- general aggregation operations- fuzzy relations-compatibility relations-orderings- morphisms- fuzzy relational equations-fuzzy set and systems

UNIT II ARCHITECTURE OF NEURAL NETWORKS 9

Architectures: motivation for the development of natural networks-artificial neural networks-biological neural networks-area of applications-typical Architecture-setting weights-common activations functions- Basic learning rules- McGulloch-Pitts neuron- Architecture, algorithm, applications-single layer net for pattern classification- Biases and thresholds, linear separability - Hebb'srule- algorithm -perceptron - Convergence theorem-Delta rule

UNIT III BASIC NEURAL NETWORK TECHNIQUES 9

Back propagation neural net:standard back propagation-architecture algorithm- derivation of learning rules-number of hidden layers--associative and other neural networks- hetro associative memory neural net, auto associative net- Bidirectional associative memory-applications-Hopfield nets-Boltzman machine

UNIT IV COMPETITIVE NEURAL NETWORKS 9

Neural network based on competition: fixed weight competitive nets- Kohonen self organizing maps and applications-learning vector quantization-counter propagation nets and applications adaptive resonance theory: basic architecture and operation-architecture, algorithm, application and analysis of ART1 & ART2

UNIT V SPECIAL NEURAL NETWORKS 9

Cognitron and Neocognitron- Architecture, training algorithm and application-fuzzy associate memories, fuzzy system architecture- comparison of fuzzy and neural systems

TEXT BOOKS

1. Kliryvan- Fuzzy System & Fuzzy logic Prentice Hall of India, First Edition.
2. Lawrence Fussett- fundamental of Neural network Prentice Hall , First Edition.

REFERENCES

1. Bart Kosko, "Neural network and Fuzzy System" - Prentice Hall-1994
2. J.Klin and T.A.Folger, "Fuzzy sets" University and information- Prentice Hall -1996
3. J.M.Zurada, "Introduction to artificial neural systems"-Jaico Publication house,Delhi 1994
4. Vallusu Rao and Hayagvna Rao , "C++ Neural network and fuzzy logic"-BPB and Publication, New Delhi,1996
5. Intelligent Systems and Control-http://nptel.ac.in/courses/108104049/16

	MICROCONTROLLER BASED SYSTEM DESIGN	L	T	P	C
BEE027	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Microprocessor and Microcontroller, Digital electronics				

	Course Designed by – Dept. of Electronics & communication Engineering

OBJECTIVES

To expose the students to the fundamentals of microcontroller based system design

COURSE OUTCOMES (COs)

CO1	Understand the basics of embedded system
CO2	Understand about Hardware/software co-design aspects and analyse the requirements for interfacing
CO3	Understand concepts of ARM Processor and programming them.
CO4	Understand concepts of PIC controller and programming them.
CO5	Analyse and implement various interfacing circuits necessary for various applications

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
2	CO1	M		M	M	M	M			M		M	M
	CO2	M		M	M	M	M			M		M	H
	CO3	M		M		M	H			M		M	M
	CO4	M		M		M	M			H		M	M
	CO5	M		H	M	H	M			H		H	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 EMBEDDED SYSTEMS 9

Introduction to embedded systems – hardware and software components –types- examples-characteristics –system on chip-challenges in embedded computing system design – embedded system design process.

UNIT II EMBEDDED SYSTEM INTERFACING 9

Serial and parallel communication devices-wireless devices – timer & counting devices-Watch dog timer – Serial communication using I2C- CAN USB buses –Parallel Communication using ISA- PCI- PCI/X buses-wireless and mobile system protocol.

UNIT III ARM PROCESSOR-7 9

MSP430 architecture-addressing modes-constant generator and emulsion instructions-instruction set, functions- interrupts low power modes.

UNIT IV PIC CONTROLLER 9

PIC microcontrollers: History and features –Architecture – memory organization – addressing modes – instruction set – PIC progrmming –I/O port, Data Conversion, RAM & ROM Allocation.

UNITV INTERFACING – CASE STUDY 9

Interfacing PIC to LCD – Keyboard– parallel and serial ADC, DAC– Stepper motor interfacing.

TEXT BOOKS:

1. Sriram. V.Iyer & Pankaj Gupta, "Embedded real time systems Programming", Tata McGraw- Hill, 2007.
2. Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey ' PIC Microcontroller and Embedded Systems using Assembly and C for PIC18', Pearson Education 2008 .
3. John Iovine, 'PIC Microcontroller Project Book ', McGraw Hill 2000

REFERENCES:

1. Rajkamal, "Embedded system-Architecture, Programming and Design", 2nd edition Tata McGraw-Hill, 2003.
2. John H. Davies, "MSP430 Microcontroller Basics", Newnes publishers, First edition, 2008.
3. Rafiquzzaman**.M,** "Microcontroller Theory and Applications with the PIC18F", Wiley 2011.
4. http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/microcontrollers/micro/ui/Course_home1_1.htm

BBM405	**BIO SENSORS AND TRANSDUCERS**	**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	l
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 & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Term Paper Seminar/ Internship (H)
							√		
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 sinsoidal 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
2. Renganathan S, Transducer Engineering, Allied Publishers, Chennai,2000.
3.https://www1.ethz.ch/lbb/Education/Biosensors/Lecture_1_overview.pdf

