Curriculum Structure & Syllabi

of

B. Tech

In

Electronics and Communication Engineering

(w.e.f. 2014-15)

Vision
Mission
Program Educational Objectives
Program Outcomes
Program Specific Outcomes
Overall Credit Structure
Curriculum
Syllabus

Offered By

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
M. M. M. UNIVERSITY OF TECHNOLOGY, GORAKHPUR-273010, UP

August 2021

Department of Electronics and Communication Engineering
CURRICULA & SYLLABI
B. Tech. Electronics and Communication Engineering

Vision:

To become a leader of education, research and innovation in the area of Electronics and Communication Engineering and to train students to be innovative and well prepared professionals in the area of Electronics and Communication Engineering.

Mission:

1. Educate and mentor students to meet the current as well as future challenges by providing them with a firm foundation in both theory and practice of Electronics and Communication Engineering.
2. Create, develop and disseminate new knowledge by top quality applied research in Electronics and Communication Engineering by interacting with government agencies and private industry.
3. Promote a sense of leadership and service to the society.

Program Educational Objectives (PEOs)

PEO-1: Excel in professional career and/or higher education by acquiring knowledge in area of Electronics and Communication Engineering.

PEO-2: Analyze real life problems, design appropriate system to provide solutions that are technically sound, economically feasible and socially acceptable.

PEO-3: Exhibit professionalism, ethical attitude, communication skills, teamwork in their profession and adapt to current trends by engaging in life-long learning.

Programs Outcomes (POs)

B.Tech. Electronics and Communication Engineering students will demonstrate the ability to:

PO-1 **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO-2 **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-3 **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO-4 **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO-5 **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex

engineering activities with an understanding of the limitations.

PO-6 **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO-7 **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO-8 **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO-9 **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO-10 **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO-11 **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12 **Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programs Specific Outcomes (PSOs)

PSO-1 An ability to understand the concepts of basic Electronics & Communication Engineering and to apply them to various areas like Signal processing, VLSI, Embedded systems, Communication Systems, Digital & Analog Devices, etc.

PSO-2 An ability to solve complex Electronics and Communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.

PSO-3 Wisdom of social and environmental awareness along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an Entrepreneur.

The Overall Credit Structure for B. Tech. Programme

Credit Courses			
Undergraduate Core (UC)		Undergraduate Electives (UE)	
Category	Min. credits	Category	Min. credits
Basic Sciences & Maths (BSM)	36	Program Electives (PE)	16
Engineering Fundamentals (EF)	24	Open Electives (OE) (Other Departments)	3
Department Core (DC)	78	Humanities & Social Science Electives (HSSE)	3
Management (M)	6		
Humanities & Social Science Core (HSSC)	4		
Project (P)	10		
Total	158	Total	22
		Grand Total	180 (min.)
Audit Courses			
Audit Courses (Other Departments)			16 (min.)
Seminar			3
Industrial/Practical Training (IT)			1
		Grand Total	20 (min.)

Credit Structure for B.Tech. Electronics & Communication Engineering

Category Semesters	I	II	III	IV	V	VI	VII	VIII	Total
Basic Sciences & Maths (BSM)	9	14	9	4	-	-	-	-	36
Engineering Fundamentals (EF)	12	7	7	2	-	-	-	-	28
Department Core (DC)	-	-	9	13	20	23	9	5	79
Management (M)	-	-	-	4	3	-	-	-	7
Humanities & Social Science Core (HSSC)	4	-	-	-	-	-	-	-	4
Project(P)	-	-	-	-	-	-	5	5	10
Programme Electives (PE)	-	-	-	-	-	-	8	9	17
Open Electives (OE)	-	-	-	-	-	-	-	4	4
Humanities & Social Science Electives(HSSE)	-	3	-	-	-	-	-	-	3
Total	25	24	25	23	23	23	22	23	188

Structure of the Curriculum

Curriculum for B.Tech.(Electronics & Communication Engineering)

Freshman Year, Semester: I

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BPM-01/BAS-02	Engineering Physics-I	3	1	2	5
2.	EF	BEC-01	Fundamentals of Electronics Engineering	3	1	2	5
3.	BSM	BMS-01/BAS-01	Engineering Mathematics-I	3	1	0	4
4.	EF	BEE-02	Electrical Circuits & Analysis	3	1	2	5
5.	HSSC	BHM-01/BAS-03	Professional Communication	3	1	0	4
6.	EF	BEC-10	Electronics Workshop &PCB	0	0	4	2
7.	AC	BCY-04/BAS-05	Environment and Ecology	2	1	0	-
			Total	17	6	10	25

Freshman Year, Semester: II

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BPM-02/BAS-08	Engineering Physics-II	3	1	2	5
2.	BSM	BCY-01/BAS-09	Engineering Chemistry	3	1	2	5
3.	BSM	BMS-02/BAS-07	Engineering Mathematics-II	3	1	0	4
4.	HSSE	BHM**/BAS-**	Humanities &Social Science Electives	2	1	0	3
5.	EF	BCS-01	Introduction to Computer Programming	3	1	2	5
6.	EF	BCE-10	Engineering Graphics	0	0	4	2
7.	AC	MBA-HR6	Knowledge Management	2	1	0	-
			Total	16	6	10	24

Sophomore Year, Semester: III

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BMS-04/BAS-21	Engineering Mathematics-III	3	1	0	4
2.	EF	BEE-16	Electromechanical Energy Conversion	3	1	2	5
3.	BSM	BPM-05/BAS-28	Solid State Physics	3	1	2	5
4.	DC	BEC-11	Network Analysis & synthesis	3	1	0	4
5.	DC	BEC-12	Digital Electronics & Circuits	3	1	2	5
6.	EF	BHM-03/BAS-20	Communication Skills	0	0	4	2
7.	AC	BMP-04/BAS-22	Nano Technology	2	1	0	-
			Total	17	6	10	25

Sophomore Year, Semester: IV

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BMS-08/BAS-23	Engineering Mathematics-IV	3	1	0	4
2.	DC	BEC-13	Signals &Systems	3	1	0	4
3.	DC	BEC-14	Electromagnetic Field Theory	3	1	0	4
4.	DC	BEC-15	Solid State Devices &Circuits	3	1	2	5
5.	M	MBA-03	Public Administration	3	1	0	4
6.	EF	BCS-52	Web Designing	0	0	4	2
7.	AC	MBA-01	Industrial Management	2	1	0	-
			Total	17	6	6	23

Junior Year, Semester: V

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	M	MBA-02	Engineering and Managerial Economics	2	1	0	3
2.	DC	BEC-26	Control Systems	3	1	2	5
3.	DC	BEC-27	Analog Integrated Circuits	3	1	2	5
4.	DC	BEC-28	Principles of Communication	3	1	2	5
5.	DC	BEC-29	Electronics Measurement & Instrumentation	3	1	2	5
6.	AC	MMS-232/ BOE-03	Operation Research	3	1	0	-
			Total	17	6	8	23

Junior Year, Semester: VI

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BEC-31	Digital Communication	3	1	2	5
2.	DC	BEC-32	Microprocessors & Application	3	1	2	5
3.	DC	BEC-33	Data Communication Networks	3	1	0	4
4.	DC	BEC-34	Microwave Engineering	3	1	2	5
5.	DC	BEC-35	VLSI Technology	3	1	0	4
6.	AC	BEC-30	Seminar	0	0	6	-
			Total	15	5	12	23

Senior Year, Semester: VII

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BEC-41	VLSI Design	3	1	2	5
2.	DC	BEC-42	Digital Signal Processing	3	1	0	4
3.	PE1	BEC-**	ProgramElective-1	3	1	0	4
4.	PE2	BEC-**	ProgramElective-2	3	1	0	4
5.	P	BEC-40	Project Part-I	0	0	10	5
6.	AC	BEC-45	Industrial/ Practical Training	0	0	2	-
			Total	12	4	14	22

Senior Year, Semester: VIII

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BEC-43	Wireless Communication	3	1	2	5
2.	PE3	BEC-**	Program Elective-3	3	1	2	5
3.	PE4	BEC-**	Program Elective-4	3	1	0	4
4.	OE	BOE-**	Open Elective	3	1	0	4
5.	P	BEC-50	Project Part-II	0	0	10	5
			Total	12	4	12	23

Engineering Fundamentals & Department Core (Electronics & Communication Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
Year-I							
1.	BEC-01	Fundamentals of Electronics Engineering	-	3	1	2	5
2.	BEC-10	Electronics Workshop & PCB	-	0	0	4	2
Year-II							
3.	BEC-11	Network Analysis & Synthesis	-	3	1	0	4
4.	BEC-12	Digital Electronics &Circuits	-	3	1	2	5
5.	BEC-13	Signals &Systems	-	3	1	0	4
6.	BEC-14	Electromagnetic Field Theory	-	3	1	0	4
7.	BEC-15	Solid State Devices & Circuits	Solid State Devices & Circuits	3	1	2	5
Year-III							
8.	BEC-26	Control Systems	-	3	1	2	5
9.	BEC-27	Analog Integrated Circuits	-	3	1	2	5
10.	BEC-28	Principles of Communication	Signals &Systems	3	1	2	5
11.	BEC-29	Electronics Measurement & Instrumentation	-	3	1	2	5
12.	BEC-31	Digital Communication	Principles of Communication	3	1	2	5
13.	BEC-32	Microprocessors & Application	Digital Electronics & Circuits	3	1	2	5
14.	BEC-33	Data Communication Networks	Principles of Communication	3	1	0	4
15.	BEC-34	Microwave Engineering	Electromagnetic Field Theory	3	1	2	5
16.	BEC-35	VLSI Technology	-	3	1	0	4
17.	BEC-30	Seminar	-	0	0	6	3
Year-VI							
18.	BEC-41	VLSI Design	VLSI Technology	3	1	2	5
19.	BEC-42	Digital Signal Processing	Signals &Systems	3	1	0	4
20.	BEC-40	Project Part-I	-	0	0	10	5
21.	BEC-45	Industrial/ Practical Training	-	0	0	2	1
22.	BEC-43	Wireless Communication	Principles of Communication	3	1	2	5
23.	BEC-50	Project Part-II	Project Part-I	0	0	10	5

Program Electives (Electronics & Communication Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
PE1 & PE2 (VII Semester)							
1.	BEC-51	RADAR Technology	Electromagnetic Field Theory	3	1	0	4
2.	BEC-52	Biomedical Instrumentation	Fundamentals of Electronics Engineering	3	1	0	4
3.	BEC-53	Information Theory & Coding	Digital Communication	3	1	0	4
4.	BEC-54	Advance Semiconductor Devices		3	1	0	4
5.	BEC-55	Optoelectronics	Solid State Devices & Circuits	3	1	0	4
6.	BEC-56	Electronics Switching	-	3	1	0	4
7.	BEC-57	Digital System Design	--	3	1	0	4
8.	BEC-58	Satellite Communications	Principles of Communication	3	1	0	4
PE3 (VIII Semester)							
9.	BEC-61	Microcontroller & Embedded Systems	Digital Electronics & Circuits	3	1	2	5
10.	BEC-62	Optical Communications	Principles of Communication	3	1	2	5
11.	BEC-63	DSP Architecture &Applications	Digital Signal Processing & Microprocessor	3	1	2	5
12.	BEC-64	Antenna Design	Electromagnetic Field Theory	3	1	2	5
PE4 (VIII Semester)							
13.	BEC-65	Digital Image Processing	Signals &Systems, DSP	3	1	0	4
14.	BEC-66	ATM Networks and B-ISDN	Data Communication Networks	3	1	0	4
15.	BEC-67	RFICs	Analog Integrated Circuits	3	1	0	4
16.	BEC-68	Neural Networks	-	3	1	0	4

Subjects offered for other departments

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BOE-13	Industrial Automation & Robotics	-	2	1	0	3
2.	BOE-14	Industrial Electronics	Electronics Measurements &Instrumentation	2	1	0	3
3.	BOE-15	Electronic Product Design	Fundamentals of Electronics Engg. & PCB Design	2	1	0	3

Seminars, project works may be considered as practical

SYLLABI

BPM-01/BAS02 ENGINEERING PHYSICS-I

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Basics of relativity and its application in Engineering.
2. Quantum Mechanics and its applications to understand material properties.
3. Use of the principle of optics in the engineering and instrumentation.
4. Basic Principles and applications of Laser, holography and optical Fibre in Engineering.

Topics Covered

UNIT-I 9

Relativistic Mechanics: Inertial and Non-inertial Frames of reference, Galilean transformation, Michelson-Morley Experiment, Postulates of special theory of relativity, Lorentz Transformation, Length contraction, Evidences of length contraction, Time dilation, Evidences for time dilation, Relativistic velocity transformation, Relativistic variation of mass with velocity, Evidence of mass variation with velocity, Relativistic kinetic energy, Mass energy equivalence, Examples from nuclear physics, Relativistic energy-momentum relation.

UNIT-II 9

Quantum Mechanics: De Broglie waves and Group velocity concept, Uncertainty principle and its application, Davisson-Germer experiment, Derivation of Schrodinger equation for time independent and time dependent cases. Postulates of quantum mechanics, Significance of wave function, Application of Schrodinger wave equation for a free particle (one dimensional and three dimensional case), Particle in a box (one dimensional), Simple harmonic oscillator (one dimensional).

UNIT-III 9

Physical Optics:

Interference: Interference of light, Interference in thin films (parallel and wedge-shaped film), Newton's rings. Refractive index and wavelength determination.

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Polarimeter

UNIT-IV 9

Modern Optics

Laser: Spontaneous and stimulated emission of radiation, population inversion, concept of 3 and 4 level Laser, construction and working of Ruby, He-Ne lasers and laser applications.

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Propagation Mechanism, and communication in fiber Single and Multi Mode Fibers, step index and graded index fiber.

Holography: Basic Principle of Holography, Construction, and reconstruction of Image on hologram and applications of holography.

EXPERIMENTS

1. To determine the wavelength of monochromatic light by Newton's Ring
2. To determine the specific rotation of cane sugar solution using polarimeter
3. To determine the wavelength of spectral lines using plane transmission grating.
4. To verify Brewster's law using rotating Nicol prism
5. To verify Stefan's law by electrical method
6. To Study resonance in LCR circuit with a c source.
7. To determine the height of a tower with a Sextant.
8. To determine the refractive index of a liquid by Newton's ring.

Books & References

1. *Introduction to Special* theory Relativity-*Robert* Resnick, Wiley Eastern Ltd.
2. Statistical Mechanics and Properties of Matter- *E S R Gopal*, John Wiley and Sons
3. Quantum Mechanics: Theory and Applications- Ajoy Ghatak, *Tata McGraw-Hill*
4. *Optics*- Ajoy Ghatak, *Tata McGraw-Hill*
5. *Optics*- N. Subrahmanyam, Brij Lal, M.N. Avadhanulu, S. Chand
6. *Fiber optics and laser* Principles and Applications-**Anuradha De,** *New Age* International
7. Concepts of Modern Physics-**Arthur Beiser,** *Tata McGraw-Hill*

BEC-01 **FUNDAMENTAL OF ELECTRONICS ENGINEERING**

Course category	:	Engineering Fundamentals (EF)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and minor and major theory & practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to identify schematic symbols and understand the working principles of electronic devices, e.g., Diode, Zener Diode, LED, BJT, JFET and MOSFETetc.
2. Able to understand the working principles of electronic circuits e.g. Rectifiers, Clipper, Clamper, Filters, Amplifiers and Operational Amplifiers etc. also understand methods to analyse and characterize these circuits
3. Able to understand the functioning and purposes of Power Supplies, Test and Measuring equipments such as multimeters, CROs and function generator sets.
4. Able to rig up and test small electronics circuits.

Topics Covered

UNIT-I 9

Semiconductor materials and properties: electron-hole concepts, Basic concepts of energy bands in materials, concept of forbidden gap, Intrinsic and extrinsic semiconductors, donors and acceptors impurities, Junction diode, p-n junction, depletion layer, v-i characteristics, diode resistance, capacitance, diode ratings (average current, repetitive peak current, non-repetitive current, peak inverse voltage). Diode Applications in rectifier, filters, voltage multipliers, load regulators, clipper and clamper circuits, Breakdown mechanism (Zener and avalanche), breakdown characteristics, Zener resistance, Zener diode ratings, Zener diode application as shunt regulator

UNIT-II 9

Bipolar Junction Transistor (BJT): Basic construction, transistor action, CB, CE and CC configurations, input/output characteristics, Biasing of transistors-fixed bias, emitter bias, potential divider bias, comparison of biasing circuits. Transistor Amplifier: Graphical analysis of CE amplifier, concept of voltage gain, current gain, h- parameter model (low frequency), computation of Ai, Av, Ri, Ro of single transistor CE and CC amplifier configurations.

UNIT-III 9

Field Effect Transistors (JFET and MOSFET): Basic construction, transistor action, concept of pinch off, maximum drain saturation current, input and transfer characteristics, characteristic equation CG, CS and CD configurations, fixed & self-biasing. MOSFET: depletion and enhancement type MOSFET-construction, operation and characteristics. Computation of Av, Ri, Ro, of single FET amplifiers using all the three configurations. Operational Amplifiers: Concept of ideal operational amplifiers, ideal op-amp parameters, inverting, non-inverting and unity gain amplifiers, adders, difference amplifiers, integrators

UNIT-IV 9

Switching theory and logic design: Number systems, conversion of bases, Boolean algebra, logic gates, concept of universal gate, canonical forms, Minimization using K-map Operational Amplifiers

Electronics Instruments: Working principle of digital voltmeter, digital multimeter (block diagram approach), CRO (its working with block diagram), measurement of voltage, current, phase and frequency using CRO

EXPERIMENTS

A. Compulsory Experiments

1. To identify the components which are used in electronic circuits.
2. To get familiarization and to study the operation of a function generator instrument and visualize the types of waveforms produced by a function generator.
3. To study the CRO and to find the Amplitude and Frequency of a sinusoidal waveform using CRO.
4. To plot and analyze the forward and Reverse Characteristics of Si based P-N junction diode.
5. To implement a circuit to study the various applications of Operational Amplifier.
6. Study of half wave rectifier.
7. Operation of diode based clipper and clamper circuits.

B. Optional Experiments

1. Implement a circuit to draw the characteristics of JFET in common source configuration.
2. Implement a circuit of half wave and full wave rectifiers with filters.
3. Implement a circuit to draw the characteristics of common emitter BJT amplifier.

Books & References

1. Electronic Devices and Circuits-Boylestad and Nashelsky, 6e, PHI,2001.
2. Electronic Devices and Circuits, A Mottershead, PHI, 2000,6e.
3. Digital Computer Design, Morris Mano, PHI, 2003.
4. Electronic Instrumentation-H.S. Kalsi, 2e, TMH,2007.

BMS-01/BAS-01		**ENGINEERING MATHEMATICS-I**
Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Use of basic differential operators in various engineering problems.
2. Solve linear system of equations using matrix algebra.
3. Use vectors to solve problems involving force, velocity, work and real-life problems and able to analyze vectors in space
4. Evaluate and use double integral to find area of a plane region and us of triple integral to find the volume of region in 3rd dimension

Topics Covered

UNIT-I 9

Differential Calculus: Leibnitz theorem, Partial derivatives, Euler's theorem for homogenous function, Total derivative, Change of variable. Taylor's and Maclaurin's theorem. Expansion of function of two variables, Jacobian, Extrema of function of several variables.

UNIT-II 9

Linear Algebra: Rank of Matrix, Inverse of a Matrix, Elementary transformation, Consistency of linear system of equations and their solution. Characteristic equation, Eigenvalues, Eigen-vectors, Cayley-Hamilton theorem.

