BACHELOR OF TECHNOLOGY
CURRICULA & SYLLABI

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Baba Sahab Dr. Bhim Rao Ambedkar

College of Agril Engg & Technology- Etawah-206001(UP)

(Chandra Shekhar Azad University of Agriculture & Technology, Kanpur)

(For newly admitted students from Session 2018-2019)

Electronics & Communication Engineering Department

ABOUT THE DEPARTMENT

The Department of Electronics & Communication Engineering established in the year 2002 with an intake of 40, is imparting quality education to the students in the field of Electronics & Communication Engineering through its Undergraduate programme. The department earn a good reputation since its inception and imparting high quality technical education the under graduate students.

The department has been under Self Finance programme with the support of the core faculty of Agricultural Engineering and its staff. The good numbers of alumni of the department are occupying high positions in Governments, Semi- Governments and Private organizations in the country as well as abroad. The laboratories of the department are being updated time to time to run the UG programmes offered by the departments.

VISION

To become an Acclaimed Department of Higher Learning, Research, Innovation and Incubation in Electronics and Communication Engineering.

MISSION

1. Educate a new generation of Engineers to meet the challenges of the future by providing them with a firm foundation of both the Final and practical of Electronics and Communication Engineering at undergraduate levels.
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.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS) OF B.TECH. PROGRAMME

PEO-I	Excel in professional career and/or higher education by acquiring knowledge in area of Electronics and Communication Engineering.
PEO-II	Analyze real life problems, design appropriate system to provide solutions that are technically sound, economically feasible and socially acceptable.
PEO-III	Exhibit professionalism, ethical attitude, communication skills, team work in their profession and adapt to current trends by engaging in life-long learning.

PROGRAM OUTCOMES (POs) of B.Tech. PROGRAMME:

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

(a) An ability to apply knowledge of mathematics, science and engineering fundamentals to the conceptualization of engineering models.

(b) An ability to identify and formulate the techniques and tools related to electronics and communication engineering to analyze conflicting technical and engineering issues.

(c) An ability to design, implement and evaluate an electronics & communication engineering based system, components or processes to meet the desired needs within realistic constraints.

(d) An ability to design and conduct experiments, as well as to analyze and interpret data.

(e) An ability to use current techniques, skills and modern tools necessary for engineering practice.

(f) An ability to apply the engineering knowledge to assess societal, health, safety, legal and cultural issues to the professional engineering practice.

(g) An ability to understand the impact of electronics and communication engineering in societal and environmental context and demonstrate the knowledge for sustainable development.

(h) An ability to understand and commit to professional ethics, responsibilities and norms of engineering practice.

(i) An ability to function individually and on team to accomplish a common goal.

(j) An ability to communicate effectively and to prepare formal technical plans and detailed reports involving creative use of knowledge of engineering principles in novel ways.

(k) An ability to demonstrate a knowledge and understanding of management and business practices and understand their limitations.

(l) Knowledge of contemporary issues like increased use of portable devices, rising health care costs and etc. which influences engineering design, and an ability to engage in independent and life long learning.

Credit Structure for B.Tech. Electronics & Communication Engineering

(For newly admitted students from Session 2018-2019)

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**

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

Year - I

Semester: I

S.N.	Category	Paper Code	Course	L	T	P	Credits
1.	BSM	BSH-111	Engineering Mathematics-I	3	1	0	4
2.	BSM	BSH-112	Engineering Physics-I	3	1	2	5
3.	EF	ECE-111	Fundamentals of Electronics Engineering	3	1	2	5
4.	EF	EEE-111	Electrical Circuits & Analysis	3	1	2	5
5.	HSSC	BSH-113	Professional Communication	3	1	0	4
6.	EF	ECE-112	Electronics Workshop & PCB	0	0	4	2
7.	AC	BSH-114	Environment Studies	2	1	0	NC
			Total	**15**	**5**	**10**	**25**

NOTE: NC = NON CREDIT

Semester: II

S.N.	Category	Paper Code	Course	L	T	P	Credits
1.	BSM	BSH-121	Engineering Mathematics-II	3	1	0	4
2.	BSM	BSH-122	Engineering Physics-II	3	1	2	5
3.	BSM	BSH-123	Engineering Chemistry	3	1	2	5
4.	HSSE	BSH***	Humanities & Social Science Electives	2	1	0	3
5.	EF	CSE-121	Introduction to Computer Programming	3	1	2	5
6.	EF	CEE-121	Engineering Graphics	0	0	4	2
7.	AC	BSH-127	Knowledge Management	2	1	0	NC
			Total	**14**	**5**	**10**	**24**

NOTE: Opt one HSSE course (BSH-***) from the list ahead, NC = **NON CREDIT**

Year-II

Semester-III

S.N.	Category	Paper Code	Course	L	T	P	Credits
1.	BSM	BSH-231	Engineering Mathematics-III	3	1	0	4
2.	EF	EEE-231	Electromechanical Energy Conversion	3	1	2	5
3.	BSM	BSH-232	Solid State Physics	3	1	2	5
4.	DC	ECE-231	Network Analysis & Synthesis	3	1	0	4
5.	DC	ECE-232	Digital Electronics & Circuits	3	1	2	5
6.	EF	BSH-233	Communication Skills	0	0	4	2
7.	AC	BSH-234	Nano Technology	2	1	0	NC
			Total	**15**	**5**	**10**	**25**

NOTE: NC = NON CREDIT

Semester-IV

S.N.	Category	Paper Code	Course	L	T	P	Credits
1.	BSM	BSH-241	Engineering Mathematics-IV	3	1	0	4
2.	DC	ECE-241	Signals & Systems	3	1	0	4
3.	DC	ECE-242	Electromagnetic Field Final	3	1	0	4
4.	DC	ECE-243	Solid State Devices & Circuits	3	1	2	5
5.	M	BSH-242	Public Administration	3	1	0	4
6.	EF	CSE-241	Web Designing	0	0	4	2
7.	AC	BSH-243	Industrial Management	2	1	0	NC
			Total	**15**	**5**	**6**	**23**

Year-III

Semester-V

S.N.	Category	Paper Code	Course	L	T	P	Credits
1.	M	BSH-351	Engineering and Managerial Economics	2	1	0	3
2.	DC	ECE-351	Control Systems	3	1	2	5
3.	DC	ECE-352	Analog Integrated Circuits	3	1	2	5
4.	DC	ECE-353	Principles of Communication	3	1	2	5
5.	DC	ECE-354	Electronics Measurement & Instrumentation	3	1	2	5
6.	AC	BSH-352	Operation Research	3	1	0	NC
			Total	**14**	**5**	**8**	**23**

Semester-VI

S.N.	Category	Paper Code	Course	L	T	P	Credits
1.	DC	ECE-361	Digital Communication	3	1	2	5
2.	DC	ECE-362	Microprocessors & Application	3	1	2	5
3.	DC	ECE-363	Data Communication Networks	3	1	0	4
4.	DC	ECE-364	Microwave Engineering	3	1	2	5
5.	DC	ECE-365	VLSI Technology	3	1	0	4
6.	AC	ECE-366	Seminar	0	0	6	NC
			Total	**15**	**5**	**6**	**23**

Year – IV

Semester-VII

S.N.	Category	Paper Code	Course	L	T	P	Credits
1.	DC	ECE-471	VLSI Design	3	1	2	5
2.	DC	ECE-472	Digital Signal Processing	3	1	0	4
3.	PE1	EPE***	Program Elective-1	3	1	0	4
4.	PE2	EPE***	Program Elective-2	3	1	0	4
5.	P	ECE-473	Project Part-I	0	0	10	5
6.	AC	ECE-474	Industrial/ Practical Training	0	0	2	NC
			Total	**12**	**4**	**12**	**22**

Note : 1. Opt one program elective each from the list of Program Elective 1&2 (EPE-***) attached ahead.

2. Industrial/ Practical Training will be offered at the end of Sixth Semester & evaluation in Seventh Semester.

Semester-VIII

S.N.	Category	Paper Code	Course	L	T	P	Credits
1.	DC	ECE-481	Wireless Communication	3	1	2	5
2.	PE3	EPE***	Program Elective-3	3	1	2	5
3.	PE4	EPE***	Program Elective-4	3	1	0	4
4.	OE	MOE-***/ AOE-***/ COE-***/ BOE-***	Open Elective offered by other Department	3	1	0	4
5.	P	ECE-482	Project Part-II	0	0	10	5
			Total	**12**	**4**	**12**	**23**

NOTE: Opt one program elective each from the list of Program Electives – 3 & 4 (EPE-***); and one open elective from list of Open Elective (MOE-***/AOE-***/ COE-***/BOE-***) attached ahead.

Humanities & Social Science Electives

S.N.	Paper Code	Course	Prerequisite Subject	L	T	P	Credits
1.	BSH-124	Technical Writing	-	2	1	0	3
2.	BSH-125	Human Values & Professional Ethics	-	2	1	0	3
3.	BSH-126	Industrial Psychology	-	2	1	0	3

Audit Courses for B. Tech. (Electronics and Communication Engineering)

S.N.	Paper Code	Course	Prerequisite Course	L	T	P	Credits
		Year-I (I & II Semester)					
1.	BSH-114	Environment Studies	-	2	1	0	NC
2.	BSH-127	Knowledge Management	-	2	1	0	NC
		Year-II (III & IV Semester)					

3.	BSH-234	Nano Technology	-	2	1	0	NC
4.	BSH-243	Industrial Management	-	2	1	0	NC
		Year-III (V Semester)					
5.	BSH-352	Operation Research	-	3	1	0	4

Engineering Fundamentals & Department Core (Electronics & Communication Engineering)