BEC013	**AUTOMOTIVE ELECTRONICS**									**L**	**T**	**P**	**C**
	Total Contact Hours - 45									3	0	0	3
	Prerequisite – basic Electrical & Electronics Engg												
	Course Designed by – Dept. of Electronics & Communication Engineering												
OBJECTIVES													
• To facilitate the acquisition of the foundation skills in the process, tools and techniques in the Integrated Product Development area of the Engineering Services industry. • To provide the requisite understanding towards application of academic topics from engineering disciplines into real world engineering projects.													
COURSE OUTCOMES (COs)													
CO1	Analyze various global trends and decide on the scope of a new product												
CO2	Outline the product development methodologies and management.												
CO3	Develop product management plan for a new product based on the type of the new product and development methodology.												
CO4	Summarize requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification.												
CO5	Conceptualize new product integrating the hardware, software, controls, electronics and mechanical systems.												
CO6	Understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and 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	l
2	CO1	H					M				M		
	CO2	M	L	H					L				
	CO3	M			M					H			H
	CO4	L				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 AUTOMOBILEELECTRICALSANDELECTRONICS 8

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

UNIT II INTRODUCTIONTOEMBEDDEDSYSTEMS 8

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

UNIT III OPERATINGSYSTEMINEMBEDDEDENVIRONMENT 7

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

UNIT III INTEGRATEDDEVELOPMENTENVIRONMENT 8

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

UNIT IV EMBEDDEDSYSTEMINAUTOMOTIVEAPPLICATIONS 10

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

UNIT V EMBEDDEDSYSTEMCOMMUNICATIONPROTOCOLS 4

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

KWP2000-Details of CAN

REFERENCES:

1. R.K. Jurgen,"Automotive electronics handbook,McGrawHillInc, New Delhi,Second Edition,1999.
2. Paul Pop, Petru Eles, Zebo Peng, "Analysis and Synthesis of Distributed Real-Time Embedded Systems",Springer-Verlag US,2004.
3. B.KantaRao, "Embedded Systems", PHILearning Pvt.Ltd, 2nd Edition, 2011

NON MAJOR ELECTIVES-III(NE-III)

BEI704	**VIRTUAL INSTRUMENTATION**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite –. This includes interfacing a computer or microcontroller, such as the Arduino microcontroller, to various instruments for data acquisition and instrument control.				
	Course Designed by – Dept. of Electronics & Instrumentation Engineering				

OBJECTIVES

- To know about virtual versus traditional instruments, programming techniques
- To know about A/D and D/A converter and data acquisition.
- To know about PC buses, Instrumentation buses and network protocols.
- To design using VI software of controllers
- To know about PC operating system and instrumentation.

COURSE OUTCOMES (COs)

CO1	Define virtual instrumentation concepts.
CO2	Describe acquisition methodologies.
CO3	Compare traditional and virtual instrumentation.
CO4	Discuss operating systems required for virtual instrumentation.
CO5	Illustrate implementation methods for instrumentation.
CO6	Familiarize the basics and interfacing of VI

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
2	CO1	H				H	M				M		
	CO2	M	L	H				M	L				
	CO3	M			H					H			H

	CO4	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 INTRODUCTION 9

Virtual Instrumentation - Definition and Flexibility - Block diagram and Architecture for Virtual Instruments versus Traditional Instruments Instrumentation -VI Programming techniques - VI, sub VI, Loop and Charts, Arrays, Clusters and Graphs, Case and Sequence Structures, Formula nodes, String and File Input / Output

UNIT- II DATA ACQUISTITION IN VI 9

A/D and D/A converters, Plug-in Analog Input / Output cards – Digital Input and Output Cards, Organization of the DAQ VI system – Opto-isolation – Performing analog input and analog output – Scanning multiple analog channels – Issues involved in selection of Data acquisition cards – Data acquisition modules with serial communication – Design of digital voltmeter with transducer input –Timers and Counters.

UNIT –III COMMUNICATION NETWORKED MODULES 9

Introduction to PC Buses – Local busses:- ISA, PCI, RS232, RS422 and RS485 – Interface Buses:- USB, PCMCIA, VXI, SCXI and PXI –Instrumentation Buses :- Modbus and GPIB – Networked busses – ISO/OSI Reference model, Ethernet and TCP/ IP Protocols.

UNIT- IV REAL TIME CONTROL IN VI 9

Designs using VI Software - ON/OFF controller – Proportional controller – Modeling and basic control of level and reactor processes – Case studies on development of HMI, SCADA in VI

UNIT- V OPERATING SYSTEM AND HARDWARE OVERVIEW 9

PC architecture, current trends, operating system requirements, PC based instrumentation, analog and digital interfaces, PXI and SCXI main frame - modular instruments – Transducers – power, speed and timing considerations.

TEXT BOOKS:

1. LabVIEW Graphical Programming, Gary W. Johnson, Richard Jennings 3rd edition ,

McGraw-Hill Professional Publishing
2. Lisa K Wells, Lab view for Everyone‖, Prentice Hall of India.

REFERENCES:

1. Barry Paton, ―Sensor, transducers and Lab view‖, Prentice Hall of India 2000.
2. Buchanan, W. ―Computer buses‖, CRC Press 2000
3. https://www.ni.com/

BEE026	**MICRO ELECTRO MECHANICAL SYSTEMS**	**L**	**T**	**P**	**C**
	Total no of hours: 45	3	0	0	3
	Prerequisite-Study of electronic devices and circuits				
	Course Designed by – Dept. of Electrical & Electronics Engineering				

PURPOSE

The objective of this course is to present the state of the art in the areas of semiconductor device physics and materials technology to enable the Nano electronics.