UNIT-III 9

Multiple Integrals: Double and triple integrals, change of order of integration, change of variables. Application of multiple integral to surface area and volume. Beta and Gamma functions, Dirichlet integral.

UNIT-IV 9

Vector Calculus: Gradient, Divergence and Curl. Directional derivatives, line, surface and volume integrals. Applications of Green's, Stoke's and Gauss divergence theorems (without Proofs).

Books & References

1. B.S. Grewal: Higher Engineering Mathematics; Khanna Publishers.
2. B.V. Ramana: Higher Engineering Mathematics, Tata Mc. Graw Hill Education Pvt. Ltd., New Delhi.
3. H.K. Dass and Rama Verma: Engineering Mathematics; S. Chand Publications.
4. N.P. Bali and Manish Goel: Engineering Mathematics; Laxmi Publications.

BEE-02		**ELECTRICAL CIRCUIT ANALYSIS**
Course category	:	Engineering Fundamentals (EF)
Pre-requisite Subject	:	Physics and Math (10+2)
Contact hours/week	:	Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Solve the dc electrical circuit parameters using basic circuit laws and theorems.
2. Analyse the ac circuit behaviour with different combination of linear active and passive elements.
3. Analyse the transient behaviour of ac circuit and find the effectiveness of current and voltage waveforms on electrical circuits.
4. Solve parameters of three phase balanced ac circuits and single-phase magnetic circuits

Topics Covered

UNIT-I 9

D C Circuit Analysis and Network Theorems: 9 Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Source transformation Kirchhoff's laws; Loop and nodal methods of analysis; Star-delta transformation Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem

UNIT-II 9

Analysis of Single Phase AC Circuits: 9 Complex quantities, the operator J, Representation of vectors, forms of expression of complex quantities, complex expression of voltage , current and impedance, addition and subtraction of Steady State , AC fundamentals, Sinusoidal, square and triangular waveforms, Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current, Analysis of series, parallel and series parallel RLC Circuits, Resonance in series and parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Causes and problems of low power factor, Concept of power factor improvement.

UNIT-III 9

Transient State Analysis: 9 Transient response of series RL circuit with alternating voltage source, Transient Response Analysis of series RC circuit, Transient Response Analysis of series RLC circuit. Non sinusoidal waves: generation of non- sinusoidal waves, Fourier analysis, constants in Fourier series, Effective values of complex wave, power and power factor. Need of Earthing of equipment and devices, important electrical safety issues

UNIT-IV 9

Three Phase AC Circuits: 9 Three phase system its necessity and advantages, Star and

delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three phase power. Magnetic Circuit: Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Mutual coupling with dot convention, Magnetic circuit calculations, Mutual inductance coupling coefficient.

Experiments

1. Verification of Kirchhoff's law
2. Verification of Norton's theorem
3. Verification of Thevenin's theorem
4. Verification of Superposition theorem
5. Verification of Series R-L-C circuit
6. Verification of Parallel R-L-C circuit
7. Study of R-L-C series resonant circuit
8. Study of R-L-C Parallel resonant circuit

Books & References

1. K. S. Suresh Kumar: Electrical Circuit Analysis . Pearson, 2013
2. Lawrence P. Huelsman „Basic Circuit Theory", 3rd ed. PHI
3. T.K. Nagsakar & M.S. Sukhija „ Basic Electrical Engg"., OXFORD, 2nd ed
4. Samarjit Ghosh, „Network Theory: Analysis and Synthesis" PHI

BHM-01/BAS-03 PROFESSIONAL COMMUNICATION

Course category	:	Humanities & Social Science Core (HSSC)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Overcome the problems he/she faces in oral and written communication.
2. Acquire knowledge of and methods for using technical communication, such as, reports, proposals and business letters etc.
3. Use and practice compositions correctly.
4. Give Presentations in different sessions and make self appraisal.
5. Learn and understand the various facets of communication skills, such as, Reading, Writing , Listening and Speaking skills and identify, formulate and solve the real life problems with positive attitude; also inculcate the habit of learning and developing the communication and soft skills

Topics Covered

UNIT-I 9

Communication

Principles of Communication – Communication as coding and decoding – signs and symbols – verbal and non –verbal symbols – Language AND communication; language VS communication, language as a tool of communication – media/channels for communication : Types of Communication- functional, situational, verbal and non-verbal, interpersonal, group, interactive, public, mass line, dyadic – with illustrations LSRW in Communication – Listening – active vs passive (Talk less, listen more); Speaking - Speech vs. enunciation (mind your tone); Reading – Focus on the structure not on the theme alone, Technical Communication, General Communication, Barriers of Communication, Levels of Communication

UNIT-II 9

Language Acquisition through Grammar, Usage and Mechanics of Writing

Vocabulary, Phrase, Clause, Parts of Speech: Types ,Examples with Use Gender, Singular, Plural, Article, Sequence of Tenses, Use of Modifiers, Sentence-Loose Sentence, Periodical Sentence, Topic Sentence, Paragraph-Different Orders and Methods of Paragraph Writing, Inductive Method, Deductive Method, Spatial Method, Question and Answer Method, Chronological Method, Expository Method, Common Errors, Antonyms, Synonyms, One-word Substitutes, Homophone, Homonym, Comprehension and Précis, Words Frequently Misspelt, Punctuation and Capitalization, Abbreviations and Numerals, Proofreading, Using the Library

UNIT-III 9

Technical Writing

Report Writing: Meaning, Types, Structure, Methods and Models of Report Writing, Technical Proposal; Concept, Kinds, Layout, and Examples of Technical Proposal, Definitions, Characteristics, Structure, Letter Writing: Importance, Types, Layout, and examples of letters, Scientific and Technical Writing: Features, Methods, Examples, Project, Thesis and Dissertation Writing

UNIT-IV 9

Spoken and Presentation Skills

Impromptu speech – tackling hesitation, shyness and nervousness in speaking – Public speaking, academic and professional presentations – Group discussions – facilitators and impediments Planning, preparing and delivering a presentation, essentials of presentation - etiquette; clarity; lively delivery – Speech generation; speech rhythm; speech initiators body language – voice, posture and gesture; eye contact; dress codes; verbal crutches; stresses, pronunciation – contextualization – creating and understanding contexts, Speech Drill.

Books & References

1. Complete Course in English - Dixon Robert J., Prentice Hall of India, New Delhi
2. A Practical English Grammar - Thomson and Martinet, ELBS
3. English Pronouncing Dictionary - Jones Daniel, Paperback
4. Spoken English - Bansal ,R.K. &Harrison J.B., Orient Longman, India
5. Handbook of Pronunciation of English Words - Sethi J. & Jindal D.V.A, Prentice Hall of India, New Delhi
6. Word Power Made Easy - Lewis, Norman, Pocket Books
7. Business Correspondence and Report Writing - Sharma R.C. & Mohan Krishna, Tata McGraw Hill
8. Business Communication - Chhabra T.N., Sun India Publication, New Delhi.

BEC-10 ELECTRONICS WORKSHOP & PCB

Course category	:	Engineering Fundamentals (EF)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 0, Tutorial : 0 , Practical: 4
Number of Credits	:	2
Course Assessment Methods	:	Continuous assessment through three Viva voce, Practical work/record, attendance and Major Practical Examination
Course Outcomes	:	After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Understand the design processes and production methods used in the manufacture of a printed circuit board.
2. Understand the use of software techniques in the design and simulation of an electronic circuit.
3. Understand the use and application of chemical itching and drilling in the manufacture of an electronic circuit.
4. Be able to design and manufacture a prototype printed circuit board and use it to assemble and test an electronic circuit.

Topics Covered

Experiments

Note: Minimum five experiments should be performed

1. Winding shop: Stepdown transformer winding of less than 5VA.
2. Soldering shop: Fabrication of DC regulated power supply.
3. Design a PCB using Etching &drilling.
4. Design a full wave center tapped rectifier & study the effect of capacitive filter &its output on a virtual oscilloscope.
5. Design a RLC resonance circuit & verify the transient & phase response for different values of R, L & C.
6. Design a half adder using discrete components & verify the timing diagrams.
7. Convert the power supply circuit into PCB & simulates its 2D & 3Dview.
8. Coating of etched PCB to protect it from oxidation.

BCY-04/BAS-05 ENVIRONMENT & ECOLOGY

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisites	:	NIL
Contact hours/week	:	Lecture : 2, Tutorial : 1 , Practical: 0
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Students will acquire basic knowledge in Environment and Ecology, which allows students to gain qualitative and quantitative skills.
2. Students will aware of environmental pollution and control methods along with quality standards of air, water etc along with waste management.
3. Students will able to give systematic account of natural resources their use of exploitation and environmental
4. How to achieve sustainable development through strategies and its threats

Topics Covered

UNIT-I 6

The Multidisciplinary nature of environmental studies, 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, Timber extraction, mining.

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

(c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources,

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

(e) Energy resources: Growing energy needs, renewable and non renewable energy sources,

use of alternate energy sources.

UNIT-II 6

Ecosystems

Concept 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: (a) Forest ecosystem (b) Grassland Ecosystem (c) Aquatic ecosystems (ponds, rivers, oceans)

Biodiversity

Introduction- Definition: genetic, species and ecosystem diversity, Biogeographical

classification of India, Value of 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 loss, Endangered and endemic species of India,

Conservation of biodiversity:

UNIT-III 6

Environmental Pollution Causes, effects and control measures of-

(a) Air Pollution. (b) Water Pollution. (c) Soil Pollution (d) Marine Pollution. (e) Noise Pollution. (f) Thermal Pollution.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution

Global warming and greenhouse effect, Acid Rain, Ozone Layer depletion

UNIT-IV 6

Environmental Protection- Role of Government, Legal aspects, Initiatives by Non-governmental Organizations (NGO), Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, public awareness.

Human Population and the Environment

Population growth, Population explosion- Family Welfare Programme, Environment and human health, Environmental Education, Women Education., Women and Child Welfare

Books & References

1. Environmental Studies - J Krishnawamy , R J Ranjit Daniels, Wiley India
2. Environmental Science - Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall
3. Environment and Ecology - R K Khandal, 978-81-265-4277-2, Wiley India
4. Environmental Science – 8th edition ISV, Botkin and Keller, 9788126534142, Wiley India
5. Environmental Studies - Soli. J Arceivala, Shyam, R Asolekar, McGrawHill India, 2012
6. Environmental Studies - D.L. Manjunath, 9788131709122 Pearson Education India, 2007

BPM-02/BAS-08 ENGINEERING PHYSICS-II

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Basics of crystallography and its application in Engineering
2. Use of the principles of sound wave and acoustics in engineering
3. Basic principles of electricity, magnetism, Maxwell's equation, electromagnetic waves and its application in Engineering.
4. Basic principles of semiconducting and advanced materials and its applications in engineering.

Topics Covered

UNIT-I 9

Crystal Structures and X-ray Diffraction: Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer.

UNIT-II 9

Sound Waves and Acoustics: Sound waves, intensity, loudness, reflection of sound, echo; Reverberation, reverberation time, Sabine's formula, remedies over reverberation; Absorption of sound, absorbent materials; Conditions for good acoustics of a building; Noise, its effects and remedies; Ultrasonics –Production of ultrasonics by Piezo-electric and magnetostriction; Detection of ultrasonics; Engineering applications of Ultrasonics (Non-destructive testing).

UNIT-III 9

Electrodynamics –I: Basic concepts of Gauss's law, Ampere's law and faradays law of electromagnetic induction. Correction of Ampere's law by Maxwell (concept of displacement current), Maxwell's equation, transformation from integral form to differential form, physical significance of each equation

Electrodynamics –II: Maxwell's equation in free space, velocity of electromagnetic wave, transverse character of the wave and orthogonality of E, H and k vectors, Maxwell's equations in dielectric medium and velocity of e. m. wave, comparison with free space, Maxwell's equations in conducting media, solution of differential equation in this case and derivation of penetration depth

UNIT-IV 9

Physics of Advanced Materials

Semiconducting Materials: Concept of energy bands in solids, Carrier concentration and conductivity in intrinsic semiconductors and their temperature dependence, carrier concentration and conductivity in extrinsic semiconductors and their temperature dependence. Hall effect in semiconductors, Compound semiconductors, Optoelectronic Materials.

Superconducting Materials: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, Type- I and Type-II superconductors, Electrodynamics of superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Superconductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene and Carbon nanotubes, Applications of nanotechnology.

EXPERIMENTS

1. To determine the specific resistance of a given wire using Carrey Foster's Bridge.
2. To study the variation of magnetic field along the axis of current carrying circular coil.
3. To study the Hall's effect and to determine Hall coefficient in n type Germanium.
4. To study the energy band gap of n- type Germanium using four probe method
5. To determine e/m of electron using Magnetron valve
6. To draw hysteresis curve of a given sample of ferromagnetic material
7. To determine the velocity of Ultrasonic waves
8. To determine the Elastic constants (Y, η, σ) by Searl's method

Books

1. Solid State Physics - S. O. Pillai, 5th edition, New Age International.
2. Semiconductor Devices and Application - S.M. Sze, Wiley
3. Introduction to Nano Technology - Poole Owens, Wiley India
4. Master Hand book of Acoustics - F. Alton Everest and Ken Pohlmann, 5th edition, McGraw Hill
5. Engineering Physics : B.K. Pandey and S. Chaturvedi, Cengage Learning

References

1. Introduction to Solid State Physics- Kittel , 7th edition, Wiley Eastern Ltd.
2. Introduction to Electrodynamics- David J. Griffiths Pearson, New International Edition

BCY-01/BAS-09 ENGINEERING CHEMISTRY

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Students will acquire basic knowledge in Engineering Chemistry, which allows students to gain qualitative and quantitative skills.
2. Make good scientific observations and develop experimental method of evaluation of different systems at industrial or research level.
3. Students will develop Interdisciplinary skills which can help them to thrive in the lifelong changing environment in various fields of Industry.
4. Students will acquire practical knowledge and will be able to analyze data constructively and formulate new ideas

Topics Covered

UNIT-I 9

Molecular orbital theory, LCAO approximation, MO diagrams of diatomic molecules. Band theory of metallic bond, Hydrogen bonding, Structure of graphite and fullerene- C60, Liquid crystallite state, classification and applications of liquid crystals, Types of unit cell, space lattice (only cubes), Bragg's Law, Calculation and density of the cubic unit cell, Phase Rule and its application to water system.

UNIT-II 9

Inductive, mesomeric and hyperconjugative effects, Stability of reactive intermediates, e.g. Carbocation, Carbanion and free radicals, Types of organic reactions, & Mechanism of nucleophilic substitution & elimination reactions, Mechanism of organic name reactions (Cannizzaro reaction, Aldol condensation, Beckmann rearrangement, Hoffmann rearrangement & Diels Alder Reaction) Stereosomerism of organic compounds containing one & two chiral centers. Enantiomers & diastereomers, R-S & E-Z Nomenclature, Examples of optically active compounds without chiral centre, Conformations of butane

UNIT-III 9

Introduction & classification of polymers, Chain and Step growth polymerization, Thermoplastic and Thermosetting resins, Elastomers and synthetic fibres, Mechanism of chain polymerization, Stereoregular polymers, Synthesis and applications of: Polyethylene, Poly propylene, PVC, PMMA, PAN, PET, Polyamides, Polyurethane, Natural and synthetic

Rubbers, Phenol Formaldehyde Resin.
Conducting & biodegradable polymers and their applications Cement and its applications.
Classification of Fuels, calorific value of fuel, gross & net calorific value, determination of calorific value using Bomb calorimeter

UNIT-IV 9

Basic principles of spectroscopic methods, Basic principles of UV-Visible, IR, 1H NMR & Mass spectroscopy, determination of structure of simple organic compounds.
Hardness of water, Softening of water (Zeolite process, Lime Soda process & Ion exchange process).
Treatment of boiler feed water by Calgon process

EXPERIMENTS

1. Determination of iron content in the given sample using K3[Fe(CN)6] as an external indicator.
2. Determination of temporary and permanent hardness in water sample using EDTA as standard solution.
3. Determination of alkalinity in the given water sample.
4. Determination of chloride content in the given water sample by Mohr's method.
5. Determination of percentage of available chlorine in bleaching powder sample.
6. pH-metric titration between strong acid and strong base.
7. Viscosity of a polymer like polystyrene by Viscometric method.
8. Element detection & functional group identification in organic compounds
9. Preparation of a polymer like Bakelite or PMMA.
10. Preparation of Sodium Cobaltinitrite salt.

Books & References

1. Engineering Chemistry, Wiley India
2. Engineering Chemistry, Tata McGraw Hill
3. Concise Inorganic Chemistry - J.D. Lee; Wiley India
4. Organic Chemistry- Morrison & Boyd, 6th edition, Pearson Education
5. Physical Chemistry - Gordon M. Barrow; McGraw Hill
6. Physical Chemistry - Peter Atkins & Julio De Paula, Oxford University Press

BMS-02/BAS-07 ENGINEERING MATHEMATICS – II

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Use of various mathematical techniques such as differential operators, matrix algebra and vector differentiation and integration.
2. To identify, formulate and solve the real life problems.
3. To inculcate the habit of mathematical thinking and lifelong learning.

Topics Covered

UNIT-I 9

Differential Equations: Linear differential equations with constant coefficients $(n^{th} order)$, complementary function and particular integral. Simultaneous linear differential equations, solution of second order differential equations by changing dependent and independent variables, Method of variation of parameters, Applications of differential equations to engineering problems

UNIT-II 9

Special functions: Series solution of second order differential equations with variable coefficient (Frobeneous method). Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials

UNIT-III 9

Laplace Transform: Laplace Transform, Laplace transform of derivatives and integrals. Unit step function, Laplace transform of Periodic function. Inverse Laplace transform, Convolution theorem, Applications to solve simple linear and simultaneous differential equations.

UNIT-IV 9

Fourier Series and Partial Differential Equations: Periodic Functions, Fourier Series of period 2π, Change of interval, Even and Odd functions, Half range Sine and Cosine Series. Harmonic analysis, Partial Differential Equations with constant coefficients

Books & References

1. Higher Engineering Mathematics - B.S. Grewal, Khanna Publishers
2. Engineering Mathematics - H.K. Dass and Rama Verma, S. Chand Publications
3. Engineering Mathematics - N.P. Bali and Manish Goel, Laxmi Publications
4. Higher Engineering Mathematics - B.V. Ramana, Tata McGraw Hill Education Pvt. Ltd., New Delhi.