S.N.	Paper Code	Course	Prerequisite Subject	L	T	P	Credits
Year-I							
1.	ECE-111	Fundamentals of Electronics Engineering	-	3	1	2	5
2.	ECE-112	Electronics Workshop & PCB	-	0	0	4	2
Year-II							
3.	ECE-231	Network Analysis &Synthesis	-	3	1	0	4
4.	ECE-232	Digital Electronics & Circuits	-	3	1	2	5
5.	ECE-241	Signals & Systems	-	3	1	0	4
6.	ECE-242	Electromagnetic Field Final	-	3	1	0	4
7.	ECE-243	Solid State Devices & Circuits	-	3	1	2	5
Year-III							
8.	ECE-351	Control Systems	-	3	1	2	5
9.	ECE-352	Analog Integrated Circuits	-	3	1	2	5
10.	ECE-353	Principles of Communication	-	3	1	2	5
11.	ECE-354	Electronics Measurement & Instrumentation	-	3	1	2	5
12.	ECE-361	Digital Communication	ECE-353	3	1	2	5
13.	ECE-362	Microprocessors & Application	ECE-232	3	1	2	5
14.	ECE-363	Data Communication Networks	ECE-353	3	1	0	4
15	ECE-364	Microwave Engineering	ECE-242	3	1	2	5
16.	ECE-365	VLSI Technology	-	3	1	0	4
17.	ECE-366	Seminar	-	0	0	6	3
Year-IV							
18.	ECE-471	VLSI Design	ECE-365	3	1	2	5
19.	ECE-472	Digital Signal Processing	ECE-241	3	1	0	4
20.	ECE-473	Project Part-I	-	0	0	10	5
21.	ECE-474	Industrial/ Practical Training	-	0	0	2	1
22.	ECE-481	Wireless Communication	ECE-353	3	1	2	5
23.	ECE-482	Project Part-II	ECE-473	0	0	10	5

Programme Electives (Electronics & Communication Engineering)

S.N.	Paper Code	Course	Prerequisite Subject	L	T	P	Credits
PE1& PE2 (VII Semester)							
1.	EPE-471	RADAR Technology	-	3	1	0	4
2.	EPE-472	Biomedical Instrumentation	-	3	1	0	4
3.	EPE-473	Information Final & Coding	ECE-361	3	1	0	4
4.	EPE-474	Advanced Semiconductor Devices	ECE-243	3	1	0	4

5.	EPE-475	Optoelectronics	-	3	1	0	4
6.	EPE-476	Electronics Switching	-	3	1	0	4
7.	EPE-477	Digital System Design	ECE-232	3	1	0	4
8.	EPE-478	Satellite Communications	-	3	1	0	4
PE3 & PE4 (VIII Semester)							
1.	EPE-481	Microcontroller & Embedded Systems	ECE-362	3	1	2	5
2.	EPE-482	Optical Communications	-	3	1	2	5
3.	EPE-483	DSP Architecture & Applications	-	3	1	2	5
4.	EPE-484	Antenna Design	ECE-242	3	1	2	5
5.	EPE-485	Digital Image Processing	-	3	1	0	4
6.	EPE-486	ATM Networks and B-ISDN	ECE-363	3	1	0	4
7.	EPE-487	RF ICs	-	3	1	0	4
8.	EPE-488	Neural Networks	-	3	1	0	4

Electronics and Communication Engineering Department

Courses Offered by the Department

S.N.	Paper Code	Course	Prerequisite Subject	L	T	P	Credits
1.	ECE-111	Fundamentals of Electronics Engineering	-	3	1	2	5
2.	ECE-112	Electronics Workshop & PCB	-	0	0	4	2
3.	ECE-231	Network Analysis &Synthesis	-	3	1	0	4
4.	ECE-232	Digital Electronics & Circuits	-	3	1	2	5
5.	ECE-241	Signals & Systems	-	3	1	0	4
6.	ECE-242	Electromagnetic Field Final	-	3	1	0	4
7.	ECE-243	Solid State Devices & Circuits	-	3	1	2	5
8.	ECE-351	Control Systems	-	3	1	2	5
9.	ECE-352	Analog Integrated Circuits	-	3	1	2	5
10.	ECE-353	Principles of Communication	-	3	1	2	5
11.	ECE-354	Electronics Measurement & Instrumentation	-	3	1	2	5
12.	ECE-361	Digital Communication	ECE-353	3	1	2	5
13.	ECE-362	Microprocessors & Application	ECE-232	3	1	2	5
14.	ECE-363	Data Communication Networks	ECE-353	3	1	0	4
15	ECE-364	Microwave Engineering	ECE-242	3	1	2	5
16.	ECE-365	VLSI Technology	-	3	1	0	4
17.	ECE-366	Seminar	-	0	0	6	3
18.	ECE-471	VLSI Design	ECE-365	3	1	2	5
19.	ECE-472	Digital Signal Processing	ECE-241	3	1	0	4
20.	ECE-473	Project Part-I	-	0	0	10	5
21.	ECE-474	Industrial/ Practical Training	-	0	0	2	1
22.	ECE-481	Wireless Communication	ECE-353	3	1	2	5
23.	ECE-484	Project Part-II	ECE-473	0	0	10	5
24.	EPE-471	RADAR Technology	-	3	1	0	4
25.	EPE-472	Biomedical Instrumentation	-	3	1	0	4
26.	EPE-473	Information Final & Coding	ECE-361	3	1	0	4
27.	EPE-474	Advanced Semiconductor Devices	ECE-243	3	1	0	4

28.	EPE-475	Optoelectronics	-	3	1	0	4
29.	EPE-476	Electronics Switching	-	3	1	0	4
30.	EPE-477	Digital System Design	ECE-232	3	1	0	4
31.	EPE-478	Satellite Communications	-	3	1	0	4
32.	EPE-481	Microcontroller & Embedded Systems	ECE-362	3	1	2	5
33.	EPE-482	Optical Communications	-	3	1	2	5
34.	EPE-483	DSP Architecture & Applications	-	3	1	2	5
35.	EPE-484	Antenna Design	ECE-242	3	1	2	5
36.	EPE-485	Digital Image Processing	-	3	1	0	4
37.	EPE-486	ATM Networks and B-ISDN	ECE-363	3	1	0	4
38.	EPE-487	RF ICs	-	3	1	0	4
39.	EPE-488	Neural Networks	-	3	1	0	4

Courses offered for other Departments

S.N.	Paper Code	Course	Prerequisite Subject	L	T	P	Credits
1.	EOE-481	Non-Conventional Energy Resources	-	3	1	0	4
2.	EOE-482	Industrial Electronics	ECE-111	3	1	0	4
3.	EOE-483	Product Development	ECE-111	3	1	0	4

Open Elective Courses

S.N. Paper	Code	Course	L	T	P	Credits
1.	MOE-481	Fundamentals Of Mechanical Engineering	3	1	0	4
2.	MOE-482	Manufacturing Processes	3	1	0	4
3.	MOE-483	Engineering Material	3	1	0	4
4.	AOE-481	Photovoltaic Technology And Systems	3	0	2	4
5.	AOE-482	Remote Sensing And GIS Applications	3	0	2	4
6.	AOE-483	Human Engineering And Safety	3	0	2	4
7.	COE-481	Database Management System, Data Mining & Warehousing	3	1	0	4
8.	COE-482	Object Oriented Techniques & Java Programming	3	1	0	4
9.	COE-483	Introduction to Web Technology	3	1	0	4
10.	EOE-481	Non-Conventional Energy Resources	3	1	0	4
11.	EOE-482	Industrial Electronics	3	1	0	4
12.	EOE-483	Development Product	3	1	0	4
13.	BOE-481	Entrepreneurship Development	3	1	0	4
14.	BOE-482	Enterprise Resource Planning	3	1	0	4
15.	BOE-483	E-Commerce & IT	3	1	0	4

Subject offered by Basic Sciences & Maths (BSM)

SYLLABI

BSH-111 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, mid-term examination, and Final 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, Eigen-values, 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 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.

BSH-112 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, mid-term examination, practical work, record, viva voce & Practical and Final 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 application to understand material properties.
3. Statistical mechanics and its application in study of Macro and Micro scale properties of Matter.
4. Use of the principle of optics in the measurement.
5. Applications of Laser and holography in Engineering.
6. Basic Principles of optical Fibre and its application in Engineering.

Topics Covered

UNIT-I

Relativistic Mechanics: Inertial and Non-inertial Frames of reference, Galilean transformation, Michelson-Morley Experiment, Postulates of special Final 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. 9

UNIT-II

Statistical Mechanics: Brief Introduction of Classical Statistics, Bose Einstein Statistics, and Application to Black body radiation, distribution law of energy, Planck's radiation formula and Stefan's law. Fermi – Dirac statistics, Application to electrons in metals (energy distribution, Fermi energy). 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 and three dimensional), Simple Harmonic oscillator (one dimensional and three dimensional).

UNIT-III 9

Geometrical Optics: General Final of image formation: Cardinal points of an optical system; general relationships, thick lens and lens combinations.

Optical instruments: Need for a multiple lens eyepiece, common type of eyepieces

Physical Optics:

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

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

Modern Optics 9

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, attenuation and losses.

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 Final Relativity-Robert Resnick, Wiley Eastern Ltd.
2. Statistical Mechanics and Properties of Matter- E S R Gopal, John Wiley and Sons
3. Quantum Mechanics: Final 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

BSH-121 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, midterm examination and Final 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

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

BSH-122 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, midterm examination, practical work, record, viva voce and Final & 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 application in Engineering

2. Use of the principles of sound wave and acoustics in civil engineering with the consideration of NDT.
3. Basic principles of electricity and magnetism applied in Engineering.
4. Maxwell's equation of electromagnetic Final and its application in engineering.
5. Basic principles of semiconducting materials and its application.
6. Basic Principles of Superconductivity and its application 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, Reciprocal Lattice, 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 Final (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 & References

1. Introduction to Solid State Physics- Kittel , 7th edition, Wiley Eastern Ltd.
2. Solid State Physics - S. O. Pillai, 5th edition, New Age International.
3. Introduction to Electrodynamics- David J. Griffiths Pearson, New International Edition
4. Semiconductor Devices and Application - S.M. Sze, Wiley
5. Introduction to Nano Technology - Poole Owens, Wiley India
6. Master Hand book of Acoustics - F. Alton Everest and Ken Pohlmann, 5th edition, McGraw Hill

BSH-123 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, practical work, record, viva voce and Final and 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 life-long 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- C_{60}, 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 and elimination reactions. Mechanism of organic name reactions (Cannizzaro reaction, Aldol condensation, Pinacol-pinacolone rearrangement, Beckmann rearrangement, Hoffmann rearrangement & Diels Alder Reaction) Stereoisomerism 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 fibers. 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, ^{1}H 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 $K_3[Fe(CN)_6]$ 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 Cobaltinitrile 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

BSH-231 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, midterm examination and Final 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 $\int_{-\infty}^{+\infty} f(x)\,dx$

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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

BSH-232 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, midterm examination, practical work, record, viva voce and Final & 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.

Topic Covered

UNIT I **9**

Crystal Structure and Binding

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

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 Final of Solids

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 Final, 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, thermo luminescence, electroluminescence and photo-conductivity; colour centres.