COURSE OBJECTIVES

CO1.	To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
CO2.	To educate on the rudiments of Micro fabrication techniques
CO3.	To introduce various sensors and actuators
CO4.	To introduce different materials used for MEMS
CO5.	To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical 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	l
2	CO1	H	H	L	L	H	M	M	L	L	L	L	L
	CO2	H	H	L	L	M	M	M	L	L	L	L	L
	CO3	H	H	L	L	H	M	M	L	L	L	L	L
	CO4	H	H	L	L	H	M	M	L	L	L	L	L
	CO5	H	H	L	L	H	M	M	L	L	L	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

Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators – Introduction to Micro fabrication – Silicon based MEMS processes – New Materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis – Flexural beam bending- Torsional deflection.

UNIT II SENSORS AND ACTUATORS-I 9

Electrostatic sensors – Parallel plate capacitors – Applications – Interdigitated Finger capacitor – Comb drive devices – Micro Grippers – Micro Motors – Thermal Sensing and Actuation – Thermal expansion – Thermal couples – Thermal resistors – Thermal Bimorph – Applications – Magnetic Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators- Actuation using Shape Memory Alloys.

UNIT III SENSORS AND ACTUATORS-II 9

Piezo resistive sensors – Piezo resistive sensor materials – Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia , Acoustic, Tactile and Flow sensors.

UNIT IV MICRO MACHINING 9

Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching – Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies – Basic surface micro machining processes – Structural and Sacrificial Materials – Acceleration of sacrificial Etch – Striction and Antistriction methods – LIGA Process – Assembly of 3D MEMS – Foundry process.

UNIT V POLYMER AND OPTICAL MEMS 9

Polymers in MEMS– Polimide – SU-8 – Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon – Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS – Lenses and Mirrors – Actuators for Active Optical MEMS.

TEXT BOOKS:

1. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2012.
2. Stephen D Senturia, 'Microsystem Design', Springer Publication, 2000.
3. Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.

REFERENCES:

1. Nadim Maluf," An Introduction to Micro Electro Mechanical System Design", Artech House, 2000.
2. Mohamed Gad-el-Hak, editor, " The MEMS Handbook", CRC press Baco Raton, 2001.
3. Julian w. Gardner, Vijay K. Varadan, Osama O.Awadelkarim, Micro Sensors MEMS and Smart Devices, John Wiley & Son LTD, 2002.
4. James J.Allen, Micro Electro Mechanical System Design, CRC Press Publisher, 2005.
5. Thomas M.Adams and Richard A.Layton, "Introduction MEMS, Fabrication and Application," Springer, 2010.

BEE050	**PROCESS CONTROL ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Engg Mathematics-I, Control system, Measurement & Instrumentation.				
	Course Designed by – Dept. of Electronics & Instrumentation				

OBJECTIVES

To enable the students to learn the basic concepts of process control and to develop sufficient knowledge of the various control actions and design of controllers used to control any process.

COURSE OUTCOMES (COs)

CO1	Learn the basic control actions and. Compute the Mathematical Model for different process.
CO2	Analyse the characteristics of different types of Controllers and selection of controller.
CO3	Select ,design and tune a controller to suit a particular process
CO4	Identify the basic components of a final control element and distinguish the different Characteristics of control valve.
CO5	Understand and analyze the concept of multi loop control 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	l
2	CO1	H	H	L		L				H			M
	CO2	M	H	M		L				M			M
	CO3	M	H	H		M				H			M

	CO4	H	M	M		L				M			M
	CO5	M	M	L		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											

UNIT I MATHEMATICAL MODELLING OF PROCESS 9

Process control introduction – Need for process control –Hardware elements of a process control system – Need of Mathematical modelling –Mathematical model of level, pressure ,thermal processes and interacting and non-interacting systems– Servo and Regulator Operation – Batch & Continuous Process – Concept of self regulation– Dead time–Degrees of freedom – Linearization.

UNIT II VARIOUS CONTROLLERS AND ITS CHARACTERSTICS 9

Characteristics of ON- OFF, Single speed floating and PID controllers – Response of P,PI and PID controllers to various type of error signals – Analysis of Servo and Regulatory response of P and PI and PID controllers for first order and second order process – Reset Wind-up and prevention – Derivative and Proportional kick –Bumpless transfer – Selection of a controller for a particular process

UNIT III CONTROLLER DESIGN 9

Need for controller tuning –Evaluation criteria - Quarter Decay Ratio, IAE, ISE and ITAE– Optimum controller tuning using Evaluation criteria–Tuning of PID controllers using Process reaction curve method, Damped oscillation method and Z-N tuning method.

UNIT IV FINAL CONTROL ELEMENTS 9

I/P, P/I converters – Final control elements - Pneumatic and electric actuators -Types of control valves - Valve positioner and its importance - Inherent and Installed characteristics of control valve - Control valve sizing - Cavitation and flashing.

UNIT V MULTI LOOP CONTROL 9

Feed-forward control – Ratio control – Cascade control – Inferential control – Split-range and introduction to multivariable control – Examples from distillation column and boiler systems – IMC– Model Predictive Control – Adaptive control – P&ID diagram.

TEXT BOOKS:

1. Stephanopoulos. G, “Chemical Process Control - An Introduction to Theory and Practice”, Prentice Hall of India, 2005.
2. Johnson .C.D, “Process Control Instrument Technology”, Prentice Hall Inc., 2004.