BCS-01 INTRODUCTION TO C PROGRAMMING

Course category	:	Engineering Fundamental (EF)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Read and understand C programs.
2. Discuss basic theory and practice of programming.
3. Design and implement practical programs using C language.
4. Use compiler and feel comfortable with Windows environment
5. Identify and fix common C errors

Topics Covered

UNIT-I 9

Basics of Computer: Introduction to Digital Computer, Basic Operations of Computer, Functional Components of Computer, Classification of Computers. Introduction to Operating System: DOS, Windows, Linux, Function, Services and Types. Basics of Programming: Approaches to Problem Solving, Concept of Algorithm and Flow Charts, Types of Computer Languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

UNIT-II 9

Standard I/O in "C", Fundamental Data Types and Storage Classes: Character Types, Integer, Short, Long, Unsigned, Single and Double-Precision Floating Point, Storage Classes, Automatic, Register, Static and External, Operators and Expressions: Using Numeric and Relational Operators, Mixed Operands and Type Conversion, Logical Operators, Bit Operations, Operator Precedence and Associativity, C Conditional Program Execution: Applying if and Switch Statements, Nesting if and else, Restrictions on switch Values, Use of Break, Program Loops and Iteration: Uses of while, do and for Loops, Multiple Loop Variables, Assignment Operators, Using Break and Continue

UNIT-III 9

Arrays: One Dimensional, Multidimensional Array and their Applications, Declaration and Manipulation of Arrays Structures: Purpose and Usage of Structures, Declaring Structures, Assigning of Structures, Strings: String Variable, String Handling Functions, Array of Strings, Functions: Designing Structured Programs, Functions in C, User Defined and Standard Functions, Formal vs. Actual Arguments, Function Category, Function Prototype,

Parameter Passing, Recursive Functions. Storage Classes: Auto, Extern, Register and Static Variables

UNIT-IV 9

Pointers: Pointer Variable and its Importance, Pointer Arithmetic and Scale Factor, Compatibility, Dereferencing, L value and R-Value, Pointers and Arrays, Pointer and Character Strings, Pointers and Functions, Array of Pointers, Pointers to Pointers Dynamic Memory Allocation Structure and Union: Declaration and Initialization of Structures, Structure as Function Parameters, Structure Pointers, Unions. File Management: Defining and Opening A File, Closing A File, Input/Output Operations in Files, Pre-Processor Directives, Command Line Arguments

EXPERIMENTS

1. Write a program that finds whether a given number is even or odd.
2. Write a program that tells whether a given year is a leap year or not.
3. Write a program that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
   a. Between 90-100%----------Print ‘A’
   b. 80-90%----------Print ‘B’
   c. 60-80%----------Print ‘C’
   d. Below 60%----------Print ‘D’
4. Write a program that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
5. Write a program to print sum of even and odd numbers from 1 to N numbers.
6. Write a program to print the Fibonacci series.
7. Write a program to check whether the entered number is prime or not.
8. Write a program to find the reverse of a number.
9. Write a program to print Armstrong Numbers from 1 to 100.
10. Write a program to convert binary number into decimal number and vice versa.
11. Write a program that simply takes elements of the array from the user and finds the sum of these elements.
12. Write a program that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
13. Write a program to find the minimum and maximum element of the array.
14. Write a program to search an element in array using Linear Search.
15. Write a program to sort the elements of the array in ascending order using Bubble Sort technique.
16. Write a program to add and multiply two matrices of order NxN.
17. Write a program that finds the sum of diagonal elements of a MxN matrix.
18. Define a structure data type TRAIN_INFO. The type contain
    a. Train No.: integer type
    b. Train name: string
    c. Departure Time: aggregate type TIME
    d. Arrival Time : aggregate type TIME
    e. Start station: string

f. End station : string

The structure type Time contains two integer members: hour and minute. Maintain a train Time table and

19. implement the following operations:

    i. List all the trains (sorted according to train number) that depart from a particular section.

    ii. List all the trains that depart from a particular station at a particular time.

    iii. List all he trains that depart from a particular station within the next one hour of a given time.

    iv. List all the trains between a pair of start station and end station.

20. Write a program to swap two elements using the concept of pointers.
21. Write a program to compare the contents of two files and determine whether they are same or not.

    Write a program to check whether a given word exists in a file or not. If yes then find the number of times it occurs

Textbooks

1. Jeri R. Hanly, Elliot B. Koffman, Problem Solving and Program Design in C, 7thedition, Pearson
2. Childt , Herbert Complete reference with C Tata McGraw Hill

References Books

1. Kerninghan and Ritchie, The C programming language, Prentice Hall
2. Samuel P. Harbison, and Guy L. Steele Jr., C-A Reference Manual, Fifth Edition, Prentice Hall, 2002

BCE-10 ENGINEERING GRAPHICS

Course category	:	Engineering Fundamentals(EF)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture:0, Tutorial : 0 , Practical: 4
Number of Credits	:	2
Course Assessment methods	:	Continuous assessment through three Viva voce, Practical work/record, attendance and Major Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. How Engineering Drawing helps to sketch the imagination?
2. Able to effectively practice the different scales for drawings.
3. Effectively analyze the geometrical shapes and to be able to draw.
4. Know about out solids and discuss about their classification.
5. How to implement the different views for a solid placed in 3dspace.
6. Construction of the object from different perspective.
7. Comparison and contrast between frustum and truncated solid.
8. Sketching of different sections for any 3D regular object.
9. Discussing the principles of Isometric Projection.
10. Sketching isometric projections for different geometrical shapes and solids.

Topics Covered

UNIT-I 6X4

Title: **Conic Sections and Orthographic Projections Introduction**

Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

Orthographic Projections Orthographic Projections covering Principles of Orthographic Projections- Conventions Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Plane

UNIT-II 3X4

Title: **Projection of Regular Solids**

Projections of Regular Solids covering, those inclined to both the Planes- Auxiliary Views

UNIT-III 3X4

Title: **Sections and Sectional Views of Right Angular Solids**

Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone

UNIT-IV 3X4

Isometric Projections

Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions. Overview of computer graphics, demonstrating knowledge of the theory of CAD software.

Textbooks

1. Engineering Drawing-Bhat, N.D.& M. Panchal, Charotar Publishing House, 2008

Reference books

1. Engineering Drawing and Computer Graphics- Shah, M.B. & B.C. Rana, Pearson Education, 2008
2. A Text Book of Engineering Drawing-Dhawan, R.K., S. Chand Publications,2007
3. Text book on Engineering Drawing-Narayana, K.L. & P Kannaiah, Scitech Publishers, 2008

MBA HR6 KNOWLEDGE MANAGEMENT

Course category	:	Program Elective
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 2, Tutorial : 1 , Practical: 0
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, assignments, Methods Quizzes and Minor test and Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. The students will be able to understand the characteristics, components and concept of knowledge economy and its management.
2. Understand need of knowledge organization, knowledge management process cycle, strategy and its development.
3. The ability to understand knowledge management system through IT, to face the future challenges of knowledge management for grooming the career.
4. Improves the overall performance by promoting the learning efficiency, innovation, competitive challenges, creation, dissemination and utilization of knowledge management

Topics Covered

UNIT-I 9

Knowledge Economy-Concept of Knowledge; the Data-Information-Knowledge-Wisdom Relationship (Knowledge Hierarchy); Organizational Knowledge; Characteristics of Organizational Knowledge; Components of Organizational Knowledge (Tacit vs. Explicit Knowledge) Transformation of an Enterprise through Knowledge Management-Concept of Knowledge Management; Characteristics of Knowledge Management

UNIT-II 9

Creating Knowledge Management System in Organizations-Need for a Knowledge Management System; the Knowledge Management Process Framework; Knowledge Management Process; Knowledge Life Cycle

The Knowledge Organization-Knowledge Organization; Characteristics of Knowledge Organization; Knowledge Management and Organizational Learning; Knowledge Management Strategy and its Development; the Knowledge Managers

UNIT-III 9

Enabling Knowledge Management through Information Technology-Role of Information Technology in Creating Knowledge-Management Systems

Organizational Culture for Knowledge Management-Need for Organizational Culture for Knowledge Management; Ways to Develop Knowledge-Sharing Culture

UNIT-IV 9

Looking Ahead: Future of Knowledge Management-Challenges to Knowledge Management; Future of Knowledge Management

Books & References

2. Amrit Tiwana - The Knowledge Management Toolkit : Orchestrating IT, Strategy, and Knowledge Platforms, Pearson Education Limited
3. Edited; D. Morey, M. Maybury and B. Thuraisingham- Knowledge Management: Classic

and Contemporary Works, Universities Press (India) Limited.
4. Edited; R. Gogula- Knowledge Management–A New Dawn, The Institute of Chartered Financial Analysis of India (ICFAI) Press
5. Elias M. Awad, Hassan M. Ghaziri-Knowledge Management, Pearson Education Limited
6. G. Natrajan & S. Shekhar - Knowledge Management: Enabling Business Growth, Tata McGraw-Hill Publishing Company Limited, New Delhi.

BMS-04/BAS-21 ENGINEERING MATHEMATICS – III

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Use of Residue theorem and Integral formula to evaluate various integrals.
2. Use of moments and kurtosis to find the type of curve.
3. To interpolate a curve using Gauss, Newton's interpolation formula.
4. To find the derivative of a curve and area of a curve.

Topics Covered

UNIT-I 9

Functions of Complex Variable: Analytic function, C-R equations, Cauchy-Integral Theorem, Cauchy-Integral formula, Taylor's Series and Laurent Series, Zero's and Singularities, Residue theorem, Evaluation of the real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$ *and* $\int_{-\infty}^{+\infty} f(x)dx$

UNIT-II 9

Statistical Techniques: Moments, Generating function for moments, Skewness, Kurtosis, and Curve fitting: Method of Least Squares, Fitting of Straight lines and Parabola. Correlation and Regression. Binomial Distribution, Poisson's Distribution, and Normal Distributions.

UNIT-III 9

Numerical Techniques: Solution of polynomial equations by Bisection, Regula-Falsi and Newton-Raphson's methods. Interpolation: Newton's forward and backward interpolation formulae, Lagrange's and Newton's divided difference methods for unequal intervals.

UNIT-IV 9

Solution of Linear and Differential equations and Numerical Integration: Solution of linear equations by Crout's method and Guass-Siedel method. Solution of ordinary Differential equations by Euler's, Picard's and Fourth order Runge-Kutta methods. Numerical Integration by Trapezoidal, Simpson's one-third and Simpson's three-eight rules.

Books & References

1. B.S. Grewal - Higher Engineering Mathematics; Khanna Publishers.
2. B.V. Ramana - Higher Engineering Mathematics, Tata McGraw Hill Education Pvt. Ltd., New Delhi
3. H.K. Dass and Rama Verma - Engineering Mathematics; S. Chand Publications
4. N.P. Bali and Manish Goel - Engineering Mathematics; Laxmi Publications.
5. Higher Engineering Mathematics - B.V. Ramana, Tata McGraw Hill Education Pvt. Ltd., New Delhi.

BEE-16 ELECTROMECHANICAL ENRGY CONVERSION

Course category	:	Fundamental Engineering (FE)
Pre-requisite Subject	:	Electrical Circuits and Analysis
Contact hours/week	:	Lecture: 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. The concepts of DC machines with numerical calculation
2. The concepts of Transformer with numerical calculation
3. Concept of Induction Motor with numerical calculation
4. Concept of Synchronous Machine with numerical calculation
5. Basic Concept of Electromagnetic & Electromechanical Energy Conversion

Topics Covered

UNIT-I 9

DC Machines:

Construction of DC Machines, Armature winding, EMF and torque equation, Armature Reaction, Commutation, Interpoles and Compensating Windings, Performance Characteristics of D.C. generators, Performance Characteristics of D.C. motors, Starting of D.C. motors; 3point and 4 point starters, Speed control of D.C. motors: Field Control, armature control and Voltage Control (Ward Lenonard method); Efficiency and Testing of D.C. machines (Hopkinson's and Swinburn's Test).

UNIT-II 9

Transformers:

Principle of operation, Construction, Phasor diagram, efficiency and voltage regulation of 1-phase transformer, O.C. and S.C. tests, Sumpner's test, polarity test. Single phase and three phase auto transformers, volt-amp, relation, efficiency, merits & demerits and applications, three phase to 2 phase, 6 phase or 12 phase connections, and their applications.

UNIT-III 9

Induction Motors:

Constructional features of 3-phase induction motor, Rotating magnetic field, Principle of operation, Phasor diagram, equivalent circuit, torque and power equations, Torque- slip characteristics, no load & blocked rotor tests, efficiency, Starting, Speed Control (with and without EMF injection in rotor circuit.) Constructional features and working of 1-phase induction motor, Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, starting methods.

UNIT-IV 9

Synchronous Machines:

Constructional features and working of 3-phase Alternator, Armature winding, EMF Equation, Winding coefficients, equivalent circuit and phasor diagram, Armature reaction, O. C. & S. C. tests, Voltage Regulation using Synchronous Impedance Method, MMF Method, Potier‟s Triangle Method, Two Reaction Theory, Power flow equations of cylindrical and salient pole machines, operating Characteristics, Starting methods of 3-phase synchronous motor, Effect of varying field current at different loads, V- Curves.

EXPERIMENTS

Note: Minimum eight experiments are to be performed from the following list:

1. To obtain magnetization characteristics of a d.c. shunt generator
2. To obtain load characteristics of a d.c. shunt generator
3. To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control.
4. Determine V-curves and inverted V-curves of a three-phase synchronous motor.
5. To obtain equivalent circuit, efficiency and voltage regulation of a single-phase transformer using O.C. and S.C. tests.
6. To obtain efficiency and voltage regulation of a single-phase transformer by Sumpner's test
7. To study polarity and ratio test of single phase and 3-phase transformers
8. To perform no load and blocked rotor tests on a three-phase squirrel cage induction motor and determine equivalent circuit.
1. To perform no load and blocked rotor tests on a single-phase induction motor and determine equivalent circuit.
2. To perform open circuit and short circuit tests on a three-phase alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by Synchronous Method

   Determine V-curves and inverted V-curves of a three-phase synchronous motor

Books & References

1. I.J. Nagrath & D. P. Kothari, "Electrical Machines", Tata McGraw Hill
2. Husain Ashfaq, "Electrical Machines", Dhanpat Rai & Sons
3. A.E. Fitggerald, C. Kingsley Jr and Umans, "Electric Machinery" 6th Edition McGraw Hill, International Student Edition.
4. B.R. Gupta &Vandana Singhal, "Fundamentals of Electrical Machines, New Age International.
5. Irving L. Kosow, "Electric Machine and Tranformers", Prentice Hall of India.
6. M.G. Say, "The Performance and Design of AC machines", Pit man & Sons.
7. Bhag S. Guru and Huseyin R. Hizirogulu, "Electric Machinery and Transformers" Oxford University Press, 2001.
8. P. S. Bimbhra, "Electrical Machinery", Khanna Publisher
9. P.S. Bimbhra, "Generalized Theory of Electrical Machines", Khanna Publishers.

BPM-05/BAS-28 SOLID STATE PHYSICS

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. The fundamental concepts of crystal structure and various kinds of bonds in solid.
2. The knowledge of crystal imperfections and different theories related to molar heat capacity.
3. The knowledge of energy bands in insulators and semiconductors. Concept of Fermi level.
4. The knowledge of electrical and optical properties of semiconductors and brief knowledge of superconductivity.

Topics Covered

UNIT-I

Crystal Structure and Binding 9

Classification of Solids, Space lattice and Bravias lattice, Primitive and unit cell, Co-ordination number , Atomic packing factor, Atomic radii, Miller indices, Inter planner spacing, Important crystal structures (NaCl, CsCl, ZnS, graphite and diamonds), Primary and Secondary bonds, Ionic, covalent, metallic and hydrogen bonds, Vander wall bonds, Forces between bonds, Dislocation energy, Cohesive energy.

Determination of Crystal Structure

Bragg's law, Laue pattern, X-ray diffractometer, Determination of lattice parameters using XRD, Absorption of X-rays, Absorption edge.

UNIT-II

Defects in Solids 9

Various kinds of crystal imperfections, Point defect, Schottky and Frenkel defect, Dislocations, Edge and screw dislocation, Grain boundary, Effect of defects on electrical properties of materials.

Lattice Dynamics and Thermal Properties

Concept of lattice vibrations and thermal heat capacity, classical, Einstein and Debye theories of molar heat capacity and their limitations, concept of phonons.

UNIT-III

Band Theory of Solids 9

Allowed and forbidden energy bands, Classification of materials on the basis of energy bands, Energy bands in insulators and semiconductors, Fermi energy, effect of impurity addition on the position of Fermi level in semiconductors.

UNIT-IV 9

Semiconducting Properties of Solids

Semiconductors, Carrier generation and recombination, Carrier drift and carrier diffusion, effect of temperature and impurity addition on the conductivity of semiconductors, Mobility

of charge carriers, effect of temperature on mobility, Hall effect in semiconductors, Junction properties.

Superconductivity

Basic properties and types of superconductors; Thermodynamics of superconducting transition, London equation, Coherence length, Basic idea of BCS Theory, Elementary discussion of high T_c superconductors.

Optical Properties of Solids

Optical reflectance, Kramers-Kronig relations; Conductivity and dielectric function of collision electron gas; Basic Theories and models of luminescence, phosphorescence, thermoluminescence, electroluminescence and photo-conductivity; colour centres.

EXPERIMENTS

Minimum Six experiments are to be conducted from the following:

1. Measurement of dielectric constant at high temperature.
2. Determination of reverse saturation current of p-n junction.
3. Study of Energy Band Gap of p-n Junction.
4. Study of Junction Capacitance of p-n junction.
5. To study the current vs voltage characteristics of CdS photo-resistor at constant irradiance.
6. To measure the photo-current as a function of the irradiance at constant voltage.
7. Measurement of resistivity of semiconductor by four probe method.
8. Determination of Energy Band Gap of semiconductor.

Books & References

1. J.P. Srivastava: Elements of Solid State Physics, (PHI New Delhi)
2. Solid State Physics by S.O. Pillai (New Age Science Ltd., New Delhi)
3. Solid state Physics by A-J. Dekkar (McMillan and Co., London)
4. Introduction to Solid State Physics by C. Kittel (Wiley Eastern, New Delhi)

BEC-11	**NETWORK ANALYSIS & SYNTHESIS**
Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to apply concept of linearity, superposition, nodal, mesh and network theorems to analyze complex RL, RC & RLC circuits in time and frequency domain
2. Able to apply the concept of Laplace transforms to evaluate the system function for single and two port networks
3. Able to synthesize the RL, RC & RLC impedance networks using the Foster and Cauer approaches.
4. Understand the fundamental of stability and its importance for the evaluation of two port network parameters.

Topics Covered

UNIT-I 9

Signal analysis, Complex frequency, Network analysis, Network synthesis General characteristics and descriptions of signals, with associated wave forms, Unit step function, Unit impulse and ramp function. Introduction to network analysis, network elements, Initial and final conditions, Solution of network equations, Maximum Power Transfer Theorem, Milliman's Theorem

UNIT-II 9

Review of Laplace transforms, poles and zeroes, Initial and final value theorems, Transform circuit, Thevenin's and Norton's theorems, System function, step and impulse responses, Convolution integral. Amplitude and phase responses. Network functions, Relation between port parameters, Transfer functions using two port parameters, Interconnection of two ports

UNIT-III 9

Hurwitz polynomials, Positive real functions, Synthesis using Cauer and Foster: Properties of real immittance functions, synthesis of LC driving point immittances, Properties of RC driving point impedances, Synthesis of RC impedances or RL admittances, Properties of RL impedances and RC admittances.

UNIT-IV 9

Concept of Poles and Zeroes on the stability, Properties of Open Circuit and Short Circuit Parameters, Zeroes of transmission, Synthesis of Y_{21} and Z_{21} with 1Ωterminations, Introduction to active network synthesis.

Books & References

1. Franklin F. Kuo, “Network Analysis and synthesis”, 2nd Edition, Wiley India Pvt Ltd.
2. Behrouz Peikari, “Fundamentals of Network Analysis & synthesis”, Jaico Publishing House, 2006.
3. M.E. Van Valkenberg, “Network Analysis”, 2nd Edition, Prentice Hall of India Ltd

BEC-12 DIGITAL ELECTRONICS & CIRCUITS

Course category	:	Department Core (DC)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Acquired knowledge about basics of digital electronics and solving problems related to number systems and Boolean algebra.
2. Ability to identify, analyze and design combinational and sequential circuits.
3. To design, implement and evaluate various synchronous and asynchronous sequential circuits and applications.
4. Acquired knowledge about internal circuitry and logic behind any digital system.

Topics Covered

UNIT-I 9

Digital system and Binary numbers: Signed binary numbers, Floating point number, Binary Codes, Cyclic codes, Error detecting and correcting codes, Hamming codes. NAND and NOR implementation, Minimization of circuit using K-map and Tabular method up to five variables, POS and SOP simplification, Logic family- TTL, DTL, ECL, CMOS, HMOS

UNIT-II 9

Combinational Logic: Analysis and Design procedure for Combinational circuits, Binary adder/subtractor, Binary multiplier, Booth Algorithm, Magnitude comparator, Encoder/ Multiplexer, Decoder/Demultiplexer.