EXPERIMENTS

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)

BSH-241 ENGINEERING MATHEMATICS-IV

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, midterm examination and Final 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 9

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.

UNIT-II 9

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

UNIT-III 9

Partial Differential Equations

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 9 partial differential equations, Wave equation up to two-dimensions, Laplace equation in two dimensions, Heat conduction equations up to two dimensions

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

Syllabus for Engineering Fundamentals (EF) (Electronics and Communication Engineering)

ECE-111 FUNDAMENTALS 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, Midterm, practical work, record, viva voce & Practical and Final 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 MOSFET etc.
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 analyze 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 generators etc.
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

Transistors(BJT and FET);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.

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

UNIT-III **9**

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

Operational Amplifiers

Concept of ideal operational amplifiers, ideal op-amp parameters, inverting, non-inverting and unity gain amplifiers, adders, difference amplifiers, integrators

UNIT-IV

Electronics Instruments: Working principle of digital voltmeter, digital multimeter (block diagram 9 approach), CRO (its working with block diagram), measurement of voltage, current, phase and frequency using CRO

EXPERIMENTS

Note: Minimum Eight experiments are to be performed

1. To Plot the forward/Reverse Characteristics of Si P-N junction diode.
2. To Plot the forward/Reverse Characteristics of Zener diode
3. Study and plot the characteristic of Zener diode as voltage regulator
4. Study of half wave rectifier and draw the nature of input / output signal. Calculate the value of Idc, Irms and ripple factor.
5. Study of Full wave rectifier and draw the nature of input / output signal. Calculate the value of I_{dc}, I_{rms} and ripple factor.
6. Study of Bridge Rectifier and draw the nature of input / output signal. Calculate the value of I_{dc}, I_{rms} and ripple factor.
7. Draw input output characteristic curve of n-p-n transistor in CE configuration
8. Draw input output characteristic curve of n-p-n transistor in CB configuration
9. Draw the drain and transfer curve of JFET
10. Study of OP-AMP (741) and calculate the gain in (i) Inverting mode and (ii) Non inverting mode
11. Study of OP-AMP as a (i) Summer (ii) Integrator (iii) Differentiator; and plot the nature of input & output waveform
12. Study of CRO and multi-meter measurement voltage, frequency, phase difference using CRO along with the testing of electronics component

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

EEE-111 ELECTRICAL CIRCUIT ANALYSIS

Course category : Department Core(DC)
Pre- requisites : Physics and Math(10+2)
Contact hours/week : Lecture : 3, Tutorial :1 , Practical :2
Number of Credits 5
Course Assessment :Continuous assessment through tutorials, assignments, methods midterm examination and Practical Examination

Course Outcome : 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 concepts of network and circuit.

2. To solve the basic electrical circuits.
3. Familiarity with the basic concepts of AC circuits.
4. Able to analyze the transient behavior of the circuit.
5. Able solve magnetic circuits.
6. Able to analyze three phase circuits.
7. Need of earthing of equipment's with safety issues.

UNIT-I **9**

D C Circuit Analysis and Network Theorems: 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: 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: 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: 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.

REFERENCES:

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

LIST OF 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

ECE-112 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 tutorials, attendance, home assignments, Midterm, practical work, record, viva voce and Final & 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.

Experiments

1. Winding shop: Step down 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 centre 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 & 3D view.

CSE-121 INTRODUCTION TO COMPUTER PROGRAMMING

Course Category	:	Engineering Fundamental (EF) for other Departments
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 Final & 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 Final 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, 9 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, and 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.
22. 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, 7th edition, Pearson
2. Childt , Herbert Complete reference with C Tata McGraw Hill

Reference 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

EEE- 231 ELECTROMECHANICAL ENRGY CONVERSION

Course category	:	Department Core (DC)
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, assignments, mid-term examination & Practical and Final 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 DC machines with numerical calculation.
2. The concept of Transformer with numerical calculation.
3. The concept of Synchronous machine & IM with numerical calculation.

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 Final, 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 Final, 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.

ELECTROMECHANICAL ENERGY CONVERSION LAB

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.
9. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.
10. 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

Text Books:

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.KingsleyJr 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

P.S. Bimbhra, " Generalized Final of Electrical Machines", Khanna Publishers

BSH-233 COMMUNICAION SKILLS

Course category	:	Humanities & Social Sciences (HSS)
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 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

Syllabus for Department Core (DC) (Electronics and Communication Engineering)

ECE-231 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, Midterm, record, viva voce and Final 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 the Thévenin, Norton, nodal and mesh analysis to express complex circuits in their simpler equivalent forms.
2. Able to apply linearity and superposition concepts to analyze RL, RC, and RLC circuits in time and frequency domains.
3. Able to analyze resonant circuits both in time and frequency domains.
4. Able to construct and make time and frequency domain measurements on elementary RL, RC, and RLC circuits.
5. Understand the fundamental concepts of network analysis and synthesis of two-port passive networks.

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

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. 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

Properties of transfer functions, Zeroes of transmission, Synthesis of Y21 and Z21 with 1Ω terminations, Introduction to active network synthesis; Foster, Cauer's etc.

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

ECE-232 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, Midterm, practical work, record, viva voce and Final & 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.
2. Acquired knowledge about solving problems related to number systems and Boolean algebra.
3. Ability to identify, analyze and design combinational circuits.
4. Ability to design various synchronous and asynchronous sequential circuits.
5. 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: Introduction, Memory organisation, Classification and characteristics of memories, RAM, ROM, PLA, PAL.

EXPERIMENTS

1. Introduction to digital electronics lab- Nomenclature of digital ICs, specifications.
2. Verification of the truth tables of logic gates using TTL ICs.
3. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
4. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
5. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
6. Implementation of 4x1 multiplexer using gates.
7. Implementation of 4-bit parallel adder using 7483 IC.
8. Design, and verify the 4-bit synchronous counter and asynchronous counter.
9. Implementation of a 3-bit SIPO and SISO shift registers using flip-flops.
10. Design of Seven segment display driver for BCD codes.
11. BCD Adders & Subtractors.

Books & References

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

ECE-241 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, Midterm, record, viva voce and Final 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 signals mathematically and understand how to perform mathematical operations on signals.
2. Understand various signals and systems properties and be able to identify whether a given system exhibits these properties and its implication for practical systems.
3. Understand the process of convolution between signals, & able to solve differential equation using Laplace transforms techniques.
4. Understand the intuitive meaning of frequency domain and the importance of analyzing and processing signals in the frequency domain.
5. Able to compute the Fourier series or Fourier transform Z-transform, and further be able to use the properties and application in analysis to ideal filtering, amplitude modulation and sampling.
6. Able to analysis and design of linear time invariant systems used in engineering

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. Convolution integral, Co-relations, Signal energy and energy spectral density, signal power and power spectral density, Properties of power spectral density,

UNIT-II

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-III 9

Fourier Transforms (FT)

(i) 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 (ii) Discrete time Fourier transform (DTFT), Inverse DTFT, Convergence, Properties and theorems, Comparison between continuous time FT and DTFT

UNIT-IV 9

Time and frequency domain analysis of systems

Analysis of first order and second order systems, continuous-time (CT) system analysis using LT, System functions of CT systems, Poles and zeros, 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. Willsky and S. Hamid Nawab, „Signals & System", Pearson Education, 2nd Ed.,2003
3. P. Ramakrishna Rao, `Signal and Systems" 2008 Ed., Tata McGraw Hill, New Delhi

ECE-242 ELECTROMAGNETIC FIELD FINAL

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, Midterm, record, viva voce and Final Examination 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 static electric fields in standard configurations.
2. Describe and analyze electromagnetic wave propagation in free-space.
3. Describe and analyze transmission lines.
4. Work in a small team using cooperative learning rules.
5. Communicate electromagnetic concepts both orally and in writing.

Topics Covered

UNIT-I 9

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.

UNIT-II 9

Magnetostatics

Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, Application of Ampere's law, and Magnetic flux density Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to 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.

UNIT-III 9

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 of a plane wave in a normal incidence.

UNIT-IV 9

Transmission lines

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

Books & References

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

ECE-243 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, Midterm, practical work, record, viva voce and Final & 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 understand the basic operation and working of different diodes like PIN, Varactor diode etc.
2. 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 device.

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, Tunnel Diode, Schottky barrier diode, Light Emitting diode, Photo diode, Characteristics and applications.

UNIT-II 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, MOS differential pair small signal operation.

UNIT-III 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-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 practical results.
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.

Books & References

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

ECE-351 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, Midterm, practical work, record, viva voce and Final & 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 control system.
2. Derive mathematical model for simple electrical and mechanical systems using transfer function and state variable method.
3. Determine the response of a control system using poles and zeros to determine the response of a control system.
4. Determine the stability of a control system using Routh-Hurwitz method.

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

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.

UNIT-III 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.

UNIT-IV 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.

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 MATLAB software.
7. To study Frequency response Plot (Polar plot, Nyquist plot, Bode plot) using MATLAB software.

Books & References

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

ECE-352 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, Midterm, practical work, record, viva voce and Final & 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 be able to learn about the operational amplifiers and its characteristics as well as various types of op-amps.
2. Students will acquire the ability to design and test practical circuits for amplifiers, filters and oscillators.
3. Students will be able to analyze the operation of comparators, data convertors and implementation of the same.
4. Students will be able to learn the functioning of PLL, VCO, V-I, I-V converters, AGC, AVC and analog multipliers and implement them for suitable 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, Cascode current mirror, 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, 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, Self-tuned filters, KHN filters

UNIT-IV 9

Advanced applications of an Op-amp : Frequency Divider, PLL, AGC, AVC using op-AMP and analog multipliers, Integrated circuit Timer**:** 555 IC timer, Astable and Monostable Multivibrators using 555 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 a stable 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: ASLK Manual
6. Ramakant A. Gayakwad, "Op-amps and Linear Integrated Circuits", PHI
7. Millman and Grabel, "Microelectronics", 2nd Ed., Mcgraw Hill
8. D. Roy Chudhary, "Linear Integrated Circuits", New Age International

ECE-353 PRINCIPLES OF COMMUNICATION

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, Midterm, practical work, record, viva voce and Final & 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 analog communication.
2. Acquired knowledge about AM transmission and reception.

3. Acquired knowledge about FM and PM transmission and reception.
4. Acquired knowledge about pulse modulation.
5. Acquired knowledge about noise.