REFERENCES:

1. Bequette. B.W, “Process Control Modeling, Design and Simulation”, Prentice Hall of India, 2004.
2. Seborg. D.E, Edgar. T.F and Mellichamp. D.A, “Process Dynamics and Control”, Wiley John and Sons, 2nd Edition, 2003.
3. Coughanowr, D.R, “Process Systems Analysis and Control”, McGraw –Hill International Edition, 2004.
4. Harriott .P, “Process Control”, Tata McGraw Hill, 2005.
5. http://nptel.ac.in/courses/103103037/

BEE022	**FIBER OPTICS AND LASER INSTRUMENTATION**	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite :Measurement and Instruments				
	Course Designed by – Dept of Electrical & Electronics Engineering				

OBJECTIVES

To contribute to the knowledge of Fiber optics and Laser Instrumentation and its Industrial and Medical Application.

COURSE OUTCOMES (COs)

CO1	To expose the students to the basic concepts of optical fibers and their properties
CO2	To provide adequate knowledge about the Industrial applications of optical fibers.
CO3	To expose the students to the Laser fundamentals.
CO4	To provide adequate knowledge about Industrial application of lasers.
CO5	To provide adequate knowledge about holography and Medical applications of Lasers.

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
2	CO1	H	M	M	H	M		M		H	L	L	M
	CO2	H	M	M	H	H		M		H	L	L	M
	CO3	H	M		H	H		M		H	L	L	M
	CO4	H	M		H	H		M		H	L	L	M
	CO5	H	M	M	H	H		M		H	L	L	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 OPTICAL FIBRES AND THEIR PROPERTIES 9

Principles of light propagation through a fiber - Different types of fibers and their properties, fiber Characteristics – Absorption losses – Scattering losses – Dispersion – Connectors and splices –Fiber termination – Optical sources – Optical detectors.

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES 9

Fiber optic sensors – Fiber optic instrumentation system – Different types of modulators – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III LASER FUNDAMENTALS 9

Fundamental characteristics of lasers – Three level and four level lasers – Properties of laser – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers – Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

UNIT IV INDUSTRIAL APPLICATION OF LASERS 9

Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect – Material processing – Laser heating, welding, melting and trimming of material – Removal and vaporization.

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS 9

Holography – Basic principle - Methods – Holographic interferometry and application, Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser and tissue interactive – Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynecology and oncology.

TEXT BOOKS:

1. J.M. Senior, “Optical Fiber Communication – Principles and Practice”, Prentice Hall of India,1 st edition,1985.
2. J. Wilson and J.F.B. Hawkes, ‘Introduction to Opto Electronics’, Prentice Hall of India, 2nd Edition,2001.

REFERENCES:

1. G. Keiser, 'Optical Fibre Communication', McGraw Hill,3rd edition, 1995.
2. John F. Read, 'Industrial Applications of Lasers', Academic Press, 1st edition,1978.
3. Monte Ross, 'Laser Applications', McGraw Hill, 1968

BBA005	**ENERGY ENGINEERING AND MANAGEMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Management				
	Course Designed by – Department of Management studies				

OBJECTIVES

To enlight the student in the field of energy engineering concern with energy efficiency, energy service and facility management

COURSE OUTCOMES

CO1	Understanding the different energy resources and their uses.
CO2	Understanding the different energy conservation techniques.
CO3	Understanding the impact of energy on environment
CO4	Understanding the energy Management
CO5	Understanding the Engineering Economics

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
2	CO1		H				M	M					M
	CO2	H							M			M	
	CO3				H				M				
	CO4			M				H		H			M
	CO5		M			M						H	
	CO6			H									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 INTRODUCTION TO ENERGY AND ENVIRONMENT 9

Definition – Fossil fuel reserves – Energy consumption – Green house effect, global warming – Renewable energy resources – Environmental aspects, utilization – energy prizes – Energy policies.

UNIT II ENERGY CONSERVATION 9

Need – different types of energy conservation schemes – industrial energy use – energy surveying and auditing – energy index – cost of energy – cost index-energy conservation in engineering and process industry in thermal systems, in buildings and non conventional energy resources schemes.

UNIT III ENERGY GENERATION BY TECHNOLOGY 9

Fuels and consumption – Boilers – Furnaces – Waste heat recovery systems – Heat pumps and refrigerators – Storage systems – Insulated pipe work systems – heat exchangers.

UNIT IV ENERGY MANAGEMENT 9

Energy management principles – energy resource management – energy management information systems – Instrumentation and measurement – Computerized energy management.

UNIT V ENGINEERING ECONOMICS 9

Costing techniques – Optimization cost – Optimal target investment schedules – Finance appraisal – Profitability – Project management.

REFERENCES:

1. W.R. Murphy and G. Mckay, Energy Management, Butterworths, London, 1982.
2. Callaghan P.W. Design and Management for Energy Conservation, Pergamon Press, Oxford,1993.

OPEN ELECTIVES-I(OE-I)

BBA004	**ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Management				
	Course Designed by – Department of Management studies				
OBJECTIVES					
To know about engineering economics and cost analysis					
COURSE OUTCOMES					
CO1	To learn about introduction to economics				
CO2	To learn about value engineering				

CO3	To learn about cash flow.
CO4	To learn about economics of sampling and Replacement and Maintenance
CO5	To learn about depreciation and Evaluation of public alternatives.