UNIT-III 9

Sequential logic: Sequential circuits, Latches, Flip-flops, Conversion of flip-flops, Analysis of clocked sequential circuits, State reduction and assignments.

Registers and counters: Shift registers, Asynchronous counter, Synchronous counter, Sequential circuit analysis and design procedure, Circuit with latches, Hazards.

UNIT-IV 9

Memory and programmable logic: Read only Memory, Read/Write Memory-SRAM and DRAM. Programmable Logic Devices,-PLAs, PALs and their applications; Sequential PLDs and their applications; State machine design with sequential PLDs: Introduction, to field programmable gate
arrays (FPGAs).

EXPERIMENTS

A. Compulsory Experiments

1. Design and verification of following arithmetic circuits using 74xx family ICs.
    a. Half adder and Full adder
    b. Half subtractor and full subtractor
2. To perform the code conversion- binary to gray and gray to binary and its truth table verification.
3. To design a combinational logic circuit using 74xx family ICs and its truth table verification in both SOP and POS forms.
4. Realization of 2:4 decoders and 4:2 encoder circuit and verification of its truth table.
5. To design and verify the truth table of multiplexer and demultiplexer circuits.
6. To design a 1-bit comparator using 74xx family ICs and to study the performance of4-bit comparator IC7485.
7. Design and verification of basic Flip-Flops using 74xx family ICs and master-slave JK flip-flop using IC7476.

B. Optional Experiments

8. To realize and verify the truth table of shift register-SIPO/SISO and PISO/PIPO.
9. Design and verification of asynchronous counter design and Mod-n counter.
10. To realize and verify the truth table of synchronous counter design.
11. To conduct an experiment to store a set of data in a RAM using IC 7489 starting from location-

    --------to location ------- and retrieve the same data.
12. To study and verify the functional table of 4-bit ALU using IC74181.

Books & References

1. Hill & Peterson, “Switching Circuit & Logic Design”,Wiley.
2. Digital principle and applications Malvino and Leach-(TMH)

BHM-03/BAS-20 COMMUNICAION SKILLS

Course category	:	Humanities & Social Sciences (HSS)
Pre-requisites	:	NIL
Contact hours/week	:	Lecture : 0, Tutorial : 0 , Practical: 4
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through three Viva voce, Practical work/record, attendance and Major Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Overcome the problems he/she faces in oral and written communication.
2. Acquire knowledge of and methods for using technical communication such as reports, proposals and business letters, etc.
3. Use and practice compositions correctly.
4. Give Presentations in different sessions and make self appraisal.

Topics Covered

UNIT-I 12

Software to be used: Learn to Speak English and Present individually and in group Introduction to vowel and consonant sounds; introduction to syllable stress; noun stress; voiced and voiceless sounds; diphthongs; rate of speech.

UNIT-II 12

Fluency Building – word match, reading aloud, recognition of attributes, parts of speech in Listening, reading and writing.

UNIT-III 12

Group Discussion, Argumentative Skills, Interview skills, completing the steps involved in Career, Life Planning and Change Management.

UNIT-IV 12

Presentation skills, Extempore (on-spot speech delivery), Improving body language and cross- cultural communication with pictures, making an oral presentation in English.

Books & References

1. A Manual for English Language Laboratory, Sudha Rani, Pearson.
2. English Language Communication Skill (lab),
3. Malcome Goodale, ―Professional Presentations, (VCD) New Delhi: Cambridge University Press, 2005
4. Robert M. Sherfield and et al ―Developing Soft Skills,4th Edition, New Delhi, Pearson Education, 2009
5. Study Materials from CIEFL, Hyderabad

BPM-04/BAS-22 NANOTECHNOLOGY

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 2, Tutorial : 1 , Practical: 0
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Will be able to demonstrate breadth and depth of knowledge in nanoscience and nanotechnology.
2. The effect of dimensionality and size on material properties.
3. The tools and techniques which can help them to experimentally observe nanomaterials.
4. They can explore the material world with their advance possible applications in making devices and sophisticated instruments.
5. They can find the vital role of this emerging area across various engineering disciplines.

Topics Covered

UNIT-I

Introduction 6

Definition of Nanoscience and Nanotechnology, Applications of Nanotechnology.

Introduction to Physics of Solid State

Structure: Size dependence of properties; crystal structures, Face Centered Cubic (FCC) and Hexagonal Closed Packing (HCP) nanoparticles; Tetrahedrally bounded semiconductor structures; lattice vibrations.

Energy Bands

Insulators, semiconductor and conductors; Reciprocal space; Energy bands and gaps of semiconductors.

UNIT-II

Quantum Theory For Nanoscience 6

Time dependent and time independent Schrodinger wave equations. Particle in a box, Potential step, Overview of Reflection and tunneling, Penetration of Barrier, Electron trapped in 2D plane sheet, Quantum confinement effect in nanomaterials.

Quantum Wells, Wires and Dots

Preparation of Quantum Nanostructure; Size and Dimensionality effect.

UNIT-III

Growth Techniques of Nanomaterials 6

Lithographic and Non-lithographic techniques, Sputtering and film deposition in glow discharge, DC sputtering technique. Thermal evaporation technique, E-beam evaporation, Chemical Vapour Deposition (CVD), Pulsed Laser Deposition, Molecular beam Epitaxy,

Sol-Gel Technique (No chemistry required), Electro-deposition, Chemical bath deposition, Ion beam deposition system.

Some Important Nanostructures

Bucky Ball, Carbon nanotubes, synthesis, properties and their applications.

UNIT-IV

Tools for Characterization of Nanomaterials 6

Structure: Crystallography, particle size determination, surface structure.

Microscopy: Scanning Probe Microscopy (SPM), Atomic Force Microscopy (AFM), Field Ion Microscopy, Scanning Electron Microscopy, Transmission Electron Microscopy (TEM).

Books & References

1. Introduction to Nanotechnology - C.P. Poole Jr and F.J. Owens, Wiley India, New Delhi
2. Nano Materials - A.K. Bandyopadhyay, New Age International
3. Microcluster Physics - S. Sugano & H. Koizuoni, Springor 1998
4. Handbook of Nanostructured Materials & Nanotechnology" vol.-5, Academic Press, 2000

BPM-08/BAS-23 ENGINEERING MATHEMATICS-IV

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 2, Tutorial : 1 , Practical: 0
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Use of Laplace Transform to solve the differential equation.
2. Use of Fourier transforms and Z transforms to solve the differential equation.
3. To solve the partial differential equations using Lagrange and charpits metghod.
4. Application of partial differential equation in real life problems

Topics Covered

UNIT-I

Integral Transform I: Laplace Transform Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function. Laplace transform of periodic function, Impulse function. Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations. 9

UNIT-II

Integral Transform II: Fourier integral, Complex Fourier transform, Inverse Transforms, Convolution Theorems, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equation, wave equation. Z- transform and its application to solve difference equations 9

UNIT-III

Partial Differential Equations 9

Partial differential equations of the first order, Lagrange's solution, Charpit's general method of solution, Partial differential equations of the second order: Constant coefficient and reducible to constant coefficient, Classification of linear partial differential equations of second order.

UNIT-IV

Applications of Partial Differential Equations: Method of separation of variables for solving partial differential equations, Wave equation up to two-dimensions, Laplace equation in two dimensions, Heat conduction equations up to two dimensions. 9

Books & References

1. B.S. Grewal - Higher Engineering Mathematics; Khanna Publishers.
2. B.V. Ramana - Higher Engineering Mathematics, Tata McGraw Hill Education Pvt. Ltd., New Delhi
3. H.K. Dass and Rama Verma - Engineering Mathematics; S. Chand Publications
4. N.P. Bali and Manish Goel - Engineering Mathematics; Laxmi Publications.

BEC-13	**SIGNALS & SYSTEMS**
Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to describe the signals and systems mathematically and understand how to perform mathematical operations on signals and systems.
2. Able to analyze spectral characteristics and system properties based on impulse response and Fourier analysis.
3. Apply the Laplace transform and Z- transform for analyzing of continuous-time and discrete-time signals and systems.
4. Able to apply the transformation tools (continuous and discrete) on the analysis of spectral densities, design of system function and its block diagram representation.

Topics Covered

UNIT-I 9

Signals: Definition, types of signals and their representations: Continuous-time/discrete-time, Periodic/non-periodic, Even/Odd, Energy/Power, Deterministic/Random, One dimensional /Multidimensional, Commonly used signals (in continuous-time as well as in discrete-time): Unit impulse, Unit step, unit ramp (and their interrelationships), Exponential, Rectangular pulse, Sinusoidal; Operations on continuous-time and discrete-time signals (including transformations of independent variables).

Systems: Classification, Linearity, Time-invariance and causality, Impulse response, Characterization of linear time-invariant (LTI) systems, Unit sample response, Convolution summation, Step response of discrete time systems, Stability, Poles and zeros

UNIT-II 9

Fourier Series (FS) and Fourier Transforms (FT):

(i) Fourier series representation and some important properties (ii) Definition, conditions of existence of FT, properties, Magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT (iii) Discrete time Fourier transform (DTFT), Inverse DTFT, Convergence, Properties and theorems, Comparison between continuous time FT and DTFT

UNIT-III 9

Laplace-Transform (LT) and Z-transform (ZT): (i) One-sided LT of some common signals, Important theorems and properties of LT, inverse LT, Solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC) (ii) One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, Solution of difference equations using one-sided ZT, s- to z-plane mapping

UNIT-IV 9

Time and frequency domain analysis of systems

Convolution integral, Co-relations, Signal energy and energy spectral density, signal power and power spectral density, Properties of power spectral density, Analysis of first order and second order systems, continuous-time (CT) system analysis using LT, System functions of CT systems, Block diagram representations; discrete-time system functions,block diagram representation, Illustration of the concepts of system bandwidth and rise time through the analysis of a first order CT low pass filter

Books & References

1. Chi-Tsong Chen, `Signals and Systems', 3rd Ed., Oxford University Press,2004
2. V.Oppenheim,A.S.WillskyandS.HamidNawab,'Signals&System',PearsonEducation,2nd Ed.,2003
3. P. Ramakrishna Rao, `Signal and Systems' 2008 Ed., Tata McGraw Hill, NewDelhi

BEC-14 ELECTROMAGNETIC FIELD THEORY

Course category	:	Department Core (DC)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Apply vector calculus to understand the behavior of Electrostatic Fields and Magnetostatic Fields in standard configurations.
2. Able to learn Maxwell's equations to understand boundary conditions of time varying fields.
3. Able to understand how EM waves will propagate in free space and their characteristics at the boundary between media
4. Become familiar with the characteristics of transmission lines and their equivalent circuits and learn parameters and transmission line equations.

Topics Covered

UNIT-I

Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses's Law – Maxwell's equation, Electric dipole and flux lines, Energy density in electrostatic fields. Electric field in material space: Properties of materials, Convection and conduction currents, conductors, Polarization in dielectrics, Dielectric Constants, continuity equation and relaxation time, Boundary condition. Electrostatic boundary value problems: Poisson's and Laplace's equations, General procedures for solving Poisson's or
Laplace's equations, Resistance and capacitance, Method of images 9

UNIT-II

Magnetostatics: Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, Application of Ampere's law, Magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces dueto magnetic field, Magnetic torque and moment, a magnetic dipole, Magnetization in materials, magnetic boundary conditions, Inductors and inductances, Magnetic energy. Waves and applications: Maxwell's equation, Faraday's Law, Transformer and motional electromotive forces, Displacement current, Maxwell's equations in differential and integral form 9

UNIT-III

Electromagnetic wave propagation: Wave propagation in lossy dielectrics, Plane waves in lossless dielectrics, Plane wave in free space, Plain waves in good conductors, Power and the Poynting vector, Reflection and Refraction of a plane wave at normal and Oblique incidence. 9

UNIT-IV

Transmission lines: Transmission line parameters, Transmission line equations, Input impedance, Standing wave ratio and power, The Smith chart, Coaxial lines and Waveguides. 9

Books & References

1. W. H. Hayt and J. A Buck "Electromagnetic field Theory" 7thEd.TMH
2. M. N. O. Sadiku, "Elements of Electromagnetics", 4th Ed, Oxford University Press

BEC-15	**SOLID STATE DEVICES & CIRCUITS**
Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One MajorTheory & Practical Examination
Course Outcomes	: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Identify the various types of special diodes and Understand the operations, characteristics and applications of special diodes in electronic devices
2. Know the structure of BJT and understand its operation and characteristics in different configurations, design and analyse the DC bias and AC circuitry of BJT and distinguish the performance and behaviour of BJT amplifiers at low and high frequencies and illustrate its applications.
3. Know the structure of MOSFET and understand its operation and characteristics in different configurations, design and analyse the DC bias and AC circuitry of MOSFET and distinguish the performance and behaviour of MOSFET amplifiers at low and high frequencies and illustrate its applications and recognition of evolution of MOSFET devices.
4. Understand the concept of feedback amplifiers and oscillators, learn about different feedback configurations and design and investigate feedback amplifier circuits and oscillators employing BJT and MOSFET devices.

Topics Covered

UNIT-I 9

Crystal Properties and charge Carriers in Semiconductors, Elemental and compound semiconductor materials, crystal lattice structure, Bonding forces and energy bands in solids, charge carriers in semiconductors, Donor/Acceptor carrier concentrations, Mobility and Conductivity, drift of carriers in electric and magnetic fields, Potential variation within a graded semiconductor, p-n junction behavior, Charge control description of a diode.
Special Diodes: Varactor diode, Zener Diode, Schottky barrier diode, Light Emitting diode, Photo diode, Characteristics and applications.

UNIT-II 9

BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier. Darlington pair, BJT differential pair, Cascode and Cascade amplifier.

UNIT-III 9

MOSFET: Review of device structure operation and V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier.

UNIT-IV 9

Feedback Amplifiers: The general feedback structure, properties of negative feed- back, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt-series feedback amplifier.

Oscillators: Basic principles of sinusoidal oscillators, RC Phase-shift Oscillator circuits, Resonant- circuit oscillators.

EXPERIMENTS

1. Study of JFET drain and transfer characteristics.
2. JFET biasing arrangement Graphical method.
3. Build and Test JFET CS amplifier. Find performance parameters for JFET amplifier - A_V, Ri, R_O.
4. Simulation of JFET CS amplifier using multisim/spice.Find performance parameters for JFET amplifier - A_V, Ri, R_O and compare with theoretical and practicalresults.
5. Input and Output Characteristics of BJT CE configuration. Find h parameters from characteristics.
6. Build and Test BJT in CE amplifier and find performance parameters - A_V, Ri, R_O, Ai
7. Simulation of BJT CE amplifier using multisim/spice.
8. Find performance parameters for BJT amplifier - A_V, Ri, R_O,Ai and compare with theoretical and practical results.
9. Comparison of CE, CC, CB configurations in terms of A_V, Ri, R_o,Ai
10. Study of MOSFET drain and transfer characteristics
11. Frequency response - For BJT/ FET single stage amplifiers - Effect of unbypassed R_E and R_S.
12. Effect of coupling and bypass capacitors on low frequency cut-off.
13. Design Wein bridge Oscillator/RC-phase shift Oscillator.

Books & References

1. Milman, Halkias &Jit- Electronics Devices and Circuits-TMH
2. Donald A Neaman, “Semiconductor Physics and Devices Basic Principles”, 3e, TMH India.

MBA-03 PUBLIC ADMINISTRATION

Course category	:	Program Elective
Pre-requisites	:	General Management
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, assignments, Methods Quizzes and Minor test and Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. The students will be able to know the scope, significance and methodology of public administration.
2. Able to understand public corporation, board, administrative set up in India, administrative decentralization and coordination.
3. Understands the objectives, recruitment, training, terms of employment of personnel administration, financial organization and its administration, and parliamentary control over the financial management.
4. Understands the accountability and judicial control over public administration, administrative aspects for rural and urban administration in India.

Topics Covered

UNIT-I 9

Nature, scope and the significance of the study of Public Administration, Public Administration and other Social Sciences, Methodology, Politic-Socioeconomic-Development and Public Administration, Role of Chief Executive Union Cabinet and Co-ordination of Public Administration

UNIT-II 9

Forms of Organisation department, Public Corporation, Commission and Board, Administrative Organisation in India Direction, Communication, Decentralisation, Deconcentration Co-ordination, Methods, Role of O and M Units in an Organisation, Public Relations

UNIT-III 9

Objectives of Personnel Administration; aspects of Personnel Administration Recruitment Public Service Commission, Training, Terms of Employment, Moral Discipline, Financial Administration, Financial Organisation, Budgetary Operations and Control: Audit; Parliamentary Control over Financial Management. Delegated Legislation; Administrative Tribunals

UNIT-IV 9

Accountability of Public Administration to Legislature, Public Administration, Political Parties, Pressure Groups and the People, Judicial Control over Public Administration, National Planning in India, Planning Organisation; Administration of Development Programmes, Administrative aspects of Indian Federalism, Local Self-Government and Administration-Rural and Urban in India

Books & References

1. Avasthi A. 1980. Central Administration: Tata McGraw Hill: New Delhi.
2. Chanda Ashok: 1967. Indian Administration: Allen and Unwin: London.
3. Jain, R. B., 1976. Contemporary Issues in Indian Administration, Vishal Publications:

New Delhi.
4. Johari, J.C., 1977. Indian Government and Politics: Vishal Publications: Delhi.
5. Khera, S.S. 1975. The Central Executive: Orient Longman: New Delhi.
6. Maheshwari, S.R., 1984. Indian Administration.
7. Muttalib, M.A. 1967. Union Public Service Commission, I.I.P.A.: New Delhi.
8. Prasad, Bishwanath 1968. The Indian Administrative Service; S. Chand and Company: Delhi.
9. Puri, K.K., 2006, Indian Administration, Bharat Prakashan, Jalandhar.
10. Singh Hoshiar and Singh Mohinder, 1989. Public Administration in India: Theory and Practice;
11. Sterling Publishers Private Ltd., New Delhi.
12. Subramaniam, Malathi, 1987, Management of Public Administration, Deputy Publications: Delhi.
13. Subramaniam, V. 1971. Social Backgrouond of India's Administrators, Publication Division,
14. Government of India: New Delhi.

BCS-19 WEB DESIGNING

Course category	:	Program Elective
Pre-requisites	:	NIL
Contact hours/week	:	Lecture : 0, Tutorial : 0 , Practical: 4
Number of Credits	:	2
Course Assessment methods	:	Continuous Assessment through Practical Work/ Attendance/ Record/ Viva Voce, Three Viva Voce Examinations and One Major Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Identify common design mistakes when creating a web based application.
2. Discuss the process of editing a web page using text editors and web page editors.
3. Cover commonly used HTML tags and discuss how this knowledge is important to a web designer
4. Demonstrate an understanding of basic CSS, XML

EXPERIMENTS

1. Create a HTML static web page which shows the use of different tags in that.
2. Insert an image and create a link such that clicking on image takes user to other page.
3. Prepare a sample code to illustrate three types of lists in HTML.
4. Use tables to provide layout to your HTML page describing your university infrastructure.
5. Use frames such that page is divided into 3 frames 20% on left to show contents of pages, 60% in center to show body of page, remaining on right to show remarks.
6. Create a simple form that will show all the INPUT METHODS available in HTML.
7. Create a sample code to illustrate the Embedded, External and Inline style sheets for your web page.
8. Write an XML example of given tree that demonstrates the creation of user-designed tags and display it in a browser. fname, lname, joindate, bdate, college, employee, age, salary (with at least 3 elements).
9. Write a program in XML for creation of DTD which specifies a particular set of rules.
10. Create an e-book having left side of the page name of the chapters and right side of the page the contents of the chapters clicked on left side.