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, Sampling Theorem and its applications, Phase Modulation, Pre-emphasis and De-emphasis, Linear and Nonlinear Modulation,
Comparison between Angle Modulation and Amplitude Modulation

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: 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

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 peak clipping effect.
3. To study frequency modulation using reactance modulator.
4. Study of frequency modulation using varactor modulator.
5. Narrow band FM generator using Armstrong method.
6. Study of Foster- Seely discriminator.
7. Generation of DSB-SC signal using balanced modulator.
8. Generation of single side band signal.
9. Study of phase locked loop and detection of FM signal using PLL.
10. Measurement of noise figure using a noise generator.
11. Study of superheterodyne AM receiver and measurement of sensitivity, selectivity & fidelity.
12. Study and demonstration of active filter (low pass, high pass, and band pass type).

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.

ECE-354 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, Midterm, practical work, record, viva voce and Final & 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 operation of different instruments.
2. Able to describe different terminology related to measurements.
3. Understand`` cthe principles of various types of transducers and sensors.
4. Basic concept of instrumentation and its industrial application and working & performances of different kind of measuring instruments.
5. Ability to analyze performance characteristics of measuring instruments.
6. Ability to know, working principle & Performances of different electrical transducers.
7. Ability to understand construction, principle of operation, working and applications of waveform analyzers and spectrum analyzers, CRO and other display devices.
8. Ability to understand principle of operation of telemetry system and data acquisition system.
9. Ability to understand principle of operation of process control system and its various applications

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 Device: LED, LCD, Gas Discharge Plasma Displays, Incandescent Display, LVD (Liquid Vapour Display), Pointers, Digital Voltmeters, Spectrum Analysis.

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 (Flow, Pressure etc.), Digital Transducer.

UNIT-III 9

Data Acquisition and Conversion: Introduction, Objective of Data Acquisition System, Multi-channel DAS, A/D and D/A converters using Op-Amp, Data Loggers, Electromechanical A/D Converter, Digital Transducer, Data Transmission, 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, Compact Data Logger, Digital Voltmeter.

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.

ECE-361 DIGITAL COMMUNICATION

Course category	:	Department Core (DC)
Pre-requisite Subject	:	Principles of Communication (EPE-28)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, Midterm, practical work, record, viva voce and Final & 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 analyzing 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

Sampling Theorem and PCM Overview of digital communication. Sampling Principles, Practical aspects of sampling and signal recovery, Nyquist Criterion, Baseband Binary transmission, Inter symbol Interference, Quantization and Quantization noise, PCM, Differential PCM, Delta

modulation, Adaptive Delta Modulation Line coding review, Pulse shaping

UNIT-II 9

Probability Final and Random Variables, Random variable, Statistical averages, Correlation, Sum of Random Variables, Central Limit Theorem, Random Process, Classification of Random Processes, Power spectral density, Multiple random processes, Gaussian Process, Probability

Density function.

UNIT-III 9

Digital Modulation Techniques: Digital Modulation formats, Digital carrier system, Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, quadrature modulation techniques. (QPSK and MSK), M-ary Digital carrier Modulation. Matched Filter, Spread spectrum systems, Frequency Hopping Spread Spectrum (FHSS) systems, Direct Sequence Spread Spectrum systems, Code Division Multiple Access, Multiuser Detection, OFDM Communications.

UNIT-IV 9

Information Final and Coding: Information Measurement, Average information and information rate, Coding for discrete memory less source, continuous channel capacity, Maximum entropy, Huffman and Fano coding, Discrete channel capacity, Trade –off between S/N and bandwidth, Block code, Hamming code, Cyclic code, Convolutional code Tree diagram, State diagram, Trellis diagram, Viterbi encoder and decoder, Turbo Codes.

EXPERIMENTS

1. Study of Sample and hold circuit using Op-amp- ST2101
2. Study of PAM generation and detection and observe characteristics of both single and dual polarity pulse amplitude modulation.
3. Study of pulse width modulation and demodulation.
4. Study of pulse position modulation demodulation.
5. Study of delta modulation and demodulation and observe effect of slope overload DCL-07.
6. Study of pulse data coding techniques for NRZ formats.
7. Data decoding techniques for NRZ formats. ST2106-7.
8. Study of amplitude shift keying modulator and demodulator.
9. Study of frequency shift keying modulator and demodulator.
10. Study of phase shift keying modulator and demodulator ST-467.
11. Study of single bit error detection and correction using Hamming code. ST-2103.
12. Study of Pulse code modulation and demodulation

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", Tata McGraw-Hill
5. Prokis J.J, "Digital Communications", McGraw Hill

ECE-362 MICROPROCESSORS & APPLICATIONS

Course category	:	Department Core (DC)
Pre-requisite Subject	:	Digital Electronics & Circuits (EPE-12)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment Methods	:	Continuous assessment through tutorials, attendance, home assignments, Midterm, practical work, record, viva voce and Final & 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 Microprocessors and its need.
2. Ability to identify basic architecture of different Microprocessors.
3. Foster ability to write the programming using 8085 microprocessor.
4. Foster ability to understand the internal architecture and interfacing of different peripheral devices with 8085 Microprocessor.
5. Foster ability to write the programming using 8086 microprocessor.
6. Foster ability to understand the internal architecture and interfacing of different peripheral devices with 8086 Microprocessor.

Topics Covered

UNIT-I 9

Introduction to Microprocessors: Evolution of Microprocessors, History of computers, Timing and control, memory devices: semiconductor memory organization, Category of memory, 8-bit Microprocessor (8085): Architecture, Instruction set, Addressing modes, Assembly Language Programming.

UNIT-II 9

Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing. 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-III 9

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

UNIT-IV 9

Advanced Microprocessors: Introduction to 32-bit and 64-bit microprocessors, Power PC, Microcontroller (8051): Introduction, Architecture, Instruction set.

EXPERIMENTS

1. Write a program using 8085 Microprocessor for Decimal addition and subtraction of two Numbers.
   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 using 8085.
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 DAC with 8085 to demonstrate the generation of square, saw tooth and triangular waveforms.
11. 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. D. V. Hall: Microprocessors Interfacing, TMH (2nd Edition).
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 Programming and Design, PHI 2nd Edition,

ECE-363 DATA COMMUNICATION NETWORKS

Course category : Department Core (DC)
Pre-requisite Subject : Principles of Communication (EPE-28)
Contact hours/week : Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits : 4
Course Assessment methods : Continuous assessment through tutorials, attendance, home assignments, midterm and Final 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 communication protocols and layered network architectures.
2. Able to explain conventional computer system interfacing standards and peer to peer data link communication protocols.
3. Able to design basic network systems and various components in a data communication system.
4. Able to describe how the physical, data link, and network layers operate in a typical data communication system.
5. Able to understand the system design principles of data communication systems.
6. Able to understand, define and explain 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

9

UNIT-II

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: RANDOH, 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, Virtual LAN IPV6 Addresses, Internet Protocol, Hardware Addressing versus IP Addressing, IP Data Gram. Transport Layer Protocol : UDP and TCP, ATM, Cryptography, Network Security

Books & References

1. B. A. Forouzan, "Data Communications and Networking", MGH, 4th ed. 2007
2. A. S. Tanenbaum, "Computer Networks", PHI.
3. W. Stallings, "Data and Computer Communication", PHI.

ECE-364 MICROWAVE ENGINEERING

Course category	:	Department Core (DC)
Pre-requisite Subject	:	Electromagnetic Field Final (EPE-14)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, Midterm, practical work, record, viva voce and Final & 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 Final to calculations regarding waveguides and transmission lines.
2. Able to describe, analyze and design simple microwave circuits and devices e.g. matching circuits, couplers, antennas and amplifiers.
3. Able to describe and coarsely design common systems such as radar and microwave transmission links.
4. Able to describe common devices such as microwave vacuum tubes, high-speed transistors and ferrite devices.
5. Able to handle microwave equipment and make measurements.

Topics Covered

UNIT-I 9

Rectangular Wave Guide: Field Components, TE, TM Modes, Dominant TE_{10} 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

1. Measurement of guide wavelength and frequency of the signal in a rectangular waveguide.
2. Measurement of VSWR using slotted line.
3. Study of mode characteristics of reflex Klystron and determination of mode number, transit time & electronic tuning sensitivity.
4. Study of characteristics of Gunn oscillator.
5. Study of Gunn diode as modulated source (PIN modulation) and determination of modulation depth.
6. Measurement of coupling coefficient and directivity of a directional coupler.
7. Study of insolation & coupling coefficient of a magic T.
8. Measurement of attenuation using substitution method and plot of attenuation versus frequency characteristics.
9. Study of waveguide horn and its radiation pattern and determination of the beam width.
10. Study of a ferrite circulator and measurement of isolation, insertion loss, cross coupling and input VSWR.
11. Measurement of microwave power using power meter

Textbooks & Reference books

1. Liao, S.Y. / Microwave Devices & Circuits; PHI 3rd Ed.
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.

ECE-365 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, Midterm, record, viva voce and Final 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 CMOS VLSI and associated technologies.
2. Able to solve problems in the design of CMOS logic circuits, with particular reference to speed and power consumption.
3. Able to acquire hands-on skills of using CAD tools in VLSI design.
4. Able to appreciate the design process in VLSI through a mini-project on the design of a CMOS sub-system.
5. Able to explain basic operation principles of diodes and MOS transistors and their circuits level models.
6. Able to design the fundamental blocks of a VLSI circuits, both by circuit schematic and physical layout.
7. Able to analyze the influence of wires/interconnects on VLSI circuit performance.

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 lithographies, 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

ECE-473 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. Understanding of electronics system requirement.
2. Defining the right architecture for right application that meets cost and performance constraints.
3. Designing and verifying the functional model of electronics system.
4. Analysis of the design on simulation software.
5. Trouble shooting the design circuits using various trouble shooting equipments.

ECE-471 VLSI DESIGN

Course category	:	Department Core (DC)
Pre-requisite Subject	:	VLSI Technology (EPE-35)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment Methods	:	Continuous assessment through tutorials, attendance, home assignments, Midterm, practical work, record, viva voce and Final & 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 fundamentals of CMOS VLSI and associated technologies.
2. Able to solve problems in the design of CMOS logic circuits, with particular reference to speed and power consumption.
3. Able to acquire hands-on skills of using CAD tools in VLSI design.
4. Able to appreciate the design process in VLSI through a mini-project on the design of a CMOS sub-system.
5. Able to explain basic operation principles of diodes and MOS transistors and their circuits level models
6. Able to design the fundamental blocks of a VLSI circuits, both by circuit schematic and physical layout.
5. Able to analyze the influence of wires/interconnects on VLSI circuit performance.