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
2	CO1			H				M				M	
	CO2					H			M				H
	CO3		H				M			M			
	CO4							H					M
	CO5	M								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 INTRODUCTION 9

Introduction –Economics Theories And Scope –Demand And Supply Analysis –Determinants of Demand –Law Of Demand – Elasticity Of Demand – Demand Forecasting –Demand Sensitivity –Price ,Income ,Gross ,Advertisement –Law Of Supply –Elasticity Of Supply –Cost Concepts – Types –Cost Curves –Short Run And Long Run –Break Even Analysis –Pricing Concepts – Types ,Price –Determinations.

UNIT II DEMAND & SUPPLY ANALYSIS 9

Concepts–Firm, Industry, Market, Market power, Market Conduct, Market Performance. Market Structure- Types-Perfect Monopoly, Monopolistic and Oligopoly Competition. Manufacturing Practices-Diversification, Vertical and Horizontal Integration, Merger.

UNIT III PRODUCTION AND COST ANALYSIS 9

National Income: Concepts and Measurements –GNP, NNP- Methods of Measuring National Income-Inflation and Deflation, Unemployment.

Money and Banking: Value of Money-Banking-Commercial Banks and Its Function. New Economic Environment: Economic Systems –Economic Liberalization, Privatization and Globalization

UNIT IV PRICING 9

Introduction, Scope, Objectives, Basic Financial Concepts – Time Value Of Money And Method Of Appraising Project Profitability – Rate of Return –Pay Back Period – Percent Value, NPV Comparison – Cost – Benefit Analysis. Source of Finance – Internal And External –Long Term And Short Term – Securities, Debentures/ Bonds, Shares, Financial Institutions.

UNIT V FINANCIAL ACCOUNTING 9

Accounting System-Financial Statement – Types- Ledger, Cash Flow Statement Profit And Loss Account, Balance Sheet, Ratios/ Financial Analysis- Liquidity Leverage Activity, Profitability, Trends Analysis.

REFERENCES

1. Maheshwari S N "Management Accounting and Financial Accounting", S.Chand andCompany. 1993.
2. D N Drivedi, "Managerial Economics ", Vikas Publishing House.1980
3. R R Barthwal, Industrial Economics ",Wiley Eastern Ltd1996
4. G S Guptha, "Management Economics ",Tata McGraw Hill Ltd

BBA 008	**TOTAL QUALITY MANAGEMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite –Professional Courses				
	Course Designed by – Dept. of Masters of Business Administration				

	COURSE OUTCOMES (COs)
CO1	Understand quality concepts and philosophies of TQM
CO2	Apply TQM principles and concepts of continuous improvement
CO3	Apply and analyze the quality tools, management tools and statistical fundamentals to improve quality
CO4	Understand the TQM tools as a means to improve quality
CO5	Remember and understand the quality systems and procedures adopted
CO6	know prerequisites of evolution of total quality management and significance of quality gurus' works to the management of modern organizations.

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
2	CO1	H					M				M		
	CO2	M	L	H					L				
	CO3	M			H					H			H
	CO4	M				L		M				L	
	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 INTRODUCTION 9

Definition of Quality, Dimensions of Quality, Quality costs, Top Management Commitment, Quality Council, Quality Statements, Barriers to TQM Implementation, Contributions of Deming, Juran and Crosby, Team Balancing

UNIT- II TQM PRINCIPLES 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Continuous Process Improvement,5S, Kaizen, Just-In-Time and TPS

UNIT –III STATISTICAL PROCESS CONTROL 9

The seven tools of quality, New seven Management tools, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Concept of six sigma.

UNIT- IV TQM TOOLS 9

Quality Policy Deployment (QPD), Quality Function Deployment (QFD), Benchmarking, Taguchi Quality Loss Function, Total Productive Maintenance (TPM), FMEA

UNIT- V QUALITY SYSTEMS 9

Need for ISO 9000 and Other Quality Systems, ISO 9001:2008 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, ISO 14001:2004

TEXT BOOKS:

1. Dale H.Besterfiled, "Total Quality Management", 3rd edition 2011 Pearson Education
2. James R.Evans & William M.Lidsay, ―"The Management and Control of Quality", 9th Edition South-Western (Thomson Learning),

REFERENCES:

1. Feigenbaum.A.V. ―Total Quality Management; 4 edition (August 1, ‖, McGraw-Hill Professional
2. Oakland.J.S. ―Total Quality Management‖,, 3rd Edition, 2003. Butterworth – Hcinemann ltdOxford

3. https://open.library.ubc.ca/cIRcle/collections

BBA001	PRINCIPLES OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR	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	l
2	CO1	H					H					H	
	CO2		H		M					H			
	CO3	M							M		H		
	CO4			M	H							H	
	CO5							M					
	CO6				H								L

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- IIMANAGEMENT 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 –VGROUPBEHAVIOUR **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.
4. https://www.extension.harvard.edu

BEE031	**WEB DESIGN**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – fundamentals of C & C++				

	Course Designed by – Dept. of Electrical & Electronics Engineering

OBJECTIVES

- The purpose of the course is to provide the knowledge and skills to build creative, interactive, and well-designed Web sites.
- To balance the technical skills with artistic skills to create web pages that are conceptually interesting, easily navigable, visually pleasing, and functional with web publishing tools and Graphics programs including Dreamweaver, Photoshop and Flash.