Textbooks

1. Uttam K. Roy,Web Technologies, 1/e , Oxford University Press, USA
2. Murray, Tom/Lynchburg, Creating a Web Page and Web Site, College, 2002
3. A beginner's guide to HTML NCSA,14th May, 2003
4. Kogent Learning Solutions Inc. HTML 5 in simple steps Dream tech Press

Reference books

1. Steven M. Schafer HTML, XHTML, and CSS Bible, 5ed ,Wiley India
2. Kogent Learning Web Technologies: HTML, JAVA script , Wiley

MBA-01 INDUSTRIAL MANAGEMENT

Course category	:	Program Elective
Pre-requisites	:	General Management
Contact hours/week	:	Lecture: 2, Tutorial: 1, Practical:0
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, assignments, Methods Quizzes and Minor test and Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Student will become efficient and acquire acumen of more profitable business practices.
2. Students will understand importance of better customer service and product quality.
3. Able to make work safer, faster, easier, and more rewarding.
4. Able to help industry in production of more products which posses all utility factors.
5. Making the world safer through better designed products and processes. Reducing costs associated with new technologies

Topics Covered

UNIT-I 6

Introduction: Management and Industrial Engineering and relation with other fields, Management concepts.

Plant Location and Layout: General considerations, Types of Layout, Cellular Manufacturing.

UNIT-II 6

Work Analysis and Measurement: Design of work methods, Time and motion study, Work sampling, Selection of labour and wage payment, Incentive and motivation.

Functional Management: Sources of finance, Balance sheet and Income statement, Different element of costs, Depreciation, Break-even analysis, Economic appraisal of projects.

UNIT-III 6

Production Planning and Control: Methodology, Aggregate Planning, Scheduling, Line of Balancing.

Quality Control: Concepts of quality, Acceptance sampling, Control Charts, Total Quality Management.

UNIT-IV 6

Material Management: Inventory management, Deterministic and probabilistic models of Inventory control, Material requirements Planning, JIT, ERP, SCM Business process reengineering.

Project Management: CPM and PERT, Cost consideration and Crashing

Books & References

1. Joel Dean.. Managerial Economics, PHI Ltd., New Delhi.
2. P. Crowson.. Economics for Managers, Macmillan, London.
3. Prasanna Chandra.. Financial Management, TMH Pvt. Ltd., New Delhi.

MBA-02 ENGINEERING AND MANEGERIAL ECONOMICS

Course category	:	Program Elective
Pre-requisites	:	General Management
Contact hours/week	:	Lecture: 2, Tutorial: 1, Practical:0
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, assignments, Methods Quizzes and Minor test and Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Students will acquire basic knowledge in Engineering & managerial economics, which allows students to gain theoretical and empirical skill of economics.
2. To make Engineering students prepared for economic empowerment so that they could manage their wealth, help them in starting their own business or during managerial period.
3. Students will develop Interdisciplinary skills which can help them to thrive in the lifelong changing environment in various fields of Industry of Economics.
4. Students will acquire practical knowledge of economics, the kind of markets, cost theory, various issues of demand and other major economic concepts.
5. Able to explain succinctly the meaning and definition of managerial economics; elucidate on the characteristics and scope of managerial economics.

Topics Covered

UNIT-I 6

Introduction: Meaning, Nature and Scope of Economics, Meaning of Science, Engineering and Technology. Managerial Economics and its scope in engineering perspective

Basic Concepts: Demand Analysis, Law of Demand, Determinates of Demand, Elasticity of Demand Price, Income and cross Elasticity. Uses of concept of elasticity of demand in managerial decision

UNIT-II 6

Demand Forecasting: Meaning, significance and methods of demand forecasting, production function, Laws of returns to scale & Law of Diminishing returns scale. An overview of Short and Long run cost curves – fixed cost, variable cost, average cost, marginal cost, Opportunity cost.

UNIT-III 6

Market Structure: Perfect Competition, Imperfect competition – Monopolistic, Oligopoly, duopoly sorbent features of price determination and various market conditions.

National Income, Inflation and Business Cycles: Concept of N.I. and Measurement. Meaning of Inflation, Type causes & prevention methods, Phases of business cycle

UNIT-IV 6

Concept of Goals, Resources, Efficiency & Effectiveness; Introduction to Management discipline and activity, Managerial Roles and Skills; Management Thought and Thinkers-Details: Scientific Management; Classical

Organization Theory; Neo-Classical Theory; Systems Approach; Contingency Approach. Managerial Functions and Decision Making

Books & References

1. Koutsoyiannis A : Modern Microeconomics, ELBS.
2. Managerial Economics for Engineering : Prof. D.N. Kakkar

3. Managerial Economics : D.N. Dwivedi
4. Managerial Economics : Maheshwari.
5. Principles & Practices of Management : L.M. Prasad
6. Industrial Economics and Principles of Management: T.N. Chabra.

BEC-26 CONTROL SYSTEMS

Course category	:	Department Core (DC)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One MajorTheory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Describe the response characteristic and differentiate between the open loop and closed loop of a controlsystem.
2. Derive mathematical model for simple electrical and mechanical systems using transfer function and state variablemethod.
3. Determine the response of a control system using poles and zeros to determine the response of a controlsystem.
4. Determine the stability of a control system using Routh-Hurwitzmethod.

Topics Covered

UNIT-I 9

Basic Components of a control system, Feedback and its effect, Types of feedback control Systems, Block diagrams: representation and reduction, Signal Flow Graphs, Modeling of Physical Systems:

Electrical Networks and Mechanical Systems, Force-voltage analogy, Force-current analogy.

UNIT-II 9

Time response of continuous data systems, Different test Signals for the time response, Unit step response and Time-Domain Specifications, Time response of a first-order and second order systems for different test signals, Steady State Error and Error constants, Sensitivity, Control Actions: Proportional, Derivative, Integral and PID control. Introduction to Process Control Systems,

Pneumatic hydraulics, Actuators.

UNIT-III 9

Stability: Methods of determining stability, Routh Hurwitz Criterion, Root Locus, Frequency Domain Analysis: Resonant Peak, Resonant frequency and Bandwidth of the second order system, Effect of adding a zero and a pole to the forward path, Nyquist Stability Criterion, Relative

Stability: Gain Margin and Phase Margin, Bode Plot.

UNIT-IV 9

State-Space Analysis of Control System: Vector matrix representation of state equation, State transition matrix, Relationship between state equations and high-order differential equations, Relationship between state equations and transfer functions, Block diagram representation of state equations, Decomposition Transfer Function, Kalman's Test for controllability and observability

EXPERIMENTS

1. To determine transfer function of (Metadyne) cross-field generator set & study of various associated characteristics.
2. To study the synchros in various configurations from application pointview
3. To study the D.C. Servo-position control system with P & PIconfigurations
4. To study the A.C. Servo motor and determine the Speed-TorqueCharacteristics.
5. To study 1st order and 2nd order system time response using MATLABsoftware.
6. To study Root Locus Plot using MATLABsoftware.
7. To study Frequency response Plot (Polar plot, Nyquist plot, Bode plot) using MATLAB software.

Books & References

1. B.C. Kuo&FaridGolnaraghi, "Automatic Control Systems", 8e, John Wiley India,2008.
2. I.J. Nagrath&M.Gopal, "Control System Engineering", New Age InternationalPublishers.
3. William A. Wolovich, "Automatic Control Systems", Oxford University Press,2010.
4. Katsuhiko Ogata, "Modern Control Engineering", 3e, PHI Publication,2000.

BEC-27		**ANALOG INTEGRATED CIRCUITS**
Course category	:	Department Core (DC)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Learn about the operational amplifiers and understand and test its characteristics as well as know various types of op-amps and its different configurations, understand current mirror circuits using MOSFETs and BJTs and design and investigate their properties and compare different models of current mirror circuits
2. Understand, design, analyze and test practical circuits for op-amp based V-I, I-V converters, Log-antilog amplifiers, analog multipliers, multivibrators, VCO and waveform generators and implement them for advance applications
3. Know various types of filters and their characteristics and understand the concept of using filter approximations, design, synthesize, analyze and implement the active analog filters of higher orders using op-amp for optimum performance in modern applications
4. Learn the functioning and operations of PLL IC, 555 IC timer, frequency divider and regulator, and design SMPS and understand their characteristics and implement them for advance applications

Topics Covered

UNIT-I 9

Introduction to Integrated Circuit Design: Power Supply configurations for Op-amp application, Various types of Op-amp, Current mirrors using BJT and MOSFETs, Base current compensated
mirrors, Wilson current mirrors, Widlar current source.

UNIT-II 9

Linear and Nonlinear applications of IC Op-amp: An overview of Op-amp, V-I and I-V converters, Log-antilog amplifiers, Precision rectifier, Peak detector, Sample and Hold Circuits, Analog multiplier and their applications, Op-amp as a comparator, Zero-crossing detector, Schmitt
trigger, Astable and Monostable multivibrator using Op-Amp, Generation of triangular waveform

UNIT-III 9

Filters: Characteristics of filters, Classification of filters, Butterworth filters, Chebyshev filters, Bessel filters, Low Pass and High Pass filters, Band Pass filters, Band reject filters, Notch filters.

UNIT-IV 9

Advanced applications of an Op-amp: Frequency Divider, PLL IC, 555 IC timer, Design of Astable and Monostable Multivibrators using 555 Timer IC, Standard Regulator ICs and their characteristics.

EXPERIMENTS

1. Study the characteristics of negative feedback amplifier
2. Design of an instrumentation amplifier
3. Design and test an astable multivibrator for a given frequency.
4. Study the characteristics of integrator circuit
5. Design of Analog filters – I
6. Design of Analog filters – II
7. Design of a self-tuned Filter
8. Design of a function generator
9. Design of a Voltage Controlled Oscillator
10. Design of a Phase Locked Loop(PLL)
11. Design and test an AGC system for a given peak amplitude of sine-wave output
12. Design of a low drop out regulator
13. Design of a switched mode power supply that can provide a regulated output voltage for a given input range using the TPS40200 IC

Books & References

1. Data Sheet:http://www.ti.com/lit/ds/symlink/tl082.pdf
2. Application Note:http://www.ti.com/lit/an/sloa020a/sloa020a.pdf
3. MPY634 Data Sheet: http://www.ti.com/lit/ds/symlink/mpy634.pdf
4. Application Note:http://www.ti.com/lit/an/sbfa006/sbfa006.pdf
5. ASLK Pro Manual: ASLKManual
6. *Ramakant A. Gayakwad, "Op-amps and Linear Integrated Circuits",PHI*
7. *Millman and Grabel, "Microelectronics", 2nd Ed., McgrawHill*
8. *D. Roy Chudhry, "Linear Integrated Circuits", New AgeInternational*

BEC-28 PRINCIPLES OF COMMUNICATION

Course category	:	Department Core (DC)
Pre-requisite Subject	:	Signals & Systems (BEC-13)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One MajorTheory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to understand the basic concept of analog communication system and analyze the various amplitude modulation schemes.
2. Able to distinguish angle modulation with amplitude modulation and analyze various modulation/demodulation techniques of angle modulation
3. Able to classify the types of noise sources added in communication channel and analyse its performance in analog communication system.
4. Able to describe and analyse the various pulse modulation and multiplexing techniques for the digital transmission of analog signal

Topics Covered

UNIT-I 9

Amplitude Modulation: Overview of Communication system, Communication channels, Need for modulation, Baseband and Pass band signals, Comparison of various AM systems

Amplitude Modulation: Double side-band with Carrier (DSB-C), Double side-band without Carrier, Single Side-band Modulation, SSB Modulators and Demodulators, Vestigial Side-band (VSB), Quadrature Amplitude Modulator.

UNIT-II 9

Introduction to Angle Modulation: Frequency modulation, Narrowband and Wideband FM, Generation of FM waves, Indirect FM and direct FM, FM modulators and demodulators, Phase locked loop, Angle Modulation by Arbitrary Message Signal, Phase Modulation, Pre-emphasis and De-emphasis, Linear and Nonlinear Modulation, Comparison between Angle Modulation and Amplitude Modulation, Radio Receivers.

UNIT-III 9

Noise: Source of Noise, Frequency domain, Representation of noise, Linear Filtering of noise, Noise in Amplitude modulation system, Noise in SSB-SC,DSB and DSB-C, Noise Ratio, Noise Comparison of FM and AM, Pre-emphasis and De-emphasis, Figure of Merit

UNIT-IV 9

Pulse Modulation and Digital Transmission of Analog Signal: Sampling Theorem and its applications, Concept of Pulse Amplitude Modulation, Pulse width modulation and

pulse position modulation, PCM, Pulse Time Modulation, TDM and FDM. Line Coding, Quantizer, Quantization Noise, Compounding multiplexer.

EXPERIMENTS

A. Compulsory Experiment:

1. To study Amplitude modulation using a transistor and determine depth of modulation.
2. To study envelope detector for Demodulation of AM signal and observe diagonal clipping.
3. To study frequency modulation using reactance modulator.
4. Narrow band FM generation using varactor modulator.
5. Generation of DSB-SC signal using balanced modulator.
6. Generation of single side band signal.
7. Study of PLL and detection of FM signal using PLL.

B. Optional Experiments:

8. To study and implement Pre-emphasis and De-emphasis circuits.
9. To design and test the circuits of voltage to frequency converter usingIC-555.
10. To understand and implement Pulse Amplitude Modulation (PAM) usingIC-555.
11. To understand and implement Pulse Width Modulation (PWM) usingIC-555.
12. To understand and implement Pulse Position Modulation (PAM) usingIC-555.

Books & References

1. H. Taub, D L Schilling, Goutom Saha, “Principles of Communication”, 3e, Tata McGraw-Hill Publishing Company Ltd.
2. B.P. Lathi, “Modern Digital and Analog communication Systems”, 3e, Oxford University Press,2009.
3. Simon Haykin, “Communication Systems”,4e, Wiley India.
4. H. P. HSU & D. Mitra, “Analog and Digital Communications”, 2e, Tata McGraw-Hill Publishing Company Ltd.

BEC-29 ELECTRONIC MEASUREMENT & INSTRUMENTATION

Course category	:	Department Core (DC)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Ability to analyzequality measurements with different digital display devices.
2. Understand the principles of various types of transducers and sensors with their practical application.
3. Ability to understand principle of operation of the data acquisition system and its industrial application and working.
4. Ability to understand construction, principle of operation, working and applications of waveform analyzers and spectrum analyzers and other display devices.

Topics Covered

UNIT-I 9

Qualities Measurements and Digital Display Devices: Performance Characteristics, Error in Measurement, Sources of Error, Arithmetic Mean, Deviation from the Mean, Average Deviation, Standard Deviation, Limiting Errors.

Digital Display Devices: LED, LCD, Gas Discharge Plasma Displays, Incandescent Display, LVD (Liquid Vapour Display), Printers, Digital Voltmeters, Spectrum Analyzer.

UNIT-II 9

Transducers: Introduction, Selection Parameters of Transducer, Resistive Transducer, Strain Gauges, Inductive Transducer, Differential Output Transducers, LVDT, Capacitive Transducer, Photo-electric Transducer, Photo cells, Photo-Voltaic Cell, Photo Transistors, Temperature Transducers, Mechanical Transducer.

UNIT-III 9

Data Acquisition and Conversion: Introduction, Objective of Data Acquisition System, Multichannel DAS, A/D and D/A converters using Op-Amp, Data Loggers, Electromechanical A/D Converter, Digital Transducer, Frequency Standards.

UNIT-IV 9

Measurement of Power and Frequency: Introduction, Power Measurement by Bolometer element, Bolometer Mount and Bolometer Bridge, Measurement of Power on a Transmission Line,

Measurement of Microwave Frequencies, Resonant Coaxial Lines, Cavity Wave meter.

EXPERIMENTS

1. Study of semiconductor diode voltmeter and its us as DC average responding AC voltmeter.
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 transducer (ii) J- type transducer (iii) K-type transducer (iv)Pressure transducer.
6. Measurement of phase difference and frequency using CRO (lissajous figure)
7. Measurement of low resistance using Kelvin's double bridge.
8. Radio Receiver Measurements

Books & References

1. David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., PHI, New Delhi 2008.
2. H. S. Kalsi, "Electronic Instrumentation", 3rd Ed., McGraw Hill Education (India),2015

MMS-232/BOE-03 OPERATIONS RESEARCH

Course category	:	Department Core (DC)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial : 1 , Practical: 0
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, assignments, Methods Quizzes and Minor test and Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Identify and develop operational research models from the verbal description of the real system.
2. Be able to build and solve Transportation Models and Assignment Models.
3. Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry
4. Aware with the basic concepts and tools of game theory and can apply these tools to real-life situations

Topics Covered

UNIT-I 6

Queuing systems and their characteristics, Pure-birth and Pure-death models, Empirical queuing models – M/M/1 and M/M/C models and their steady state performance analysis.

UNIT-II 6

Inventory models, Inventory costs. Models with deterministic demand – model (a) demand rate uniform and production rate infinite, model (b) demand rate nonuniform and production rate infinite, model (c) demand rate uniform and production rate finite, Inventory models with partial backlogging and lost sales. Discrete demand Model, Multi-item Inventory models with constraints.

UNIT-III 6

PERT and CPM with known and probabilistic activity times, constructing project networks: Gantt chart, Activity on arrow/Activity on node, Various types of floats and their significance, Updating PERT charts, Project crashing, Linear programming formulation of Project crashing, Resource constrained project scheduling: Resource levelling & Resource smoothing.

UNIT-IV 6

Games Theory: Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game, Solution of games with saddle points, dominance principle, Rectangular games without saddle point mixed strategy for 2 x 2 games, LPP formulation and solution of game.

Books & References

1. Hillier, F. S., & Lieberman, G. J. (2010). Introduction to operations research- concepts and cases (9th ed.). New Delhi: Tata McGraw Hill (Indian print).

2. Taha, H. A. (2007). Operations research-an introduction (8th ed.). New Delhi: Pearson Prentice Hall (Indian print).
3. Ravindran, A., Phillips, D. T., and Solberg, J. J. (2005). Operations research- principles and practice (2nd ed.). New Delhi: Wiley India (P.) Ltd. (Indian print).
4. Kanti Swaroop, P K Gupta and Manmohan, Operations Research, Sultan Chand & Sons
5. Gross, D., Shortle, J. F., Thompson, J. M., & Harris, C. M. (2008). Fundamentals of queueing theory (4th ed.). Wiley

BEC-31 DIGITAL COMMUNICATION

Course category	:	Department Core (DC)
Pre-requisite Subject	:	Principles of Communication (BEC-28)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to compute the bandwidth and transmission power by analysing time and frequency domain spectra of signal required under various modulation schemes.
2. Able to apply suitable modulation schemes and coding for various applications.
3. Able to identify and describe different techniques in modern digital communications, in particular in source coding, modulation and detection, carrier modulation, and channel coding.
4. Able to analyze digital modulation techniques by using signal processing tools.

Topics Covered

UNIT-I 9

Overview of digital communication, Overview of PCM system and Quantization, Differential PCM, Delta modulation, Adaptive Delta Modulation. Baseband Binary transmission inter symbol interference (ISI), Nyquist criterion for zero ISI, pulse shaping and raised-cosine filter, duobinary coding, Modified Duobinary.

UNIT-II 9

Probability theory and Random Variables, Random variable, Probability mass function, cumulative distribution function, Probability Density function, Statistical averages, Gaussian distribution, Binomial Distribution, Sum of Random Variables, Central Limit Theorem, Transformation of random variables, Random Process, Classification of Random Processes, Auto correlation function, Power spectral density, Multiple random processes, Gaussian Process.