Topics Covered

UNIT-I 9

Introduction: Trends & Projections in VLSI Circuits, Flow diagram of VLSI Circuit Design and VLSI Design issues, Y-Chart.

UNIT-II 9

Electrical Characterization of MOS transistor: Energy-band explanation for MOS structure, Weak & strong Inversion Conditions, C-V characteristics of MOS Capacitor, Parameters affecting Threshold Voltage of MOSFET, Long-Channel and Short-Channel MOSFETs, Short-Channel effects, SPICE parameters of MOS transistor.

UNIT-III 9

Basic VLSI Design Styles-NMOS, CMOS Process flow; n-MOS p-MOS and CMOS Inverter Design, Noise Margin, VTC curve, Delay computations, Power Dissipation and scaling in CMOS circuits. Combinational circuit design using CMOS, Stick Diagrams; Physical Design Rules; Layout Designing; Euler's Rule for VLSI Physical Design.

UNIT-IV 9

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, Semiconductor Memories, ROM, DRAM and SRAM Cell Design

EXPERIMENTS

1. Design Entry and Simulation of Combinational Logic Circuits
2. Design Entry and simulation of sequential logic circuit
3. Study of Synthesis Tools
4. Study of place and root annotation
5. Schematic Entry and SPICE Simulation
6. Layout of a CMOS Inverter
7. Design of a 10 bit number controlled oscillator
8. Automatic Layout Generation
9. Implementation of Flip-flops
10. Implementation of Counters
11. Implementation of Register

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", PHI.
3. K. Eshraghian & Pucknell, "Introduction to VLSI", PHI.
4. J.M. Rabaey, "Digital Integrated Circuits-A Design Perspective", PHI.
5. B. Razavi, "Design of Analog CMOS Integrated Circuits", TMH

ECE-472 DIGITAL SIGNAL PROCESSING

Course category	: Department Core (DC)
Pre-requisite Subject	: Signals and Systems (EPE-13)
Contact hours/week	: Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, Midterm, record, viva voce and Final 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 (DFT).
2. Understand circular convolution, its relationship to linear convolution, and how circular convolution can be achieved via the discrete Fourier transform.
3. Able to understand the decimation in time and frequency FFT algorithms for efficient computation of the DFT.
4. Able to design digital filters on paper and implement the design by using MATLAB.
5. Able to design a digital FIR filter using Window method.
6. Able to implement digital filters in a variety of forms:-Direct form I &II, Parallel, Cascade and lattice structure.

Topics Covered

UNIT-I 9

Realization of Digital Systems: Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H(z), example of continued fraction, realization of a ladder structure, example of a ladder realization.

UNIT-II 9

Design of Infinite Impulse Response Digital Filters: Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters.

UNIT-III 9

Finite Impulse Response Filter Design: Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows ,The Kaiser Window.

UNIT-IV

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.

Books & References

1. John G Prokias, Dimitris G Manolakis, "Digital Signal Processing", Pearson Education.
2. Oppenheim & Schafer, "Digital Signal Processing" PHI
3. Johnny R. Johnson, "Digital Signal Processing", PHI Learning Pvt Ltd., 2009.

ECE-481 WIRELESS COMMUNICATION

Course category	:	Department Core (DC)
Pre-requisite Subject	:	Principles of Communication (EPE-28)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, Midterm, practical work, record, viva voce and Final & 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 Infrastructure to develop mobile communication system: cellular Final.
2. Able to understand the characteristics of different multiple access techniques in mobile/wireless communication.
3. Able to understand the need of coding, channel models, diversity, equalization and channel estimation techniques. Able to apply analytical and empirical models in the design of wireless links.
4. Able to understand the Wireless communication systems and standards: GSM, IS-95.
5. Able to understand the Ad Hoc networks and new trends in Mobile/wireless communication.
6. Able to understand the radio propagation over wireless channel and different limitations.
7. Able 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. Second generation Cellular Networks, Third Generation (3G) 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 equalizer, Algorithms for Adaptive Equalization, Diversity techniques, RAKE receiver. Characteristics of speech signals, quantization techniques, vocoders, linear predictive coders, Multiple Access techniques for Wireless Communications.

UNIT-III 9

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

GSM system architecture, Radio interface, Protocols, Localization and calling, Handover, 9
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.

EXPERIMENTS

1. Simulation and calculation of throughput for a TCP connection (using ns2 simulator)
2. Simulation and calculation of throughput for a star connected network with 2 TCP and 1 UDP connection (using ns2 simulator)
3. Simulation of a Local Area Network (using ns2 simulator)
4. Simulation of Mobile Adhoc Network and comparison of the performance of Routing Protocol (DSDV, AODV & DSR) (using ns2 simulator)
5. Simulation of a Bluetooth system (using system view software)
6. Simulation of an IEEE802.11a system (using system view software)
7. Assembly of GSM setup & real time study of GSM 07.05 & 07.07 AT commands (such as network registration, call control, call setting, etc.

8. Study and implementation of Auto Dial, Call Forwarding in IP Telephony
9. Configuration of an IP phone and implementation of Class of Services (COS) and Class of Restriction (COR)
10. Analysis of signal strength and throughput at several locations in a wireless LAN
11. Study and analysis of the working of DHCP & NAT in a network
12. Programming with Cryptographic libraries: Encryption and Decryption
13. Study of Advanced Encryption Standards (AES)
14. Study of the concept of Cellular System Design (such as frequency reuse, sectorization and frequency channel assignment) and investigation of the effect of Demographic, Traffic, Terrain on Cell Planning and to expose the students" tool used for cell-planning
15. Setting up a Virtual Local Area Network for voice IP

Books & References

1. T.S. Rappaport, "Wireless Communication-Principles and practice", Pearson, Second Edition.
2. T L Singal, "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.

ECE-482 PROJECT PART-II

Course category	:	Department Core (DC)
Pre-requisite Subject	:	Project Part-I (EPE-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. Understanding of electronics system requirement.
2. Defining the right architecture for right application that meets cost and performance constraints.
3. Designing and verifying the functional model of electronics system.
4. Analysis of the design on simulation software.
5. Trouble shooting the design circuits using various trouble shooting equipments.

Syllabus For Programme Electives (Electronics & Communication Engineering)

EPE-471 RADAR TECHNOLOGY

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, Midterm, record, viva voce and Final 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.

EPE-472 BIOMEDICAL INSTRUMENTATION

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, Midterm, record, viva voce and Final 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 Final, 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

EPE-473 INFORMATION FINAL & CODING

Course category	:	Programme Electives (PE1 & PE2)
Pre-requisite Subject	:	Digital Communication (EPE-31)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, Midterm, record, viva voce and Final 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 Final

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, EPE – 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 Final, Coding and Cryptography", TMH 2007.
2. Fred Halsall, "Multimedia Communications: Applications, Networks, Protocols and Standards", Perason Education Asia, 2002.
3. K Sayood, "Introduction to Data Compression" 3/e, Elsevier 2006
4. S Gravano, "Introduction to Error Control Codes", Oxford University Press 2007.
5. Amitabh Bhattacharya, "Digital Communication", TMH 2006.

EPE-474 ADVANCED SEMICONDUCTOR DEVICES

Course category	: Programme Electives (PE1 & PE2)
Pre-requisite Subject	: Solid State Devices & Circuits (EPE-15)
Contact hours/week	: Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, Midterm record, viva voce and Final 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 in Semiconductors Excess Carriers in Semiconductor.

UNIT-II 9

Junctions and Interfaces: Description of p-n junction, Action, The Abrupt Junction, Example of an Abrupt Junction, The linearly graded Junction. The Ideal Diode Model, Real Diodes, Temperature Dependence of I-V Characteristics, High Level Injection Effects, Example of Diodes. Description of Breakdown Mechanism, Zener and Avalanche Breakdown in p-n Junction.

UNIT-III 9

Majority Carrier Diodes: The Tunnel Diode, The Backward Diode, The Schottkey Barrier Diode, Ohmic Contacts Hetero junctions. Microwave Diodes: The Varactor Diode, The p-i-n Diode, The IMPATT Diode, TRAPATT Diode, The BARITT Diode, Transferred Electron Devices Optoelectronic Devices: The Solar Cell, Photo detectors, 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, High Frequency Performance, MESFETs Structures. MOS Transistors and Charge Coupled Devices: Basic Structures and the Operating Principle, I-V Characteristics, Short Channel Effects, MOSFET Structures, Charge Coupled Devices.

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", 2e, John Willy-India Pvt. Ltd.
3. B. G. Streetman and S. Banerjee, "Solid state electronics devices", 5e, PHI.

EPE-475 OPTOELECTRONICS

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, Midterm, record, viva voce and Final 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 Final of fiber optics.

Topics Covered

UNIT-I 9

Industrial Applications Of Optoelectronics

Revision of basics of reflection, refraction, transmission and absorption of light radiation, Ray-tracing through lenses, convex, concave and plane mirrors, prisms etc. Refractive index, total internal reflection.

UNIT-II 9

Lamps And Illumination Systems, LEDs

working principle and applications, LED lighting, Display devices, indicators, numeric, alphanumeric and special function displays, Liquid Crystal Display elements, Plasma Displays, Multimedia projectors.

UNIT-III 9

Gas and solid state LASERs, pulsed lasers, industrial applications of low power lasers. Alignment, Pointing, tracking and particle Size detection Instruments. Laser Level. Wire Diameter Sensor. Laser Doppler Velocimetry-Principle of Operation. Performance Parameters. Electronic Processing of the Doppler Signal.

UNIT-IV 9

Photo detectors types and applications, Opt couplers, Opto interrupters, LASCR. used in safety interlocks, power isolators, rotary and linear encoders and remote control. Intrinsic and Extrinsic Fiber optic sensors. Digital camera and automatic inspection systems. Introduction to Optical computing and holography.

Books & References

1. Optical Engineering Fundamentals, B.H. Walker, PHI.
2. Industrial Electronics, T.E. Kissell, PHI.
3. Electro-Optical Instrumentation Sensing and Measuring with Lasers, Silvano Donati, Pearson.
4. Fiber optics and Optoelectronics, R.P. Khare, Oxford Press

EPE-476 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, Midterm, record, viva voce and Final Examination 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 Final 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. Signaling: Introduction, Customer line signaling, AF junctions and trunk circuits, FDM carrier systems, PCM and inter register signaling, Common channel signaling principles, CCITT signaling system No. 6 and 7, Digital customer line signaling.