COURSE OUTCOMES (COs)

CO1	To understand the principles of creating an effective web page, including an in-depth consideration of information architecture.
CO2	To design, create, and maintain of web pages and websites with various multimedia elements.
CO3	To develop skills in developing web site with Dream weaver
CO4	To draw and create symbols in Flash for providing interactivity with the user
CO5	To understand basics of Photoshop and incorporate the artistic skills by applying various brushes and 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	l
2	CO1	M				L				M			
	CO2	M								M			
	CO3												
	CO4												
	CO5									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 WEB DESIGN INTRODUCTION 9

Environment and Tools –Web Publishing Fundamentals –Planning a Website

UNIT II WEB DESIGN – CONCEPTS 9

Typography and Images –Multimedia Elements –Promoting and maintaining a Website

UNIT III DREAM WEAVER 9

Getting Started –Developing a web page –Working with Text and CSS –Adding Images – Working with Links and Navigation –Managing a Web Server and files

UNIT IV FLASH 9

Getting Started –Drawing objects –Working with Symbols – Creating Animations

UNIT V PHOTOSHOP 9

Photoshop Basics –Working with Layers –Making Selections –Incorporating Color Techniques – Brushes –Filters –Placing Type in an Image

TEXT BOOKS

1. Gary B.Shelly, H.Albert Napier, Ollie N. Rivers, "Web Design: Introductory Concepts and Techniques", Course Technology, Cengage Learning, Third Edition, 2009.
2. Sherry Bishop , James E. Shuman , Elizabeth Eisner Reding, "The Web Collection Revealed Premium Edition: Adobe Dreamweaver CS5, Flash CS5 and Photoshop CS5", DELMAR, Cengage Learning, 2010.

REFERENCES

1. Tom Negrino, Dori Smith, "Dreamweaver CS5 for Windows and Macintosh: Visual QuickStart", Peachpit Press, 2010.
2. Elaine Weinmann, Peter Lourekas, "Photoshop CS5 for Windows and Macintosh: Visual QuickStart", Peachpit Press, 2010.
3. Katherine Ulrich, "Flash CS5 Professional for Windows and Macintosh: Visual QuickStart", Peachpit Press, 2011.
4. https://teamtreehouse.com/tracks/web-design

BEE046	**JAVA PROGRAMMING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Fundamentals of Computing				
	Course Designed by – Dept of Electrical & Electronics Engineering				

OBJECTIVES	
To enable the students to becomes as java professional and able to work in real time environment.	
COURSE OUTCOMES (COs)	
CO1	Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
CO2	Have the ability to write a computer program to solve specified problems.
CO3	Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.

CO4	Understand the basics of event handling, swing components and exception handling.
CO5	Understand the basics of Multi-threaded 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	l
2	CO1									M			L
	CO2									M			L
	CO3									M			L
	CO4									M			L
	CO5									M			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 TO OBJECT ORIENTED PROGRAMMING 9

Object oriented programming concepts – objects – classes – methods and messages – abstraction and encapsulation – inheritance – abstract classes – polymorphism.- Objects and classes in Java – defining classes – methods - access specifiers – static members – constructors – finalize method

UNIT II INHERITANCE 9

Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy – polymorphism – dynamic binding – final keyword – abstract classes

UNIT III GRAPHICS PROGRAMMING 9

The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes.

UNIT IV JAVA SWING 9

Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – introduction to Swing – Model-View-Controller design pattern – buttons – layout management – Swing Components – exception handling – exception hierarchy – throwing and catching exceptions.

UNIT V GENERIC PROGRAMMING&MULTITHREADING 9

Motivation for generic programming – generic classes – generic methods – generic code and

virtual machine – inheritance and generics – reflection and generics - Multi-threaded programming – interrupting threads – thread states – thread properties – thread synchronization – Executors – synchronizers.

TEXT BOOKS

1. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Eighth Edition, Sun Microsystems Press, 2008.
2. K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000.

REFERENCES:

1. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.
2. C. Thomas Wu, "An introduction to Object-oriented programming with Java", Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2006.
3. http://www.tutorialspoint.com/java/java_overview.htm

OPEN ELECTIVE-II(OE-II)

BBA007	**ENGINEERING ECONOMICS AND COST ANALYSIS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Management, Engineering				
	Course Designed by – Department of Management studies				

OBJECTIVES	
To know about engineering economics and cost analysis.	
COURSE OUTCOMES (COs)	
CO1	To learn about the introduction to economics
CO2	To learn about the value engineering
CO3	To learn about the cash flow.
CO4	To learn about the Replacement and Maintenance analysis.
CO5	To learn about the depreciation and Evaluation of public alternatives.
CO6	To learn about the Break-even analysis

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
2	CO1			H				M				M	
	CO2					H			M				H
	CO3		H				M			M			
	CO4							H					M
	CO5	M								H			
	CO6				M				M			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 INTRODUCTION TO ECONOMICS 8

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis- V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning.

UNIT II VALUE ENGINEERING 10

Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor-Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III CASH FLOW 9

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV REPLACEMENT AND MAINTENANCE ANALYSIS 9

Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

UNIT V DEPRECIATION 9

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives- introduction, Examples, Inflation adjusted decisions – procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.

TEXT BOOKS

1. Panneer Selvam, R, Engineering Economics, Prentice Hall of India Ltd, New Delhi, 2001.

REFERENCES

1. Chan S.Park, Contemporary Engineering Economics, Prentice Hall of India, 2002.
2. Donald.G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2002
3. Degarmo, E.P., Sullivan, W.G and Canada, J.R, Engineering Economy, Macmillan, New York, 1984.
4. Grant.E.L., Ireson.W.G., and Leavenworth, R.S, Principles of Engineering Economy, Ronald Press, New York,1976.
5. Smith, G.W., Engineering Economy, Lowa State Press, Iowa, 1973.