UNIT-III 9

Digital Modulation Techniques: Digital Modulation formats, Digital carrier system, Gram Schmidt Orthogonalization procedure, Method of generation and detection of coherent & noncoherent binary ASK, FSK & PSK, Differential phase shift keying, quadrature modulation techniques. (QPSK and MSK), Mary Digital carrier Modulation. Matched Filter, Overview of spread spectrum systems.

UNIT-IV 9

Information Theory and Coding: Information Theory and Coding: Information Measurement, Average information and information rate, Coding for discrete memory less source, continuous channel capacity, Maximum entropy, Huffman and **Shannon** Fano coding, Discrete channel capacity, Trade –off between S/N and bandwidth, **Error control coding**, Block code, Hamming code, Cyclic code, Convolutional code: Tree diagram, State diagram, Trellis diagram.

EXPERIMENTS

A. Compulsory Experiments

1. To design of Sample and hold circuit using Op-amp
2. To construct a pulse amplitude modulation (PAM) and demodulation circuit and to observe the waveform.
3. To understand and implement Pulse Width Modulation (PWM) using IC 555 by varying the amplitude of the modulating signal and plot the relevant waveforms.
4. To understand and implement Pulse Position Modulation (PPM) using IC 555 and plot the relevant waveforms.
5. Study of delta modulation and demodulation and observe effect of slope overloadDCL07.
6. Study of pulse data coding techniques for NRZ formats.
7. Data decoding techniques for NRZ formats.ST21067.

B. Optional Experiments

1. To Study and implement of amplitude shift keying modulator and demodulator and to observe the waveform.
2. To Study and implement of FSK modulator and demodulator and to observe the waveform.
3. Study of phase shift keying modulator and demodulatorST467.
4. Study of single bit error detection and correction using Hamming code.ST2103.
5. Implementing Convolutional Encoder/Decoder using MATLAB.
6. Implementing ASK, PSK and FSK using SIMULINK.

Books & References

1. Haykin, Simon, “Communication Systems”, John Wiley,4e.
2. Singh, R.P. &Sapre, S.D. “Communication Systems: Analog & Digital”, Tata McGraw-Hill.
3. Lathi, B.P, “Modern Digital & Analog Communication Systems”, Oxford University Press.
4. Taub& Schilling, “Principles of Communication Systems”, TataMcGraw-Hill
5. Prokis J.J, “Digital Communications”, McGraw Hill

BEC-32 MICROPROCESSORS & APPLICATIONS

Course category	:	Department Core (DC)
Pre-requisite Subject	:	Digital Electronics and Circuits(BEC-12)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One MajorTheory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Acquired knowledge about 8085 Microprocessor and supporting devices.
2. Foster ability to write the assembly language programming using 8085 microprocessor.
3. Foster ability to understand 8086 microprocessor and also develop programming skill.
4. Foster ability to develop microprocessor-based system using different peripheral devices.

Topics Covered

UNIT-I 9

Introduction to Microprocessors: Evolution of Microprocessors, Microprocessor Architecture and its operations, Memory devices, I/O Devices, 8-bit Microprocessor (8085): Introduction, Signal Description, Register Organization, Architecture, Basic Interfacing Concepts for Memory and I/O Devices

UNIT-II 9

8085 Assembly Language Programming: Instruction Classification, Instruction Format, Addressing Modes, 8085 Instructions: Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Flow Chart, Writing assembly language programs, Programming techniques: looping, counting and indexing.

UNIT-III 9

16-bit Microprocessors (8086/8088): Architecture, Physical address segmentation, memory organization, Bus cycle, Addressing modes, difference between 8086 and 8088, Introduction to 80186 and 80286, Assembly Language Programming of 8086/8088.

UNIT-IV 9

Data Transfer Schemes: Introduction, Types of transmission, 8257 (DMA), 8255 (PPI), Serial Data transfer (USART 8251), Keyboard-display controller (8279), Programmable Interrupt Controller (8259), Programmable Interval Timer/ Counter (8253/8254): Introduction, modes, Interfacing of 8253, applications, ADC and DAC

EXPERIMENTS

1. Write a program using 8085 Microprocessor for Decimal addition and subtraction of two numbers.
2. Write a program using 8085 Microprocessor for Hexadecimal addition and subtraction of two numbers.
3. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
4. To perform multiplication and division of two 8 bit numbers using8085.
5. To find the largest and smallest number in an array of data using 8085 instruction set.
6. To write a program to arrange an array of data in ascending order.
7. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set.
8. To write a program to initiate 8251 and to check the transmission and reception of character.
9. To interface 8253 programmable interval timer to 8085 and verify the operation of 8253 in six different modes.
10. To interface 8255 with 8085 and verify the operation of 8255 in different modes.
11. To interface 8259 with 8085 and verify the operation of8259.
12. Serial communication between two 8085 microprocessors through RS-232 C port.

Books & References

1. R. Singh and B. P. Singh: Microprocessor Interfacing and Application, New Age International Publishers, 2nd Edition.
2. V. Hall: Microprocessors Interfacing, TMH (2ndEdition).
3. R. S. Gaunkar: Microprocessor Architecture, Programming and Applications with 8085/8080, Penram Publication
4. Y.C. Liu and G.A. Gibson: Microcomputer Systems: The 8086/8088 Family Architecture
5. Programming and Design, PHI 2nd Edition,

BEC-33 DATA COMMUNICATION NETWORKS

Course category	:	Department Core (DC)
Pre-requisite Subject	:	Principles of Communication (BEC-28)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to explain communication protocols, layered network architectures, interfacing standards and peer to peer data link communication protocols.
2. Able to describe how the physical and data link layers operate in a typical data communication system.
3. Able to describe the functionality of MAC and Ethernet layers operated in TCP/IP protocol.
4. Able to describe how the network layer, transport layer and application layer operate with data communications networks concepts.

Topics Covered

UNIT-I 9

Introduction to Networks & Data Communications The Internet, Protocols & Standards, Layered Tasks, OSI Model, TCP / IP, Addressing, Line Coding Review, Transmission Media: Guided and
unguided Media Review

UNIT-II 9

Switching: Datagram Networks, Virtual Circuit Networks, Structure of a switch, Ethernet Physical Layer, Data Link Layer: Error detection and Correction Data Link Control: Framing, Flow and
Error Control Protocols, Noiseless and Noisy Channel Protocols, HDLC, Point-to-Point Protocol.

UNIT-III 9

Multiple Access: RANDOM, CDMA, CSMA/CD, CSMA/CA, Controlled Access, Channelization Wired LANs: IEEE Standards, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN
IEEE 802.11, Bluetooth, IEEE 802.16

UNIT-IV 9

Network layer: Design Issues. Routing Algorithms. Congestion control Algorithms. IPV4 Addresses, Connecting Devices, IPV6 Addresses, Hardware Addressing versus IP Addressing, Transport Layer Protocol: UDP and TCP. Application Layer Protocol : SIP,

DNS, FTP, HTTP,
SMTP and SNMP.

Text Books

1. Behrouz A. Forouzan (2006), Data communication and Networking, Tata McGraw-Hill, India.
2. A.S. Tanenbaum, Computer Networks (2003), 5 ed, Pearson Education/ PHI. New Delhi, India.

Reference Books

1. Micheal A Gallo, Bill Hancock , (2001),Computer Communications and Networking Technologies, Thomson Fitz Gerald , Dennis(2009), Business Data Communications & Networking, 10 ed, john willeysons,USA.
2. William stallings (2006), Cryptography and network security, 4thedition, Pearson Education, India.

BEC-34 MICROWAVE ENGINEERING

Course category	:	Department Core (DC)
Pre-requisite Subject	:	Electromagnetic Field Theory (BEC-14)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One MajorTheory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to apply electromagnetic theory to calculations regarding waveguides and transmission lines.
2. Able to design, analyze and characterize the passive microwave devices.
3. Able to describe common devices such as microwave vacuum tubes, high-speed transistors and ferrite devices.
4. Able to handle microwave equipment and make measurements

Topics Covered

UNIT-I 9

Rectangular Wave Guide: Field Components, TE, TM Modes, Dominant TE10 mode, Field Distribution, Power, Attenuation. Circular Waveguides: TE, TM modes. Wave Velocities, Micro- strip Transmission line (TL), Coupled TL, Strip TL, Coupled Strip Line, Coplanar TL, Microwave Cavities.

UNIT-II 9

Scattering Matrix, Passive microwave devices: Microwave Hybrid Circuits. , Terminations, Attenuators, Phase Shifters, Directional Couplers: Two Hole directional couplers, S Matrix of a Directional coupler, Hybrid Couplers, Microwave Propagation in ferrites, Faraday Rotation, Isolators, Circulators. S parameter analysis of all components.

UNIT-III 9

Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube, Backward Wave Oscillators: Solid state amplifiers and oscillators: Microwave Bipolar Transistor, Microwave tunnel diode, Microwave Field-effect Transistor, Transferred electron devices, Avalanche Transit –time devices: IMPATT Diode, TRAPPAT Diode.

UNIT-IV 9

Microwave Measurements: General set-up of a microwave test bench, Slotted line carriage, VSWR Meter, microwave power measurements techniques, Crystal Detector, frequency measurement, wavelength measurements. Impedance and Refection coefficient, VSWR, Insertion and attenuation loss measurements, measurement of antenna characteristics, microwave link design

EXPERIMENTS

A. Compulsory Experiment

1. To determine the frequency and wavelength of a microwave in a rectangular waveguide operated in TE10mode.
2. To measure the frequency of a microwave source and demonstrate relationship among guide dimensions, free space wavelength andguide.
3. To study the characteristics of the reflex klystron tube and to determine its electronic tuning range.
4. To study the characteristics of Gunn Diode and to determine the thresholdvoltage.
5. To measure the standing wave ratio and reflection coefficient in a Microwave Transmission line.
6. To measure coupling coefficient, Insertion loss & Directivity of a Directional coupler.
7. To study isolation and coupling coefficient of a magic Tee.

B. Optional Experiments

8. To study the substitution method for measurement of attenuation and hence.
   I. to determine attenuation due to a component undertest.
   II. to study variations in its attenuation with the frequency.
9. Study of wave guide horn and its radiation pattern and determination of the beamwidth.
10. To measure isolation and insertion loss of a three port Circulators/Isolator.

Textbooks & Reference books

1. Liao, S.Y. / Microwave Devices & Circuits; PHI 3rdEd.
2. Collin, R.E. Foundations for Microwave Engineering; TMH 2nd Ed.
3. Rizzi, Microwave Engineering: Passive Circuits; PHI.
4. A Das and S.K. Das, Microwave Engineering; TMH.

BEC-35 VLSI TECHNOLOGY

Course category	:	Department Core (DC)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to understand the fundamentals of VLSI Technology.
2. Able to understand about different IC Fabrication Techniques.
3. Able to understand about Lithography, Etching and Metallization.
4. Able to understand about fabrication steps of different Electronic devices.

Topics Covered

UNIT-I 9

Fundamentals of VLSI Technology: Introduction, Trends & Projections in microelectronics. Semiconductor materials and their merits and demerits. Monolithic chips trends. Advantages, limitations & classification of ICs.

Source of silicon; EGS and MGS, Single crystalline and Poly-crystalline crystal, SGS

UNIT-II 9

Fabrication Techniques: float zone method, Czocharalski method, Refining, Silicon Wafer Preparation & Crystal Defects.

Epitaxial Process: Need of epitaxial layer; VPE, MBE, merits and demerits of various epitaxial processes.

Oxidation Techniques: Importance of oxidation, types of oxidation techniques, growth mechanism, factors affecting the growth mechanisms, silicon oxidation model, dry & wet oxidation.

Diffusion and Ion Implantation: Diffusion mechanisms; diffusion reactor; diffusion profile; diffusion kinetics; parameters affecting diffusion profile; Dopants and their behaviour, choice of dopants; Ion Implantation- reactor design, impurity distribution profile, properties of ion implantation, low energy and high energy ion implantation.

UNIT-III 9

Lithography: Basic steps in lithography; lithography techniques-optical lithography, electron beam lithography, x-ray lithography, ion beam lithography; resists and mask preparation of respective lithography, printing techniques-contact, proximity printing and projection printing.

Etching: Performance metrics of etching; types of etching- wet and dry etching; dry etching techniques-ion beam or ion-milling, sputter ion plasma etching and reactive ion etching (RIE).

Metallization: Desired properties of metallization for VLSI; metallization choices;

metallization techniques –vacuum evaporation, sputtering.

UNIT-IV 9

Fabrication steps of Diodes and Transistors, MOSFETs, CMOS, Resistors, Capacitors.

Books & References

1. S.M. Sze, "VLSI Technology",TMH
2. S.K. Gandhi, "VLSI Fabrication Principles", John Willey &Sons
3. D. Nagchoudhuri, "Principles of Microelectronics Technology"PHI
4. Botkar, "Integrated Circuits", Khanna Publishers

BEC-30 SEMINAR

Course category	:	Audit Course (AC)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 0, Tutorial : 0 , Practical: 6
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through quality of material, presentation, quality & extent of external response of question asked and participation in other seminars (attendance)
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To acquire in depth study in a specialized area.
2. Acquaint the students of methods of carrying our literature survey on a given topic.
3. Derive a balance between the depth of the work and understanding of what has been learned in this process.
4. To be able to prepare seminar report and presentation and deliver it effectively.

BEC-41 VLSI DESIGN

Course category	:	Department Core (DC)
Pre-requisite Subject	:	VLSI Technology (BEC-35)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, assignments, quizzes and Three Minor tests and One Major Theory &Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Design and development of MOS technology in the last three decades
2. Design issues related to current MOS transistors used in digital circuits
3. CMOS logic circuits, fabrication issues and its layout
4. Circuit characterization and performance estimation

Topics Covered

UNIT-I 9

Introduction: Trends & Projections in VLSI Circuits, Flow diagram of VLSI Circuit Design and VLSI Design issues, Y-Chart; Electrical characterization of MOS transistor; Energy-band explanation for MOS structure, C-V characteristics of MOS Capacitor, Long-Channel and Short-Channel MOSFETs, Short-Channel effects, SPICE parameters of MOS transistor.

UNIT-II 9

Basic VLSI design styles; NMOS, CMOS process flow; NMOS, PMOS and CMOS inverter design, noise margin, VTC curve, delay computations, power dissipation and scaling in CMOS circuits; combinational circuit design using NMOS, PMOS, CMOS & CMOS TG Circuits.

UNIT-III 9

Stick Diagrams; Physical Design Rules; Layout Designing; Euler's Rule for VLSI Physical Design. Dynamic CMOS circuits; Basic Principles of pass transistor and transmission gate, CMOS Transmission-Gate and Pass-transistor logic circuits, Domino CMOS Logic, NORA CMOS Logic, Zipper CMOS circuits, Basic BiCMOS behavior

UNIT-IV 9

Semiconductor Memories, ROM, DRAM and SRAM Cell Design; VLSI testing Introduction, Principle of testing, DC and AC parametric tests, fault modeling, Stuck-at-fault, fault equivalence, fault collapsing, fault dominance, fault simulation.

EXPERIMENTS

A. Compulsory Experiments:

1. To design a CMOS inverter and perform the DC and transientanalysis.
2. To design a CMOS inverter [W_P/L_P:W_n/L_n = 3:1] and analyze the effect of following parameters on averagepower:
   i. VDD (Supplyvoltage)
   ii. C_L (Output loadcapacitance)
   iii. Frequency
3. To design XOR gate using transmission gate and perform its transientanalysis.
4. To design a 2:1 Multiplexer and analyze its transientanalysis.
5. Design the layout of XOR circuit using CMOStechnology.
6. Write a Verilog HDL code to design 4 to 1 MUX and simulate on Questa simulatorusing Verilog testbench.
7. Write a Verilog HDL code for 16-Byte ROM memory and simulate on Questa simulatorusing Verilog testbench.

B. Optional Experiments:

8. To design CMOS based NAND gate and perform its transientanalysis.
9. To design CMOS based NOR gate and perform its transientanalysis.
10. To design XNOR gate using transmission gate and perform its transientanalysis.
11. Design the layout of CMOS inverter using CMOStechnology.
12. Write a Verilog HDL code to design 4 to 2 Encoder and simulate on Questa simulatorusing Verilog testbench.
13. Write a Verilog HDL code to design 4 to 2 Decoder and simulate on Questa simulatorusing Verilog testbench.
14. Write a Verilog HDL code for binary to Gray Code Conversion and simulate on Questa simulator using Verilog testbench.
15. Write a Verilog HDL code for 4-bit SIPO register and simulate on Questa simulatorusing Verilog testbench.

Books & References

1. S.M. Kang & Y. Leblibici, "CMOS Digital Integrated Circuits-Analysis & Design", TMH, Ed. 2003.
2. B.G. Streetman & S. Banerjee, "Solid State Electronic Devices", PearsonEducation.
3. Neil H. Weste& David Harris, "CMOS VLSI Design: A Circuit and Systems Perspective", PHI.
4. J.M. Rabaey, A. Chandrakasan & B. Nikolic "Digital Integrated Circuits-A Design Perspective", Pearson.
5. Doughlas Pucknell & Kamran Eshragian, "Basic VLSI Design", PHI.

BEC-42 DIGITAL SIGNAL PROCESSING

Course category	:	Department Core (DC)
Pre-requisite Subject	:	Signals and Systems (BEC-13)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to analyze signals using the Discrete Fourier Transform and Fast Fourier Transform.
2. Able to understand the characteristics of infinite impulse response (IIR) filters and learn designing IIR filters for filtering undesired signals.
3. Able to understand the characteristics of finite impulse response (FIR) filters and learn designing FIR filters for filtering undesired signals.
4. Able to implement digital filters in a variety of forms:-Direct form I & II, Parallel, Cascade and lattice structure.

Topics Covered

UNIT-I 9

Discrete Fourier Transforms: Definitions, Properties of the DFT, Circular Convolution, Linear Convolution

Fast Fourier Transform Algorithms: Introduction, Decimation in Time (DIT) Algorithm, Computational Efficiency, Decimation in Frequency (DIF) Algorithm.

UNIT-II 9

IIR Filter Design: Structures of IIR – Analog filter design – Discrete time IIR filter from analog
filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRF) filter design using frequency translation.

UNIT-III 9

FIR Filter Design: Filter design using windowing (Rectangular Window, Hamming window,
Hanning window, Blackman window, Kaiser window), Frequency sampling technique.

UNIT-IV 9

Realization of Discrete Time Systems: FIR systems – Direct form, cascaded, parallel and lattice structures**,** IIR systems – Direct form, cascaded, parallel, lattice and lattice ladder structures

Finite Word length Effects: Quantization effect in filter coefficients, round-off effect in digital filters

Books & References

1. John G Prokias, Dimitris G Manolakis, "Digital Signal Processing", PearsonEducation.
2. Oppenheim & Schafer, "Digital Signal Processing"PHI
3. Johnny R. Johnson, "Digital Signal Processing", PHI Learning Pvt Ltd.,2009.
4. S. Salivahanan, ""Digital Signal Processing" Mc Graw Hill Education

BEC-40 PROJECT PART-I

Course category	:	Department Core (DC)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 0, Tutorial : 0 , Practical: 10
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through three viva voce/presentation, preliminary project report, effort and regularity and end semester presentation
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Identify and define problem statement through literature survey for project work in the field of Electronics and Communication.
2. Develop design strategy to build electronic hardware by learning PCB artwork design, soldering techniques, testing, and various software troubleshooting etc.
3. Evaluate application of project work with appropriate societal consideration.
4. Develop presentation and interpersonal communication skills through project work.