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, "Telecommunication switching, Traffic and Networks", Pearson education.
3. J.C. Bellamy, "Digital Telephony", John Wiley, 3e.

EPE-477 DIGITAL SYSTEM DESIGN

Course category	: Programme Electives (PE1& PE2)
Pre-requisite Subject	: Digital Electronics & Circuits (EPE-12)
Contact hours/week	: Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, Midterm, record, viva voce and Final 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

EPE-478 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, Midterm, record, viva voce and Final Examination
Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Recall the fundamentals of orbital mechanics, identify the characteristics of common orbits used by communications and other satellites, and assess launch methods and technologies.
2. Identify the systems required by a communications satellite to function and the trade- offs and limitations encountered in the design of a communications satellite system.
3. Identify the radio propagation channel for Earth station to satellite and satellite to satellite communications links, and
4. Describe the basics of designing antenna systems to accommodate the needs of a particular satellite system.
5. Calculate an accurate link budget for a satellite or other wireless communications link.
6. Assess the analog and digital technologies used for satellite communications networks and the topologies and applications of those networks, and compare them to alternative systems.

Topics Covered

UNIT-I 9

Elements of Satellite Communication. Orbital mechanics, look angle and orbit determination, launches & launch vehicle, orbital effects, Geostationary Orbit. Satellite subsystems, attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna

UNIT-II 9

Satellite link design: basic transmission Final, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N. Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc.

UNIT-III 9

Introduction of various satellite systems: VSAT, low earth orbit and non geostationary Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, Timing accuracy, GPS Receiver Operation

UNIT-IV 9

Global Mobile Satellite Systems, Antenna System for mobile satellite applications, Evolution, Antenna Requirement and Technical Characteristics, Classification of Mobile Satellite Antenna(MSA), Low gain omni directional Antenna, Medium gain Directional Antenna, High gain Directional Aperture Antenna, Wire Quadrifilar Helix Antenna(WQHA) for Hand held Terminals, Antenna Systems for Mobile Satellite Broadcasting.

Books & References

1. B. Pratt, A. Bostian, "Satellite Communications", Wiley India.
2. D. Roddy, "Satellite Communications", TMH, 4th Ed.
2. S. D. Ilcev, "Global Mobile Satellite Communication", Springer
3. R. Pandya, "Mobile and Personal Communication Systems and Services", PHI.

EPE-481 MICROCONTROLLER & EMBEDDED SYSTEMS

Course category	:	Programme Electives (PE3)
Pre-requisite Subject	:	Microprocessors & Application (EPE-32)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, Midterm, practical work, record, viva voce and Final & 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.

EPE-482 OPTICAL COMMUNICATION

Course category	:	Programme Electives (PE3)
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, Midterm, practical work, record, viva voce and Final & 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 Final transmission, Optical fiber Modes and configuration, Mode Final for circular Waveguides, Step Index fibers, Graded Index fibers. Single mode fibers- Cut off 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 rate equations, 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

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED's and photo detector

Books & References

1. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3e, ,2004.
2. Joseph C. Plais, "Fiber Optic Communication", Pearson Education, 4e, 2004.
3. Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, "Control Systems" Schaums Outlines Series, 3e, Tata McGraw Hill, Special Indian Edition 2010.
4. I. J. Nagrath& M. Gopal, "Control System Engineering", New Age International Publishers
5. John M. Senior, "Optical Fiber Communications", PEARSON, 3e, 2010.
6. Gerd Keiser, "Optical Fiber Communications", TMH, 4e

EPE-483 DSP ARCHITECTURE & APPLICATIONS

Course category	: Programme Electives (PE3)
Pre-requisite Subjects	: NIL
Contact hours/week	: Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, Midterm, practical work, record, viva voce and Final & 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 TMS32OC54xx Processor.

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, Bit Reversed 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, IQ Format).
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. K mitra, TMH, 2002
5. Applications to DSP Using Matlab-Proakis
6. "Digital Signal Processing", Avatar Singh and S. Srinivasan, Thomson Learning, 2004.

EPE-484 ANTENNA DESIGN

Course category	: Programme Electives (PE3)
Pre-requisite Subject	: Electromagnetic Field Final (EPE-14)
Contact hours/week	: Lecture : 3, Tutorial : 1 , Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, Midterm, practical work, record, viva voce and Final & 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" principle, Fourier transform method in aperture antenna Final

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 Schelkun off 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 dependant 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 Final 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 Final and Design", 2e, John Wiley & Sons.
4. Elliot, R.S., "Antenna Final and Design", Revised edition, Wiley IEEE Press.

EPE-485 DIGITAL IMAGE PROCESSING

Course category : Programme Electives (PE4)
Pre-requisite Subjects : NIL
Contact hours/week : Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits : 4
Course Assessment methods : Continuous assessment through tutorials, attendance, home assignments, Midterm, record, viva voce and Final 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 and FFT.
3. Ability to design linear digital filters both FIR and IIR using different techniques and their associated structures.
4. Ability to understand the concept of linear prediction and estimation.
5. Ability to understand the concept of Multi-rate signal processing and sample rate conversion.
6. Acquired knowledge about time-frequency analysis.

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.

EPE-486 ATM NETWORKS AND B-ISDN

Course category	:	Programme Electives (PE4)
Pre-requisite Subject	:	Data Communication Networks (EPE-33)
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, Midterm, record, viva voce and Final 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

EPE-487 RF ICs

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, Midterm, record, viva voce and Final 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 circuitry used in telecommunication integrated circuits.
2. Understand the concepts of high frequency transmission lines and impedance matching.
3. Understand the methodology of using analog and digital modulation of an RF carrier.
4. Understand the basic super hetrodyne architecture utilized in RFIC applications.
6. Understand basic RF characterization utilizing gain, bandwidth, noise, phase noise, S-parameters.
7. Design and simulate basic RF circuits at the schematic level, using Cadence Spectre/RF CAD tools.
8. Design basic RF circuits at the chip level including layout and simulation with extracted models

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

Multiple Access: Techniques and wireless standards, mobile RF communication, FDMA, TDMA, CDMA, Wireless standards.

Transceiver Architectures: General considerations, receiver architecture, Transmitter Architecture, transceiver performance tests, case studies.

UNIT-III 9

Amplifiers, Mixers and Oscillators: LNAs, down conversion mixers, Cascaded Stages, oscillators, Frequency synthesizers.

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.

EPE-488 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, Midterm, record, viva voce and Final Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. The role of neural networks in engineering, artificial intelligence, and cognitive modeling.
2. Feed-forward neural networks of increasing complexity, gradient descent learning and extensions, learning and generalization Final.
3. Hopfield model of content-addressable memory, Hopfield-Tank approach to optimization, resistive networks for vision models, complex dynamical learning models.
4. Ability to evaluate whether neural networks are appropriate to a particular application.
5. Ability to apply neural networks to particular applications, and to know what steps to take to improve performance.

Topics Covered

UNIT-I

Introduction

Introduction and history, human brain, biological neuron, models of neuron, signal flow graph of neuron, feedback, network architecture, knowledge representation, Artificial intelligence and neural networks. Learning Process: Error correction learning, memory based learning, Hebbian learning, competitive learning, Boltzmann learning, learning with and without teacher, learning tasks, memory and adaptation.

UNIT-II

Artificial neurons, Neural networks and architectures Introduction, neuron signal function, mathematical preliminaries, Feed forward & feedback architecture. Geometry of Binary threshold neurons and their networks Pattern recognition, convex sets and convex hulls, space of Boolean functions, binary neurons for pattern classification, non linear separable problems, capacity of TLN, XOR solution.

UNIT-III

Perceptrons and LMS Learning objective of TLN, pattern space & weight space, perceptron learning algorithm, perceptron convergence theorem, pocket algorithm, α – LMS learning, MSE error surface, steepest descent search, μ – LMS and application. Back propagation and other learning algorithms Multilayered architecture, back propagation learning algorithm, practical considerations, structure growing algorithms, applications of feed forward neural networks, reinforcement learning

UNIT-IV

Statistical Pattern Recognition Bayes" theorem, classical decisions with Bayes" theorem, probabilistic interpretation of neuron function, interpreting neuron signals as probabilities, multilayered networks & posterior probabilities, error functions for classification problems. RBF Networks Regularization networks, generalized RBF networks, RBF network for solving XOR problem, comparison of RBF networks & multilayer perceptrons. Stochastic Machines Statistical mechanics simulated annealing, Boltzmann machine. Introduction, Maximal eigenvector filtering, principal component analysis, generalized learning laws, competitive learning, vector quantization, Mexican hat networks.

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.

Syllabus for Humanities & Social Science Core (Electronics and Communication)

BSH-113 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, midterm examination and Final 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 facets of communication skills, such as, Reading, Writing, Listening and speaking skills.
2. To identify, formulate and solve the real life problems with positive attitude.
3. To inculcate the habit of learning and developing the communication and soft skills by practice

Topics Covered

UNIT-I

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

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

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

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 Hil

Syllabus for Humanities & Social Science Electives (Electronics and Communication)

BSH-124 TECHNICAL WRITING

Course category	:	Humanities & Social Science Electives (HSSE)
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, Midterm examination and Final 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 6

The Sentence, The paragraph: Structure, types and Linking, Technical Vocabulary, Impersonal Style, Scientific Attitude Plain Statement, Interesting Composition, Miscellaneous Exercises, Definition, Description, Description of a process, Diagrams, Explanations, Technical Communication-Simplicity, Clarity and Conciseness of a Presentation, Blending of Artistic and Technical Writing, Usages in Grammar, Comprehension—Reading Listening, Précis Writing

UNIT-II 6

Thesis Elements-Front Matter of a Thesis, Main Text of a Thesis, End Matter of a Thesis, Paper Elements-Front Matter of a Paper, Main Text of a Paper, End Matter of a Paper, Order of a thesis and Paper Elements, Concluding Remarks ,Identification of Author and His Writing-Author's name and Affiliation, Joint Authorship of a Paper, Identification of Writing-Title, Keywords, Synopsis, Preface and abstract, Specimen—Thesis and Research Paper, Chapters and Sections-Introductory Chapters and Sections, Statement of the Problems, Plan and Scope, Core Chapters and Sections-Theoretical Analysis and Synthesis, Basic Assumption and Hypothesis

UNIT-III 6

Letter Writing_ Formal and Informal Letters, Parts of a Letter, Types of Letters, Business Letters, Examples of Letter-Writing, Job Applications, C.V and Resume Writing, Stylistic Faults in Letter Writing, Report Writing, Kinds of Reports, Length of Report, Parts of a Report, Terms of Reference, Collection of Facts, Outlines of Report, Examples of Report, Technical Proposal, Elements of Proposal, Examples of Proposal, drafting of proposal

UNIT-IV 6

Technical seminar-purpose, modes and methods, Interviewing skills-body language, gesture, posture, tips and tactics of interview, resume making. Case study- objectives, methods, examples of various case studies. Audience Analysis: Industrial vs. non-industrial users; Exploring primary, secondary, tertiary users in contexts of production and use; Creating personas; Multicultural issues; Analyzing real-world examples Estimating, tracking, and managing tech writing projects. Determine the project scope, Estimates and schedules, Assemble the team, Provide resources and leadership, Evaluate the project, Appendixes and Annexure, References, Peripherals—Official Formalities, Rights and Permission, Certificate and Copyright, Dedication, Acknowledgement, Correspondences. Project making: Making a final Project on topics, given by the instructor.