BBA002	**ENTREPRENEURSHIP DEVELOPMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Professional Courses				
	Course Designed by – Department of Management Studies				

OBJECTIVES

- To learn about types of entrepreneurship.
- To study about major motivation methods.
- To study about government policies for small scale industries.

COURSE OUTCOMES (COs)

CO1	To learn the difference between entrepreneur and intrepreneur.
CO2	To learn about entrepreneurship development programs.
CO3	To study about economic feasibility methods
CO4	To learn about taxation.
CO5	To study about corrective measures methods.
CO6	To know about the Factors Affecting Entrepreneurial Growth

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

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 ENTREPRENEURSHIP 8

Entrepreneur- Types of Entrepreneurs - Difference Between Entrepreneur and I nterpreneur- Role of Entrepreneurship in Economic Growth- Women and Rural Entrepreneurship - Factors Affecting Entrepreneurial Growth.

UNIT II MOTIVATION 8

Major Motives Influencing Entrepreneur – Achievement Motivation Training, Self Rating – Business Game – Thematic Apperception Test – Stress Management – Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS 9

Small Enterprise – Definition, Classification – Characteristics- Ownership Structure – Project Formulation – Steps Involved in Setting up a Business – Identifying, Selecting a Good Business Opportunity- Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports- Project Appraisal- Sources of Information- Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING 10

Need – Sources of Finance- Terms Loans, Capital Structure- Financial Institutions, Management of Working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/ CPM –Taxation – Income Tax – Excise Duty – Sales Tax.

UNIT V SUPPORT TO ENTREPRENEURS 10

Sickness in Small Business- Concept, Magnitude, Causes and Consequences, Corrective Measures- Government Policy for Small Scale Enterprises- Growth Strategies in Small Industry – Expansion- Diversification, Joint Venture, Merger, Sub Contracting.

TEXT BOOKS

1. S.S.Khanka, “Entrepreneurial Development”, S. Chand & Co. Ltd., Ram Nagar, New Delhi, 1999.
2. Hisrich RD and Peters MP, “Entrepreneurship”, 5th Edition, Tata McGraw Hill, 2002.

REFERENCES

1. Rabindra Kanungo, "Entrepreneurship and Innovation" , Sage Publications, New Delhi
2. ED II. Faculty & External Experts-A Hand book for New Entrepreneurs Publishers: Entrepreneurial Development, Institute of India, and Ahmedabad, 1986.

BBA003	**MARKETING MANAGEMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Professional Courses				
	Course Designed by – Department of Management				

OBJECTIVES

- To learn about consumer marketing.
- To study about demographic factors.
- To study about retailing process

COURSE OUTCOMES (COs)

CO1	To learn marketing concepts of industry and consumer.
CO2	To learn about demographic factors.
CO3	To study about pricing methods.
CO4	To learn about portfolio analysis.
CO5	To study about advertising and sales methods.
CO6	To understand Buyer Behavior and Market Segmentation

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

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 INTRODUCTION 9

Definition- Marketing Process- Dynamics- Needs- Wants and demands-Marketing Concepts- Environment- Mix- Types- Philosophies- Selling Vs Marketing- Organizational- Industrial Vs Consumer Marketing- Consumer Goods- Industrial Goods- Product Hierarchy.

UNIT II BUYING BEHAVIOUR &MARKET SEGMENTATION 9

Cultural- Demographic Factors- Motives- Types- Buying Decisions- Segmentation factors- Demographic- Psychographic & Geographic Segmentation- Process- Patterns.

UNIT III PRODUCT PRICING AND MARKETING RESEARCH 9

Objectives- Pricing- Decisions & Pricing Methods- Pricing Management- Introduction- Uses- Process of Marketing Research.

UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION 9

Components of marketing plan- Strategy formulation and marketing process- Implementation- Portfolio analysis- BCG- GEC grids.

UNIT V ADVERTISING, SALES PROMOTION AND DISTRIBUTION 9

Characteristics- Impact- Goals- Types- Sales promotion- Point of Purchase- Unique selling proposition- Characteristics- Whole selling- Retailing- Channel Design- Logistics- Modern trends in retailing.

TEXT BOOKS:

1. Ramasamy and Nama Kumari, “Marketing Environment: Planning, implementation and control the Indian context”,2002
2. Govindarajan.M, “Industrial marketing management:”, Vikas Publishing Pvt. Ltd, 2003

REFERENCES:

1. Philip Kotler, Marketing Management, Analysis, Planning, Implementation and control, 1998.
2. Khanna O.P. – Industrial Engineering and Management, Khanna Publishers, New Delhi, 2000.
3. Green Paul.E and Donald Tull, “Research for marketing decisions”, Prentice Hall of India. 1995
4. Donald S. Tull and Hawkins, “Marketing Research”, Prentice Hall of India- 1997

BEE029	**CLOUD COMPUTING**	**L**	**T**	**P**	**C**
	Total Contact hours : 45	3	0	0	3
	Prerequisite- Fundamentals of Computing				
	Course Designed by – Dept. of Electrical & Electronics Engineering				
OBJECTIVE					
This course gives an introduction to cloud computing and its techniques, issues, and its services that will lead to design and development of a simple cloud service.					