BEC-45 INDUSTRIAL / PRACTICAL TRAINING

Course category	:	Audit Course (AC)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 0, Tutorial : 0 , Practical: 2
Number of Credits	:	1
Course Assessment methods	:	Continuous assessment through technical quality of the work, attendance, discipline, involvement and interest, project work, viva voce, project report and presentation
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Extend the boundaries of knowledge through research and development
2. Integrate classroom theory with workplace practice and Write formatted report explaining the work in industrial training and describing the experience
3. Appreciate the ethical basis of professional practice in relevant industry
4. Develop lifelong learning skills and make a gradual transition from academia to career

BEC-43 WIRELESS COMMUNICATION

Course category	:	Department Core (DC)
Pre-requisite Subject	:	Principles of Communication (BEC-28)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Able to understand cellular theory approach to develop the infrastructure for mobile communication systems.
2. Able to understand the need of coding, channel models, diversity, equalization, channel estimation techniques and multiple access techniques in mobile and wireless communication.
3. Able to understand the wireless communication systems and standards: GSM, IS-95 and the Ad Hoc networks and new trends in Mobile/wireless communication.
4. Able to understand the radio propagation over wireless channel and their different limitations and to apply analytical and empirical models in the design of wireless links.

Topics Covered

UNIT-I 9

Evolution of mobile communications, Mobile Radio System around the world, Types of Wireless communication System, Comparison of Common wireless system, Trend in Cellular radio and personal communication. Review of 2G, 3G, 4G and 5G wireless networks, Wireless Local Loop (WLL), Wireless Local Area network (WLAN), Bluetooth and Personal Area Networks.

UNIT-II 9

Fundamentals of equalisation, Equalisers in communication receiver, Survey of equalisation techniques, linear equaliser, Algorithms for Adaptive Equalization, Diversity techniques, RAKE receiver with its applications. Characteristics of speech signals, quantisation techniques, vocoders,

linear predictive coders, Multiple Access techniques for Wireless Communications.

UNIT-III 9

Review of probability distribution function (PDF): Nakagami-m, Weibull distribution, Lognormal fading with application in realistic scenarios, Large scale path loss:-Free Space Propagation loss equation, Path-loss of NLOS and LOS systems, Reflection, Ray ground reflection model, Diffraction, Scattering, Link budget design, Max. Distance Coverage formula, Empirical formula for path loss, Indoor and outdoor propagation models, Small scale multipath propagation, Impulse model for multipath channel, Delay spread.

UNIT-IV 9

GSM system architecture, Radio interface, Protocols, Localization and calling, Handover, Authentication and security in GSM, GSM speech coding, Concept of spread spectrum, Architecture of IS-95 CDMA system, Air interface, CDMA forward channels, CDMA reverse channels, Soft handoff, CDMA features, Power control in CDMA, Performance of CDMA System, RAKE Receiver, CDMA2000 cellular technology, GPRS system architecture. Review of 4G and 5G networks and their comparative analysis, issues and challenges.

EXPERIMENTS

A. Compulsory Experiments

1. Indoor planning and find out the basic parameters like path loss, path gain, and received power.
2. Outdoor planning and find out Propagation path displays, Delay spread, Complex Impulse Response.
3. Co-Siting of WiMax Transmitters in Ottawa and predict path loss and otherpropagation characteristics in Ottawa.
4. Study the Signal coverage, multipath, and channel characteristics for wireless communications in complex urbanenvironments.
5. To analyze the communication system and calculates SINR, throughput, theoretical capacity, and bit error rate(BER).
6. Set up and run a simulation using multiple-input multiple-out (MIMO) antennas in Wireless Insites X3D propagationmodel.
7. Throughput of a 5G New Radio FD-MIMO System in an Urban Area Using Custom Beam forming.

B. OptionalExperiments

1. Maximum Permissible Exposure Prediction.
2. Study the outdoor propagation using hata model.
3. Simulation of Beam forming by Massive MIMO Antennas in Urban Environments.
4. Millimeter (mm) Wave Channel Modeling with Diffuse Scattering in an Office Environment.
5. Wi-Fi Performance Simulation in a house with Two Routers.
6. 5G mm Wave Channel Modeling with Diffuse Scattering in an Office Environment.
7. 5G Massive MIMO Outdoor Communications Analysis.
8. Modeling an Ad Hoc Network with Transceivers in an Urban Setting.

Books & References

1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson, Second Edition.
2. T L Signal, “Wireless Communications”, McGraw Hill Publications.
3. Andrea Goldsmith, “Wireless Communications”, Cambridge University press.
4. Andreas F. Molisch, “Wireless Communications”, Wiley Student Edition.
5. S. Haykin & M. Moher, “Modern wireless communication”, Pearson,2005.

BEC-50	**PROJECT PART-II**
Course category	: Department Core (DC)
Pre-requisite Subject	: Project Part-I (BEC-40)
Contact hours/week	: Lecture : 0, Tutorial : 0 , Practical: 10
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through three viva voce/presentation, final project report, contribution made to literary world and Major examination
Course Outcomes	: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Identify and define problem statement through literature survey for project work in the field of Electronics and Communication.
2. Develop design strategy to build electronic hardware by learning PCB artwork design, soldering techniques, testing, and various software troubleshooting etc.
3. Evaluate application of project work with appropriate societal consideration.
4. Develop presentation and interpersonal communication skills through project work.

BEC-51 RADAR TECHNOLOGY

Course category	:	Programme Electives (PE1 & PE2)
Pre-requisite Subject	:	Electromagnetic Field Theory (BEC-14)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Acquired knowledge about Radar and Radar Equations.
2. Understanding the working principal of MTI and Pulse Doppler Radar.
3. Foster ability to work using Detection of Signals in Noise and Radio Direction Finding.
4. Foster ability to work using Instrument Landing System.
5. Acquired knowledge about Satellite Navigation System.

Topics Covered

UNIT-I 9

Introduction to Radar: Basic Radar, The Simply Form of the Radar Equations, Radar lock Diagram, Radar Frequencies, Applications of Radar. The Radar Equation: Detection of Signals in Noise, Receiver Noise and the Signal-to-Noise Ratio, Probabilities of detection and False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets, Radar Cross-Section of Targets, Radar Cross-Section Fluctuations, Transmitter Power, Pulse Repetition Frequency, Antenna Parameters, System Losses, problems

UNIT-II 9

MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay-Line Cancelers, Staggered Pulse Repetition Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.

UNIT-III 9

Tracking Radar: Tracking with Radar, Mono pulse Tracking, Conical Scan and Sequential Lobing, Limitations to tracking Accuracy, Low- Angle Tracking, Tracking in Range, Other Tracking Radar Topics, Comparison of Trackers, Automatic Tracking with Surveillance Radars(ADT)

UNIT-IV 9

Detection of Signals in Noise: Introduction, Detection Criteria, Detectors, Automatic Detection, Integrators, Constant-False-Alarm Rate Receivers. Information from Radar Signals: Basic Radar Measurements, Theoretical Accuracy of Radar Measurements, Ambiguity Diagram, Pulse Compression, Target Recognition, Land Clutter, Sea Clutter, Weather Clutter

Books & References

1. Merrill I. Skolnik, “Introduction to Radar Systems” Third Edition.
2. J.C. Toomay, Paul J. Hannen “ Principles of Radar” Third Edition.

BEC-52 BIOMEDICAL INSTRUMENTATION

Course category	:	Programme Electives (PE1 & PE2)
Pre-requisite Subject	:	Fundamentals of Electronics Engineering (BEC-01)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Students will have a clear knowledge about human physiology system.
2. They will have knowledge of the principle operation and design and the background knowledge of biomedical instruments and specific applications of biomedical engineering.
3. Learn several signals that can be measured from the human body. Specific examples include temperature, electrical, and pressure signals.
4. Review the cardiac, respiratory and neural physiological systems.
5. Study the designs of several instruments used to acquire signals from living systems. Examples of instruments studied include ECG, blood pressure monitors, spirometers, EEG, MRI, and ultrasound. Integrate information learned about biomedical signals, sensors and instrumentation design to create a design of your own.

Topics Covered

UNIT-I 9

Introduction: Specifications of bio-medical instrumentation system, Man-Instrumentation system Components, Problems encountered in measuring a living system. Basics of Anatomy and Physiology of the body. Bioelectric potentials: Resting and action potentials, propagation of action potential, The Physiological potentials – ECG, EEG, EMG, ERG, EOG and Evoked responses. Electrodes and Transducers: Electrode theory, Biopotential Electrodes – Surface electrodes, Needle electrodes, Microelectrodes, Biomedical Transducer.

UNIT-II 9

Cardiovascular Measurements: Electrocardiography – ECG amplifiers, Electrodes and Leads, ECG–Single channel, Three channel, Vector Cardiographs, ECG System for Stresses testing, Holter recording, Blood pressure measurement, Heart sound measurement. Pacemakers and Defibrillators. Patient Care & Monitoring: Elements of intensive care monitoring, displays, diagnosis, Calibration & Reparability of patient monitoring equipment.

UNIT-III 9

Respiratory system Measurements: Physiology of Respiratory system. Measurement of breathing mechanism – Spirometer. Respiratory Therapy equipments: Inhalators, Ventilators & Respirators, Humidifiers, and Nebulizers & Aspirators. Nervous System

Measurements: Physiology of nervous system, Neuronal communication, Neuronal firing measurements.

UNIT-IV 9

Ophthalmology Instruments: Electroretinogram, Electro - oculogram, Ophthalmoscope, Tonometer for eye pressure measurement. Diagnostic techniques: Ultrasonic diagnosis, Eco-cardiography, Eco-encephalography, Ophthalmic scans, X-ray & Radio-isotope diagnosis and therapy, CAT- Scan, Emission computerized tomography, MRI.

Bio-telemetry: The components of a Bio-telemetry system, Implantable units, Telemetry for ECG measurements during exercise, for Emergency patient monitoring.

Books & References

1. R. S. Khandpur, "Biomedical Instrumentation",TMH
2. S. K. Venkata Ram, "Bio-Medical Electronics &Instrumentation (Revised)",Galgotia.
3. J. G. Webster (editor), "Medical Instrumentation Application & Design", 3rd Ed WILEY, India
4. Cromwell, "Biomedical Instrumentation and Measurements"PHI
5. J. G. Webster, "Bio- Instrumentation", Wiley
6. S. Ananthi, "A Text Book of Medical Instruments", New Age International
7. Carr & Brown, "Introduction to Biomedical Equipment Technology", Pearson

BEC-53 INFORMATION THEORY & CODING

Course category	:	Programme Electives (PE1 & PE2)
Pre-requisite Subject	:	Digital Communication (BEC-31)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Students will be introduced to the basic notions of information and channel capacity.
2. Students will be introduced to convolutional and block codes, decoding techniques, and automatic repeat request (ARQ)schemes.
3. Students will be understood how error control coding techniques are applied in communication systems.
4. Students will understand the basic concepts of cryptography.

Topics Covered

UNIT-I 9

Information Theory

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

UNIT-II 9

Source Coding: Text, Audio And Speech

Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 - Speech: Channel Vocoder, Linear Predictive Coding.

UNIT-III 9

Error Control Coding: Block Codes

Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder – CRC.

UNIT-IV 9

Error Control Coding: Convolutional Codes

Convolutional codes – code tree, trellis, state diagram - Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding.

Books & References

1. R Bose, "Information Theory, Coding and Cryptography", TMH2007.
2. Fred Halsall, "Multimedia Communications: Applications, Networks, Protocols and Standards", Perason Education Asia,2002.
3. K Sayood, "Introduction to Data Compression" 3/e, Elsevier2006
4. S Gravano, "Introduction to Error Control Codes", Oxford University Press2007.
5. Amitabh Bhattacharya, "Digital Communication", TMH2006.

BEC-54 ADVANCED SEMICONDUCTOR DEVICES

Course category	:	Programme Electives (PE1 & PE2)
Pre-requisite Subject	:	Solid State Devices & Circuits (BEC-15)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Students study the basic of different kinds of modern semiconductor devices.
2. Ability to understand the basic operation and working of different diodes like PIN, Varactor diode etc. To understand the high frequency application of diodes.
3. To understand and use of the device models to explain and calculate the characteristics of the field effect transistors.
4. To be able to understand and analyze the V-I characteristics of different high power devices.
5. Understand the operation of charge-transfer devices and charge storage devices.

Topics Covered

UNIT-I 9

Review of Fundamentals of Semiconductors: Semiconductor Materials and their properties, carrier transport by drift and diffusion, electron - hole pair generation and recombination: band to band
(direct and indirect band gap transitions), continuity equations.

UNIT-II 9

Junctions and Interfaces: Description of p-n junction, The Abrupt Junction, The linearly graded Junction, Description of Breakdown Mechanism, Zener and Avalanche Breakdown in p-n Junction. Special purpose diodes: P-I-N diode, IMPATT diode, TRAPATT diode, BARITT diode, Photo detectors: photoconductor, photodiodes, avalanche photodiode, phototransistor, charge-coupled
device (CCD).

UNIT-III 9

Majority Carrier Diodes: The Tunnel Diode, The Schottkey Barrier Diode, Ohmic Contacts Heterojunctions.

Optoelectronic Devices: The Solar Cell:generation of photo voltage, light generated current, I-V
equation, solar cell characteristics, parameters of solar cells, Relation of V_{OC} and Eg, light emitting diodes, semiconductor lasers.

UNIT-IV 9

Metal Semiconductor Field Effect Transistors: Basic Types of MESFETs, Models for I-V Characteristics of Short – Channel MESFETs, tunnelling field-effect transistor (TFET), thin film transistor (TFT), JFET, high electron-mobility transistor (HEMT), modulation-doped FET (MODFET), single-electron transistor, floating gate MOSFET.

Books & References

1. M.S. Tyagi, "Introduction To Semiconductor Materials And Devices", John Willy-India Pvt. Ltd.
2. S. M. Sze, "Physics of Semiconductor Devices", 2nd Edition, John Willy-India Pvt. Ltd.
3. B. G. Streetman and S. Banerjee, "Solid state electronics devices", 5th Edition, PHI.
4. Solar Photovoltaics: Fundamentals, Technologies and Applications, C.S. Solanki, 2nd Edition Prentice Hall of India, 2011.

BEC-55 OPTOELECTRONICS

Course category	:	Programme Electives (PE1 & PE2)
Pre-requisite Subject	:	Solid State Devices & Circuits (BEC-15)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Understand fundamental properties of light and operation principles of basic optical components.
2. Demonstrate a mastery of basic mechanisms of light generation (including lasers) through detailed understanding and analysis of operation principles, characteristics, design architectures and trade-offs of semiconductor lasers.
3. Understand and compare operation principles, characteristics, design architectures and trade-offs of optical detectors and modulators of light.
4. Understand basic system design of fiber optic communication link and fundamental theory of fiberoptics.

Topics Covered

UNIT-I 9

Nature and Properties of Light

Wave nature of light, polarization, reflection, refraction, diffraction, Interference, transmission and absorption of light radiation, Refractive index, total internal reflection, light sources, Units of light.

UNIT-II 9

Review of Semiconductor Devices

Introduction to optoelectronics devices , Energy bands in solids, the E-k diagram, , elemental and compound Semiconductor, Semiconductor optoelectronic materials, effect of temperature and pressure on bandgap, Bandgap modification, Heterostructures and Quantum Wells.

UNIT-III 9

Display Devices

Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, Injection Luminescence, working principle and application of LED, Display devices, Liquid Crystal Display, Plasma Displays, Numeric Displays.

UNIT-IV 9

Industrial Applications of Optoelectronics

Gas and solid state LASERs, Photo detectors types and applications, Solar cell, Fiber optic sensors. Optoelectronic integrated Circuits (OEICs): Need for Hybrid and monolithic integration, OEIC transmitter and receivers.

Books & References

1. Semiconductor Optoelectronic Devices, Pallab Bhattarchrya, Prentice Hall Publication
2. Optoelectronics An Introduction, J. Wilson-J.F.B. Hawkes
3. Optical Engineering Fundamentals, B.H. Walker, PHI.
4. Electro-Optical Instrumentation Sensing and Measuring with Lasers, Silvano Donati, Pearson.
5. Fiber optics and Optoelectronics, R.P. Khare, Oxford Press

BEC-56 ELECTRONICS SWITCHING

Course category	:	Programme Electives (PE1 & PE2)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Acquire knowledge about switching theory and algebra.
2. Ability to learn and design sequential circuits.
3. Acquire knowledge and ability to analyze threshold gates sand their synthesis.
4. Foster ability to use PLDs and PLAs.
5. Acquired knowledge about and ability to design ASM and FSM.
6. Learn about various fault tolerance and diagnosis techniques.

Topics Covered

UNIT-I 9

Evolution of Switching systems: Introduction: Message switching, circuits switching, functions of a switching system, register-translator-senders, distribution frames, crossbar switch, a general trunking, electronic switching, Reed electronic system, digital switching systems.

UNIT-II 9

Digital switching: Switching functions, space division switching, Time division switching, two dimensional switching, Digital cross connect systems, digital switching in analog environment.

Telecom Traffic Engineering: Network traffic load and parameters, grade of service and blocking probability, modelling switching systems, incoming traffic and service time characterization, blocking models and loss estimates, Delay systems.

UNIT-III 9

Control of Switching Systems: Introduction, Call processing functions; common control, Reliability availability and security; Stored program control. Signalling: Introduction, Customer line signalling, AF junctions and trunk circuits, FDM carrier systems, PCM and inter register signalling, Common channel signalling principles, CCITT signalling system No. 6 and 7, Digital customerline signalling.

UNIT-IV 9

Packet Switching: Packets formats, statistical multiplexing, routing control, dynamic, virtual path circuit and fixed path routing, flow control, X.25 protocol, frame relay, TCP/IP, ATM cell, ATM service categories, ATM switching, ATM memory switch, pace memory

switch, memory-space, memory-space-memory switch, Banyan network switch.

Books & References

1. Thiagarajan Viswanathan, "Telecommunication switching System and networks", PHI.
2. J.E. Flood,"Telecommunicationswitching,TrafficandNetworks",Pearsoneducation.
3. J.C. Bellamy, "Digital Telephony", John Wiley,3e.

BEC-57 DIGITAL SYSTEM DESIGN

Course category	:	Programme Electives (PE1& PE2)
Pre-requisite Subject	:	Digital Electronics & Circuits (BEC-12)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Model digital systems in VHDL at different levels of abstraction.
2. Partition a digital system into different subsystems.
3. Simulate and verify a design.
4. Transfer a design from a version possible to simulate to a version possible to synthesize
5. Use modern software tools for digital design in VHDL.
6. Describe principal parts in programmable circuits (PLD, FPGA, ASIC) and describe how small designs are implemented in programmable circuits.

Topics Covered

UNIT-I 9

Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.

UNIT-II 9

Digital System Design Automation– Abstraction Levels, System level design flow, RTL design flow, VHDL.

RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration.

UNIT-III 9

Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE– related issues, Predefined Attributes

UNIT-IV 9

VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution

Books & References

1. Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3e.
2. R.D.M. Hunter, T. T. Johnson, "Introduction to VHDL" Springer Publication, 2010.
3. C. H. Roth, "Digital System Design using VHDL", PWS Publishing
4. Douglas Perry, "VHDL- Programming by examples", MGH

BEC-58 SATELLITE COMMUNICATION

Course category	:	Programme Electives (PE1 & PE2)
Pre-requisite Subject	:	Nil
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Revised the fundamentals of orbital mechanics, identify the characteristics of common orbits used by communications and other satellites.
2. Identify the Different elements used to design the earth station for satellite communication.
3. Identify the Different elements used to design the space station for satellite communication.
4. Calculate an accurate link budget design for the uplink and downlink in satellite communications link.