Books & References

1. Technical Writing – O.P. Pandey, SK Kataria & sons
2. Interview Skills : Tips & Techniques – Anita Acharya, Yking Books
3. Managing Writers - Richard Hamilton, Penguin
4. Technical Writing Management: A Practical Guide - Steven A. Schwarzman
5. Technical Writing - R.S. Sharma, Radha Publications, New Delhi
6. Technical Writing - B.N. Basu, PHI Learning Pvt. Ltd.., New Delhi
7. Lesikar and petit, Report writing for Business

BSH-125 HUMAN VALUES & PROFESSIONAL ETHICS

Course category	:	Humanities & Social Science Electives (HSSE)
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, and Final Examination.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To create conducive environment for professionals to grow as good and responsible human beings imbibing values and ethics.
2. Understanding the significance of environment.
3. Developing humanitarian outlook.

Topics Covered

UNIT-I 6

Origin, Meaning, and Definition of Value, Types of Values, Individual Value, Family Value, Societal Value, Human Value, Value in Education System, Understanding Happiness and Prosperity, Self Exploration and Natural Acceptance.

UNIT-II 6

Harmony in family, Harmony in Society, Values Leading to Harmony, Creating a world family, Harmony in Nature, Environment and Sustainable Developmental, Legal aspects of Environment, Holistic Perspectives of Values, Existence and Co-existence.

UNIT-III 6

Origin, Meaning and Definition of Ethics, Ethics: The science of the Morality of The Art of Correct Living ,Ethics in Human Acts, Ethics and Religion, Ethical Norms and Laws ,Ethics in Literature, Ethics in Science and Technology.

UNIT-IV 6

Ethical Approaches:- Theistic Approach, Atheistic Approach, General and Special Ethics, Professional Ethics: Ethics at work place, Ethics as Skill, Values and Ethics, Ethics with Value Education, Managerial and Business & Corporate Ethics, Corporate Social Responsibilities.

Books & References

1. Bangaria ,G.P et.al A foundation course in Human Values and Professional Ethics**,** Excel books.
2. Govindrajan, M Professional Ethics and Human Values, Eastern Economy Edition
3. Naagrazan, R.S. Textbook on Professional Ethics and Human Values**,** New age International.
4. Misra, Anuranjan and Shukla**,** Dr. R.K. Human values and Professional Ethics, Amazon(Paper Back).
5. Fernando, A.C Business Ethics**:** An Indian Perspective, Pearson,India.

BSH-126 INDUSTRIAL PSYCHOLOGY

Course category	:	Humanities & Social Science Electives (HSSE)
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 Final 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 facets of psychology, it problems and understanding.
2. To identify, formulate and solve the real life problems with positive attitude.
3. To inculcate the habit of learning and developing the industrial problems from psychological eyes.

Topics Covered

UNIT-I 6

Introduction to Industrial Psychology and its basic concepts

Nature, Importance and scope of Industrial Psychology, Scientific management, Time and motion study and human relations school

UNIT-II 6

Individual in workplace

Motivation and job satisfaction, Stress management, Organisational culture, Leadership and group- dynamic.

UNIT-III 6

Work environment, Recruitment and selection

Engineering Psychology, Fatigue and boredom, Work environment, Accident and safety, Job-analysis, Recruitment and selection, Psychological tests.

UNIT-IV 6

Performance management and training

Performance appraisal, Importance and Methods of Performance appraisal, Training and development- Concepts and Benefits to the organization.

Books & References

1. Miner, J. B. (1992). Industrial/Organizational Psychology. N Y: McGraw Hill
2. Blum & Naylor (1962). Industrial Psychology. Its Theoretical & Social Foundations CBS Publication
3. Aamodt, M. G. (2007). Industrial/Organization Psychology: A Applied Approach (5e) Wadsworth /Thompson: Belmont, C. A.
4. Aswathappa K. (2008). Human Resource Management (Fifth edition) New Delhi: Tata McGraw Hill
5. Archana Despandey (2010). Industrial Psychology, Sun India Publications, New Delhi.

Audit Courses and Management Courses for B.Tech. (Electronics and Communication Engineerig)

Year I

BSH-118 ENVIRONMENT & STUDIES

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, mid-term examination and Final 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 uses and their exploitation.
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, Biogeographically 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:

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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, Biogeographically 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) Soli 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 green house 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 Krishnaswamy , 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

BSH-127 KNOWLEDGE MANAGEMENT

Course category	:	Management (M)
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, Mid Term Examination and Final 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

Knowledge Economy-Concept of Knowledge; the Data-Information-Knowledge-Wisdom 6 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

Creating Knowledge Management System in Organizations-Need for a Knowledge 6 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

Enabling Knowledge Management through Information Technology-Role of Information 6 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

Looking Ahead: Future of Knowledge Management-Challenges to Knowledge 6 Management; Future of Knowledge Management.

Books & References

1. Amrit Tiwana - The Knowledge Management Toolkit : Orchestrating IT, Strategy, and Knowledge Platforms, Pearson Education Limited
2. Edited; D. Morey, M. Maybury and B. Thuraisingham- Knowledge Management: Classic and Contemporary Works, Universities Press (India) Limited.
3. Edited; R. Gogula- Knowledge Management–A New Dawn, The Institute of Chartered Financial Analysis of India (ICFAI) Press
4. Elias M. Awad, Hassan M. Ghaziri-Knowledge Management, Pearson Education Limited
5. G. Natrajan & S. Shekhar - Knowledge Management: Enabling Business Growth, Tata McGraw- Hill Publishing Company Limited, New Delhi.

Year II

BSH-234 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, mid-term examination, and Final 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 engineeringdisciplines.

Topics Covered

UNIT-I 6

Introduction

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 6

Quantum Final For Nanoscience

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 6

Growth Techniques of Nanomaterials

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 6

Tools for Characterization of Nanomaterials

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

BSH-243 INDUSTRIAL MANAGEMENT

Course category	: Management (M)
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 Final 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
6. Reducing costs associated with new technologies

Topics Covered

UNIT-I

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

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

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

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.**

BSH-242 PUBLIC ADMINISTRATION

Course category	:	Management (M)
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 Final 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

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.. 9

UNIT-II

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. 9

UNIT-III

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. 9

UNIT-IV

Accountability of Public Administration to Legislature, Public Administration, Political Parties, 9 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: Final and Practice; Sterling Publishers Private Ltd., New Delhi.
11. Subramaniam, Malathi, 1987, Management of Public Administration, Deputy Publications: Delhi.
12. Subramaniam, V. 1971. Social Background of India's Administrators, Publication Division, Government of India: New Delhi

Year –III

BSH-352: OPERATIONS RESEARACH

UNIT-I

Introduction: Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

Linear Programming: Two variable Linear Programaming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, senstivity analysis.

UNIT-II

Transportation Problems: Types of transportation problems, mathemataical models , transportation algorithms,

Assignment: Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Teachniques: Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Final of Games :

Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

Quality Systems:

Elements of Queuing model, generalized poisson queing model, single server models.

UNIT-V Inventory

Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text / Reference Books:

1. Wayne L. Winston,"Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

ECE-366 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.

ECE-474 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. Ability to demonstrate the use, interpretation and application of an appropriate international engineering standard in a specific situation.
2. Ability to analyze a given engineering problem identifies an appropriate problem solving methodology, implement the methodology and propose a meaningful solution.
3. Ability to apply prior acquired knowledge in problem solving.
4. Ability to identify sources of hazards, and assess/identify appropriate health & safety measures.
5. Ability to work in a team.
6. Ability to take initiatives.
7. Ability to effectively communicate solution to problems (oral, visual, written).

8. Ability to manage a project within a given time frame.
9. Ability to adopt a factual approach to decision making.
10. Ability to take engineering decision.

List of Suggested Open Electives
For Interdisciplinary Courses offered by Other Departments

MECHANICAL ENGINEERING

MOE-481 FUNDAMENTALS OF MECHANICAL ENGINEERING

Course category	:	Open Elective Courses
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, midterm examination, record, viva voce and Final Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

Topic Covered

UNIT-I 9

Thermodynamics

First and second law of thermodynamics, statements of Second Law of Thermodynamics and their equivalence, Third law of thermodynamics, Steam properties, Steam processes at constant pressure, volume, enthalpy and entropy, Classification of steam boilers, Efficiency and performance analysis, Refrigeration, Vapour compression and vapour absorption cycles, Coefficient of performance (COP), Refrigerant properties

Reciprocating Machines

Steam engines, hypothetical and actual indicator diagrams, Carnot cycle, Otto and Diesel cycles, Working of two and four strokes petrol and diesel IC engines.

UNIT-II 9

Measurement & Metrology

Introduction to measurement and measuring instruments, Types of sensors, Types of transducers and their characteristics, Measurement error and uncertainty analysis, Temperature, pressure, velocity, flow, strain, force and torque measurement, Measurement by dial gauges, slip gauges and sine bar

Engineering Materials

Classification, Ferrous and non ferrous metals, Composition of cast iron and carbon steel, mechanical properties, alloy steel and mechanical properties, Non-ferrous metals such as Cu, Al, Zn, Cr, Ni etc. and its applications.