COURSE OUTCOME	
1.	To analyze the components of cloud computing and its business perspective.
2.	To evaluate the various cloud development tools
3.	To collaborate with real time cloud services.
4.	To analyze the case studies to derive the best practice model to apply when developing and deploying cloud based applications.

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
2	CO1	H	H	L	L	H	M	M	L	L	L	L	L
	CO2	H	H	L	L	M	M	M	L	L	L	L	L
	CO3	H	H	L	L	H	M	M	L	L	L	L	L
	CO4	H	H	L	L	H	M	M	L	L	L	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)
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4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I CLOUD INTRODUCTION 9

Cloud Computing Fundamentals: Cloud Computing definition, Types of cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing , usage scenarios and Applications , Business models around Cloud –Major Players in Cloud Computing - Issues in Cloud - Eucalyptus - Nimbus – OpenNebula, CloudSim.

UNIT II CLOUD SERVICES AND FILE SYSTEM 9

Types of Cloud services: Software as a Service - Platform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services. Service providers- Google App Engine, Amazon EC2,Microsoft Azure, Sales force. Introduction to Map Reduce, GFS, HDFS, Hadoop Framework.

UNIT III COLLABORATING WITH CLOUD 9

Collaborating on Calendars, Schedules and Task Management – Collaborating on Event Management, Contact Management, Project Management – Collaborating on Word Processing, Databases – Storing and Sharing Files- Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Collaborating via Social Networks – Collaborating via Blogs

and Wikis.

UNIT IV VIRTUALIZATION FOR CLOUD 9

Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization –System Vm, Process VM, Virtual Machine monitor – Virtual machine properties -Interpretation and binary translation, HLL VM - Hypervisors – Xen, KVM ,VMWare, Virtual Box, Hyper-V.

UNIT V SECURITY, STANDARDS, AND APPLICATIONS 9

Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging –Standards for Security,

TEXT BOOKS

1. Bloor R., Kanfman M., Halper F. Judith Hurwitz "Cloud Computing for Dummies" (Wiley India Edition),2010
2. John Rittinghouse & James Ransome, "Cloud Computing Implementation Management and Strategy", CRC Press, 2010.
3. Antohy T Velte ,Cloud Computing : "A Practical Approach", McGraw Hill,2009.
4. Michael Miller, Cloud Computing: "Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, August 2008.
5. James E Smith, Ravi Nair, "Virtual Machines", Morgan Kaufmann Publishers, 2006.
6. http://cloud-standards.org/wiki/index.php?title=Main_Page

REFERENCES

1. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing", Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008
2. webpages.iust.ac.ir/hsalimi/.../89.../Cloud%20Common%20standards.pptopennebula.org,
3. www.cloudbus.org/cloudsim/, http://www.eucalyptus.com/
4. http://hadoop.apache.org/docs/stable/hdfs_design.html
5. http://static.googleusercontent.com/external_content/untrusted_dlcp/research. google.com/ en//archive/mapreduce-osdi04.pdf

BEE030	**CYBER SECURITY**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	3	0	0	3
	Prerequisite – Fundamentals of Computing				
	Course Designed by – Dept. of Electrical & Electronics Engineering				
OBJECTIVES					

The proliferation of Internet has impacted the lives of people in all professions. Equally, they are also prone to get attacked by hackers and intruders and eventually lose their privacy. Naïve users of Internet, without proper awareness and implications carry out communication in the cyber world. Therefore, it becomes indispensable for every individual to gain knowledge in the fundamentals of cyber security, best practices related to cyber security and legal implications of intruding in the privacy of others. This necessitates the need for this course on Cyber Security.													
COURSE OUTCOMES (COs)													
CO1	Understand the need for Cyber security and its related threats and attacks.												
CO2	Learn methods to become secure in the cyber world and securely communicate in the cyber world.												
CO3	Become knowledgeable about the best practices related to cyber security, regulations and laws associated with the same.												
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
2	CO1		M	M		M	M	M			H	L	M
	CO2		M	M		H	M	M		M	M	M	M
	CO3		M			H	H	M			M	L	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)				
								X					
4	Approval	37th Meeting of Academic Council, May 2015											

UNIT I NEED FOR CYBER SECURITY 9

Introduction to security- CIA triad-Case studies- security attacks-issues related to social networking - Guidelines

UNIT II METHODS TO SECUREYOURSELF IN THE CYBER WORLD 9

Why and What of Reversible and Irreversible Cryptographic mechanisms? - Applications of Digital Signature - Good password practices

UNIT III E-COMMERCE: SECURE TRANSACTIONS 9

What is E-commerce? – Online banking security- Online shopping fraud-Guidelines and Recommendations

UNIT IV EVERYDAY SECURITY 9

Connecting your laptop, mobile devices, PDAs to Internet-Managing your browser-Facebook Security-E-mail security – Safe guarding from Viruses: Antiviruses– Best practices and guidelines

UNIT V CYBER SECURITY LAWS AND COMPETENT AUTHORITIES 9

Indian IT Act, 2008 - What is Cyber Forensics? – Functions of cybercrime cell – Responding to a cyber attack

REFERENCES

1. "Information Security Awareness Handbook, ISEA, Department of Electronics and Information Technology", Government of India, 2010
2. deity.gov.in/sites/upload_files/dit/.../itact2000/it_amendment_act2008.pdf
3. www.schneier.com/blog/archives/2013/03/browser_securit.html
4. www.dhses.ny.gov/ocs/awareness-training-events/news/2010-03.cfm
5. https://www.watsonhall.com/e-commerce-security/