Topics Covered

UNIT-I 9

Evolution of satellite communication, Elements of Satellite Communication, Kepler laws, Orbital elements, Orbital perturbations, Apogee perigee heights, Inclines orbits, Sun synchronous orbits, Geo stationary orbits, Limits of visibility, Sun transit outage, polar Mount antenna, Antenna Look angles, Launching orbits, Low earth orbits, Medium orbits, satellite antenna.

UNIT-II 9

Earth segment: Receive-Only Home TV Systems, Master Antenna TV System, Transmit-Receive Earth Stations, Introduction to GPS and VSAT system, GPS and VSAT Receiver Operation.

UNIT-III 9

Space segment: power supply subsystem, attitude control, station keeping, thermal control, TT & C Subsystem, Transponders, Antenna subsystem.

UNIT-IV 9

Satellite link design: basic transmission theory, system noise temperature and G/T ratio, Uplink and downlink design, design for specified C/N, Input and Output back Off, Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc.

Books & References

1. B. Pratt, A. Bostian, “Satellite Communications”, WileyIndia.
2. D. Roddy, “Satellite Communications”, TMH, 4thEd.
3. S. D. Ilcev, “Global Mobile Satellite Communication”,Springer.
4. R. Pandya, “Mobile and Personal Communication Systems and Services ”,PHI.

BEC-61 MICROCONTROLLER & EMBEDDED SYSTEMS

Course category	:	Programme Electives (PE3)
Pre-requisite Subject	:	Microprocessors & Application (BEC-32)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

At the end of the course the students will be able to understand the concept and scope of microcontrollers specially 32-bit microcontroller, programming, interfacing of various external I/O devices, communication protocols used by microcontrollers and embedded networking.

Topics Covered

UNIT-I 9

Microprocessors for embedded systems

Embedded system overview and applications, features and architecture considerations-ROM, RAM, timers, data and address bus, Memory and I/O interfacing concepts, memory mapped I/O. CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture, instruction set, instruction formats, and various addressing modes of 32-bit. Fixed point and floating point arithmetic operations.

Introduction ARM architecture and Cortex – M series, Introduction to the Tiva family viz. TM4C123x & TM4C129x and its targeted applications, Tiva block diagram, address space, on-chip peripherals (analog and digital) Register sets, Addressing modes and instruction set basics.

UNIT-II 9

Microcontroller Fundamentals for Basic Programming, Timers, PWM and Mixed Signals Processing

I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Hibernation Module on Tiva, Active vs Standby current consumption. Introduction to Interrupts, Interrupt vector table, interrupt programming.

Case Study: Tiva based embedded system application bringing up the salient features of GPIO, Watchdog timer, etc.

Timer, Basic Timer, Real Time Clock (RTC), Timing generation and measurements, Analog interfacing and data acquisition: ADC, Analog Comparators, DMA, Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

Case Study: Tiva based embedded system application using ADC & PWM.

UNIT-III 9

Communication protocols and Interfacing with external devices

Synchronous/Asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, I2C protocol, SPI protocol & UART protocol. Implementing and programming I2C, SPI & UART interface using Tiva. CAN & USB interfaces on Tiva platform. Case Study: Tiva based embedded system application using the interface protocols for communication with external devices "Sensor Hub Booster Pack

UNIT-IV 9

Embedded networking and Internet of Things

Embedded Networking fundamentals, Ethernet, TCP/IP introduction IoT overview and architecture, Overview of wireless sensor networks and design examples. Various wireless protocols and its applications: NFC, ZigBee , Bluetooth, Bluetooth Low Energy, Wi-Fi. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications Building IoT applications using CC3100 user API: connecting sensor devices using Tivaware sensor library.

Case Study: Tiva based Embedded Networking Application: "Smart Plug with Remote Disconnect and Wi- Fi Connectivity"

EXPERIMENTS

1. Interfacing and programming GPIO ports in C using Tiva (blinking LEDs , push buttons)
2. Interrupt programming examples through GPIOs
3. Use Hibernation mode and wake on RTC interrupt
4. PWM generation using PWM Module on Tiva
5. Interfacing potentiometer with Tiva GPIO
6. PWM based Speed Control of Motor controlled by potentiometer connected to Tiva GPIO
7. Connect the Tiva to terminal on PC and echo back the data using UART
8. Interfacing an accelerometer with Tiva using I2C
9. Experiment on USB (Sending data back and forth across a bulk transfer-mode USB connection.)
10. Using IQmath Library for implementing Low pass FIR filter
11. Review of User APIs for TI CC3100 & Initialization and Setting of IP addresses
12. A basic Wi-Fi application – Communication between two Tiva based sensor nodes using TIVA sensor library in Tiva Ware
13. Setting up the CC3100 as a HTTP server

Books & References

1. Embedded Systems: Real-Time Interfacing to ARM Cortex-M Microcontrollers, 2014, ISBN: 978-1463590154.
2. http://processors.wiki.ti.com/index.php/Hands-on_Training_for_TI_Embedded_Processors
   http://processors.wiki.ti.com/index.php/MCU_Day_Internet_of_Things_2013_Workshop
3. http://www.ti.com/ww/en/simplelink_embedded_wi-fi/home.html
4. R. Kamal, "Embedded Systems: Architecture, Programming & Design", 2007, McGraw Hill, USA 2007.

BEC-62 OPTICAL COMMUNICATION

Course category	:	Programme Electives (PE3)
Pre-requisite Subject	:	Principles of Communication (BEC-28)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Fundamentals, advantages and advances in optical communication system.
2. Types, basic properties and transmission characteristic of optical fibers.
3. Knowledge of working and analysis of optical amplifiers and important parts at the transmitter (Semiconductor lasers/LEDs, modulators etc) as well as at the receiver sides (optical detector etc.) of the optical communications system.
4. Configuration and architecture of coherent optical communication, advanced system techniques and nonlinear optical effects and their applications.

Topics Covered

UNIT-I 9

Overview of optical fiber communication- The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Optical fiber Modes and configuration, Mode theory for circular Waveguides, Step Index fibers, Graded Index fibers. Single mode fibers-Cutoff wavelength, Mode Field Diameter, Effective Refractive Index. Fiber Material and its Fabrication Techniques.

UNIT-II 9

Signal distortion in optical fibers- Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, Group delay, Attenuation Measurements Techniques, Types of Dispersion - Material dispersion, Wave-guide dispersion, Polarization mode dispersion, and Intermodal dispersion. Pulse broadening. Overall fiber dispersion in Multi mode and Single mode fibers, Fiber dispersion measurement techniques, Non linear effects. Optical fiber Connectors: Joints, Couplers and Isolators.

UNIT-III 9

Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product.

Laser Diodes- Basic concepts, Classifications, Semiconductor injection Laser Modes, Threshold conditions, External quantum efficiency, Laser diode rateequations, resonant

frequencies, reliability of LED & ILD

UNIT-IV 9

Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling.

Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors.

Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers

EXPERIMENTS

A. Compulsory Experiments

1. To setting up fiber optic analoglink.
2. To measurement and study of losses in opticalfiber.
3. Study and measurement of numerical aperture of opticalfiber.
4. Measurement of Intensity modulation techniques using analog inputsignal.
5. Study of Intensity modulation techniques using digital inputsignal.
6. To measure propagation loss in optical fiber using optical powermeter.
7. Study of bendingloss.

B. Optional Experiments

1. To Study of pulse width modulation anddemodulation.
2. Study and measure characteristics of fiber optic LED and photodetector.
3. Setting a fiber optic voicelink.

Books & References

1. Govind P. Agrawal, “Fiber Optic Communication Systems”, John Wiley, 3e,,2004.
2. John M. Senior, “Optical Fiber Communications”, PEARSON, 3e,2010.
3. Gerd Keiser, “Optical Fiber Communications”, TMH,4e
4. Joseph C. Plais, “Fiber Optic Communication”, Pearson Education, 4e,2004.

BEC-63 DSP ARCHITECTURE & APPLICATIONS

Course category	:	Programme Electives (PE3)
Pre-requisite Subjects	:	Digital Signal Processing (BEC-42) Microprocessors & Application (BEC-32)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Comprehends the knowledge & concepts of digital signal processing techniques.
2. Acquire knowledge of DSP computational building blocks and knows how to achieve speed in DSP architecture or processor.
3. Develop basic DSP algorithms using DSP processors.
4. Acquire knowledge about various addressing modes of DSP and are able to program DSP processor.
5. Discuss about interfacing of serial and parallel communication devices.

Topics Covered

UNIT-I 9

Introduction To Digital Signal Processing: Introduction, A Digital Signal-Processing System, The Sampling Process, Discrete Time Sequences, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear Time-Invariant Systems, Digital Filters, Decimation and Interpolation.

UNIT-II 9

Architectures For Programmable Digital Signal Processors: Introduction, Basic Architectural Features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Features for External Interfacing.

UNIT-III 9

Programmable Digital Signal Processors: Introduction, Commercial Digital Signal-processing Devices, Data Addressing Modes of TMS32OC54xx., Memory Space of TMS32OC54xx Processors, Program Control. Detail Study of TMS320C54X & 54xx Instructions and Programming, On-Chip peripherals, Interrupts of TMS32OC54XX Processors, Pipeline Operation of TMS32OC54xxProcessor.

UNIT-IV 9

Implementation of Basic DSP And FFT Algorithms: Introduction, the Q-notation, FIR Filters, IIR Filters, Interpolation and Decimation Filters (one example in each case). Introduction, an FFT Algorithm for DFT Computation, Overflow and Scaling, BitReversed Index Generation & Implementation on the TMS32OC54xx.

Applications of DSP Using MATLAB: Mobile communication, medical, image processing, Acoustic Noise Canceller, Dynamic range compression, LPC analysis and synthesis, SSB modulation, Radar tracking implementation

EXPERIMENTS

1. Numbers representation. Fixed Point Representation (Qx, IQFormat).
2. Effect of sampling rate on waveform generation using DSP processor (Using CCS)
3. DFT computation using DSP processor
4. FIR filter design using MATLAB and find finite word length effect
5. FIR filter design using DSP processor
6. IIR filter design using MATLAB and find finite word length effect
7. IIR filter design using DSP processor
8. Analysis of speech signal
9. Application Development using CCS. Examples Signals Acquisition, DTMF tone detection techniques and the Goertzel algorithm, A GMSK Modulator Implementation

Books & References

1. Digital Signal Processing: A practical approach, Ifeachor E. C., Jervis B. W Pearson-Education, PHI,2002
2. “Digital Signal Processors”, B Venkataramani and M Bhaskar TMH,2002
3. “Architectures for Digital Signal Processing”, Peter Pirsch John Weily,2007
4. “Digital Signal Processing”, S.kmitra,,TMH,2002
5. Applications to DSP Using Matlab-Proakis
6. “Digital Signal Processing”, Avatar Singh and S. Srinivasan, Thomson Learning,2004

BEC-64 ANTENNA DESIGN

Course category	:	Programme Electives (PE3)
Pre-requisite Subject	:	Electromagnetic Field Theory (BME-29)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To understand the radiation mechanism of antenna and also to learn about the basic parameters of antennas.
2. To have insight into the derivation of field quantities of various antennas and there by deducing the other quantities like gain, directivity, impedance etc.
3. To design, development and fabrication of various types antennas and also to explore array concepts.
4. To understand the features of antennas test range (ATR) to perform various measurements on different antennas.
5. To understand the wave propagation over ground and through different layers of atmosphere.

Topics Covered

UNIT-I 9

Fundamental Concepts: Radiation pattern, near- and far-field regions, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions.

UNIT-II 9

Radiation from Wires and Loops: Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop.

Aperture Antennas: Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Fourier transform method in aperture antenna theory

UNIT-III 9

Horn and Reflector Antennas: Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and cassegrain antennas.

Microstrip Antennas: Basic characteristics, feeding methods, methods of analysis, design of rectangular and circular patch antennas.

UNIT-IV 9

Antenna Arrays: Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, extension to planar arrays, synthesis of antenna arrays using Schelkunoff polynomial method, Fourier transform method, and Woodward-Lawson method.

EXPERIMENTS

1. To verify the inverse square law of propagation: to measure the variation of the strength of radiated wave, with distance from transmitting antenna.
2. Measure parameter of dipole/folded dipole antenna:
   a) To plot the radiation pattern of the dipole antenna in azimuth and elevation planes on log and linear scales on polar and Cartesian plots.
   b) To measure the beam width(-3dB), front–to-back ratio, side lobe level & its angular position, plane of polarization &directivity and gain of the dipole antenna.
3. To demonstrate that the transmitting and receiving radiation patterns of an antenna are equal and hence confirm the reciprocity theorem of antenna.
4. To study the characteristics of Broadside array.
5. To measure various parameters of log periodic antenna using radiation pattern.
6. To measure various parameter of slotted antenna using radiation patterns.
7. To study the frequency dependent and independent antenna.
8. To study the characteristic features of end fire array.
9. To study the characteristic features of microstrip antenna.
10. To measure the phenomenon of linear and circular polarization of antennas.
11. To study an antenna design simulation software.

Books & References

1. Balanis, C.A., “Antenna Theory and Design”, 3e., John Wiley &Sons.
2. Jordan, E.C. and Balmain, K.G., “Electromagnetic Waves and Radiating Systems”, 2e, Prentice- Hall of India.
3. Stutzman, W.L. and Thiele, H.A., “Antenna Theory and Design”, 2e, John Wiley &Sons.
4. Elliot, R.S., “Antenna Theory and Design”, Revised edition, Wiley IEEE Press.

BEC-65 DIGITAL IMAGE PROCESSING

Course category	:	Programme Electives (PE4)
Pre-requisite Subjects	:	Signals & Systems (BEC-13) Digital Signal Processing (BEC-42)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Acquired knowledge about discrete-time sequences, concept of energy and power, periodicity.
2. Acquired knowledge DFT andFFT.
3. Ability to design linear digital filters both FIR and IIR using different techniques and their associatedstructures.
4. Ability to understand the concept of linear prediction andestimation.
5. Ability to understand the concept of Multi-rate signal processing and sample rate conversion.
6. Acquired knowledge about time-frequencyanalysis.

Topics Covered

UNIT-I 9

Introduction

Fundamental steps in DIP, elements of DIP, Simple image model, sampling & quantization, basic relationships between pixels, colour image model. Image Transforms: One-dimensional & two- dimensional DFT, cosine, sine, Hadamard, Haar, and Slant & KL transforms. Image Enhancement: Introduction, point operations, histogram modelling, spatial operations, Transform operations.

UNIT-II 9

Image Restoration

Introduction, image observation models, Inverse & Wiener filtering, difference between enhancement & restoration Restoration-spatial filtering, Noise reduction in frequency domain.

UNIT-III 9

Image Compression

Introduction, Pixel coding, Predictive coding, Transform coding, Inter-frame coding

UNIT-IV 9

Image Segmentation

Introduction, Spatial feature extraction, Transforms features, Edge detection, Boundary extraction, Segmentation techniques.

Books & References

1. Rafael C. Gonzalez Richard E Woods, "Digital Image Processing", Pearson, 3e,2009.
2. Anil K Jain, "Fundamentals of Digital Image Processing", PHI.

BEC-66 ATM NETWORKS AND B-ISDN

Course category	:	Programme Electives (PE4)
Pre-requisite Subject	:	Data Communication Networks (BEC-33)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Understand the basics of network protocols, access control, data link control, ATM, TCP/IP.
2. Understand the tradeoffs involved in network design in a variety of environments- LAN and WAN, diverse link rates, and varied error and delay conditions.
3. Understand the layered structure of protocols.
4. Understand the importance of standards.
5. Understand various concepts of broadband networks and subsequently conduct research in this field.

Topics Covered

UNIT-I 9

ATM

ATM standards, Terms and Concepts, B-ISDN Protocol Architecture, Physical Layer, ATM Layer, AAL, ATM services, ATM switches.

UNIT-II 9

Overview of ISDN

ISDN Channels, Access interface, functional devices and reference, services, Protocol structure, D- Channel Layer 3 Protocols, Numbering and addressing, ISDN Products.

UNIT-III 9

Broadband networks & Frame relay

Broadband networks: Need, Fast packet switching, Frame relay, Cell relay & ATM, FDDI, SMDS. Frame Relay: Basic Definition, Protocol Architecture, Permanent and switched VC, Frame relay
standards, Multicast services.

UNIT-IV 9

SMDS Overview

SMDS Interface & Services.

ISDN, B-ISDN and Internet Protocols.

Books & References

1. Kessler & Southeick: "ISDN" – McGraw Hill, 3e,1996.
2. William Stallings: "ISDN" – Pearson Education

BEC-67 RF ICs

Course category	:	Programme Electives (PE4)
Pre-requisite Subject	:	Analog Integrated Circuits (BEC-27)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Possess a basic knowledge of RF systems used in telecommunication industries.
2. Understand the concepts of various components of circuits used in RF systems.
3. Understand the basic RF device characteristics like gain, bandwidth, noise etc.
4. Design LNAs, power amplifiers, mixer, multipliers, oscillators used in RF systems.

Topics Covered

UNIT-I 9

Introduction to RF and Wireless Technology: Complexity comparison, Design bottle necks, Applications, Analog and digital systems, Choice of Technology. Basic concepts in RF Design: Nonlinearity and time variance, ISI, Random process and noise, sensitivity and dynamic range, passive impedance transformation.

UNIT-II 9

Low Noise Amplifiers: Gain, Linearity, stability and bandwidth considerations; LNA Topologies; Non-linearities calculation

UNIT-III 9

Mixers, Oscillators and Frequency synthesizers: performance parameters, noise figure, down conversion and up conversion mixers

UNIT-IV 9

Power Amplifiers: General considerations, linear and nonlinear PAs, classification, High Frequency power amplifier, large signal impedance matching, linearization techniques.

Books & References

1. Behzad Razavi, RF Microelectronics Prentice Hall of India,2001.
2. Thomas H. Lee, The Design of CMOS Radio Integrated Circuits, Cambridge University Press.

BEC-68 NEURAL NETWORKS

Course category	:	Programme Electives (PE4)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To study the role of neural networks in engineering, artificial intelligence, and cognitive modelling.
2. To study the learning process of the neural networks of increasing complexity and learning the generalization theory.
3. To study the single-layer perceptron and multi-layered architecture of the neural networks.
4. Ability to apply neural networks to particular applications, and to know what steps to take to improve the performance.

Topics Covered

UNIT-I 9

Introduction to neural networks, human brain, biological neuron, models of neuron, signal flow graph of neuron, feedback, network architecture, knowledge representation, Artificial intelligence and neural networks.

UNIT-II 9

Learning Process: Error correction learning, memory based learning, Hebbian learning, competitive learning, Boltzmann learning, learning with and without teacher, learning tasks, memory and adaptation. Artificial neurons, Neural networks and architectures, neuron signal function, mathematical preliminaries, Feed forward & feedback architecture.

UNIT-III 9

Introduction to Rosenblatt's perceptron, perceptron learning algorithm, perceptron convergence theorem, Single-Layer Perceptron classifiers, LMS learning Algorithm, Back propagation and other learning algorithms Multi-layered architecture, structure growing algorithms, applications of feed
forward neural networks.

UNIT-IV 9

Applications of Neural Algorithms and Systems: Linear Programming Modelling Network, Character Recognition Networks, Neural Networks Control Applications, Networks for Robot Kinematics, Neural Networks for nanotechnology applications.

Books & References

1. Kumar Satish, “Neural Networks”,TMH
2. Simon Haykin, ”Neural Networks”,PHI
3. J. M. Zurada, “Introduction to Artificial Neural Systems”, Jaico Publishers,3e.