UNIT-III

Simple Stress and Strain

Introduction, Normal and shear stresses, Poisson‘s ratio, Elastic constants and their relationships, Generalized Hooke‘s law, Deflection of bars of uniform and varying cross-sections, Strain energy in members due to static loading, Statically determinate problems, Stress-strain diagrams for ductile and brittle materials

Mechanical Properties and Testing

Toughness, Hardness, Fracture, Fatigue and Creep, Strength and deformation testing, Bend/rebend testing, Hardness testing, Impact testing, Fatigue testing and creep testing, spring stiffness testing

UNIT-IV

Beams

Introduction, Types of supports, Beams classification, Free body diagram, Shear force and bending moment, Analysis of beams, Continuous loading and discontinuous loading, Shear force and bending moment diagrams for statically determinate beams

Pure Bending of beams

Introduction, Assumptions, Simple bending Final, Stress of beams of different cross sections

Torsion of Circular shafts

Introduction, Torsion of circular shafts, Shear stress due to torsion, Polar modulus, Power transmission

Books & References

1. Basic and Applied Thermodynamics-P. K. Nag (Tata McGraw Hill)
2. Applied Thermodynamics-Onkar Singh (New Age International)
3. Elements of Materials science and Engineering-Van Vlash (Jhon Wiley & Sons)
4. Material Science-V. Raghvan (Prentice Hall India Limited)
5. Mechanical Measurement-G. Beckwith Thomas (Narosa Publishing House)
6. Mechanical Measurement – Sirohi (New Age Publications)
7. Strength of Materials-S. Ramamurtham (Dhanpat rai Publishing Co.)
8. Strength of Materials-R. K. Rajput (S. Chand)
9. Strength of Materials–R. K. Bansal (Lakshmi Publications)

MOE-482 MANUFACTURING PROCESSES

Course category	:	Open Elective Courses
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, midterm examination and Final 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 basic manufacturing processes and different types of mechanical properties of ferrous, non-ferrous metals and alloys.
2. The basic knowledge of different forming and casting processes and foundry tools used for the manufacturing of different products.
3. The knowledge of different machine tools and machining processes, welding processes and their applications.
4. The knowledge of sheet metal processes and their applications, powder metallurgy process, basic heat treatment processes, nonmetallic materials and features of manufacturing establishment

Topics Covered

UNIT-I

Introduction 9

Introduction and importance of Manufacturing processes, classification and overview of Manufacturing processes.

Mechanical Properties of Materials

Strength, elasticity, plasticity, stiffness, malleability, ductility ,brittleness, malleability, toughness hardness, resilience, hardness, machine ability, formability, weldability, Elementary ideas of fracture fatigue & creep.

Steels and Cast Irons

Carbon steels, their classification based on percentage of carbon as low, mild, medium & high carbon steel, their properties & applications. Wrought iron, Cast iron. Alloy steels: stainless steel, tool steel.

Alloys of Non Ferrous Metals

Common uses of various non-ferrous metals (Copper, Zink, Tin, Magnesium, Lead, Aluminum etc.) & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys

UNIT-II

Forming Processes 9

Hot-working & cold-working, Basic metal forming operations & uses of such as: Forging, Rolling, Wire & Tube drawing and Extrusion, and their uses.

Press-work: Die & Punch assembly, cutting and forming, its applications.

Casting

Pattern making, Materials, pattern making tools, pattern types and allowances. Type and composition of Molding sands and their desirable properties. Foundry tools, Mould making with the use of a core. Gating system. Casting defects & remedies. Cupola Furnace. Brief description of various types of casting processes.

UNIT-III

Machining

Lathe-machine: principle, types, main parts, specifications and operations performed on it., Basic description of machines and operations of Shaper-Planer, Drilling, Milling & Grinding.

Welding

Introduction, classification of welding processes. Gas-welding, types of flames and their applications. Electric-Arc welding. Resistance welding. Soldering & Brazing processes and their uses.

UNIT-IV

Sheet Metal Work

Tools and equipments used in sheet metal work, metals used for sheets, standard specification for sheets, Types of sheet metal operations: shearing, drawing, bending

Powder Metallurgy

Introduction of powder metallurgy process: powder production, blending, compaction, Sintering

Heat Treatment Processes

Introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching, tempering and case-hardening, Introduction to Galvanizing and Electroplating.

Non-Metallic Materials

Common types & uses of Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite-materials

Manufacturing Establishment

Plant location. Plant layout–its types. Types of Production. Production versus Productivity.

Books & References

1. Workshop Technology Vol-I-B. S. Raghubanshi (Dhanpat Rai and Sons)
2. Workshop Technology Vol-II-B. S. Raghubanshi (Dhanpat Rai and Sons)
3. Production Technology - R.K. Jain (Khanna publication
4. Manufacturing Processes- H. N .Gupta, R. C. Gupta, Arun Mittal (New Age publisher)
5. Manufacturing Science -Ghosh and Mallik (EWP)
6. Manufacturing processes – Santosh Bhatnagar (B S publication)
7. Production Technology – P. C. Sharma (S. Chand)
8. Manufacturing Technology – Machine Tools- P. N. Rao (TMH)
9. Manufacturing Technology – Foundry, Forming and Welding- P. N. Rao (TMH).
10. Manufacturing Engineering & Technology- Kalpakjian (Pearson)

MOE-482 ENGINEERING MATERIAL

Course Category	:	Open Elective Courses
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 and Final Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. The importance of numerous materials with their basic concepts including crystallography and imperfections.
2. The understanding about the advanced materials testing by different mechanical testing methods such as strength testing, hardness, fatigue, NDT, etc.
3. Different surface behavior studies of engineering materials including heat treatment processes, TTT diagram and other related processes.
4. Different concepts regarding materials and electrical, magnetic, electronic, etc. properties.

Topics Covered	
UNIT-I	9
Introduction Importance of materials, Brief review of modern & atomic concepts in Physics and Chemistry. Atomic models **Crystalline nature of solids** Crystal system unit cell space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices, Imperfections, Defects & Dislocations in solids	
UNIT-II	9
Ferrous & Non-ferrous material Various types of carbon steels, alloy steels and cast irons, its properties, uses and applications, Heat Treatment: Various types of heat treatment processes such as Annealing, Normalizing, Quenching, Tempering, and various case hardening processes. Time Temperature Transformation (TTT diagrams. Diffusion: Diffusion of Solids, Fick's I and II law.	

Non-Ferrous metals and alloys

Non-ferrous metals such as Cu, Al, Zn, Cr, Ni etc. and its applications

UNIT-III 9

Dielectric & Magnetic properties

Dielectric Materials and their applications, Concept of magnetism- Dia, para, ferro magnetic materials, Hysteresis, Soft and hard magnetic materials, Magnetic Storages

Electronic Properties

Energy band, concept of conductor, insulator and semi conductor. Intrinsic and extrinsic semi-conductors, P-n junction and transistors, Basic devices and their applications. Bragg's law, Messier effect. Type I & II superconductors. High Temp. superconductors. Brief description of other material such as optical and thermal materials, Composite Materials and its uses, Smart materials & Nano-materials and their potential applications

Books & References

1. Material Science and Engineering – Smith, Hashemi and Prakash (Tata McGraw Hill)
2. Material Science- Narula (Tata McGraw Hill)
3. Material Science for Engineering Students- Fischer (Academic Press)
4. Material Science & Engineering - Van Vlash (John Wiley & Sons)
5. Elements of Material Science & Engineering -W.D. Callister (Wiley India Pvt. Ltd.)
6. Technology of Engineering Materials- Philip and Bolton (Butterworth-Heinamann)
7. Material Science -V. Raghvan (Prentice Hall of India)
8. Elements of Material Science & Engineering- Van Vlack (Pearson)

AGRICULTURAL ENGINEERING

AOE-481 PHOTOVOLTAIC TECHNOLOGY AND SYSTEMS

Course Category	:	Open Elective Courses
Pre-requisite Subject	:	NIL
Contact Hours/Week	:	Lecture : 3, Tutorial : 0 , Practical: 2
Number of Credits	:	4
Course Assessment Methods	:	Continuous assessment through tutorials, attendance, home assignments, Final Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge,skills and attitudes after completing this course

Topic Covered :

Unit I

Solar PV Technology: Advantages, Limitations, Current Status of PV technology, SWOT analysis of PV technology. Types of Solar Cell, Wafer based Silicon Cell, Thin film amorphous silicon cell Thin Cadmium Telluride (CdTe) Cell, Copper Indium Gallium Selenide (CiGS) Cell, Thin film crystalline silicon solar cell.

Unit II:

Solar Photo Voltaic Module: Solar cell, solar module, solar array, series & parallel connections of cell, mismatch in cell, fill factor, effect of solar radiation and temperature on power output of module, IV and power curve of module. Balance of Solar PV system:

Unit III-

Introduction to batteries: Battery classification, lead acid battery, Nicked Cadmium battery, comparison of batteries, battery parameters,

Unit IV

Charge controller: Types of charge controller function of charge controller, PWM type, MPPT type charge controller, Converters: DC to DC converter and DC to AC type converter.

Unit V:

Application of Solar PV system. Solar home lighting system, solar lantern, solar fencing, solar street light, solar water pumping system, Roof top solar photovoltaic power plant and smart grid.

Practical

1. Study of V-I characteristics of solar PV system, smart grid technology and application.
2. Manufacturing technique of solar array.
3. Different DC to DC and DC to AC converter
4. Domestic solar lighting system.
5. Various solar module technologies.
6. Safe measurement of PV modules.
7. Electrical characteristics and Commissioning of complete solar PV system.

Suggested Readings

1. Rai GD. 1998. Non-conventional Sources of Energy. Khanna Pub.
2. Rathore N.S., Kurchania A.K., Panwar N.L. 2006. Renewable Energy: Final & Practice, Himanshu Publications,.
3. Solanki C.S. 2011. Solar Photovoltaic: Fundamentals, Technologies and Applications, PHI Learning Private Ltd.
4. Meinel & Meinel. Applied Solar Energy.
5. Derrick, Francis and Bokalders, Solar Photo-voltaic Products.

AOE-482 REMOTE SENSING AND GIS APPLICATIONS

Course Category	:	Open Elective Courses
Pre-requisite Subject	:	NIL
Contact Hours/Week	:	Lecture : 3, Tutorial : 0 , Practical: 2
Number of Credits	:	4
Course Assessment Methods	:	Continuous assessment through tutorials, attendance, home assignments, Final Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

Unit I

Basic component of remote sensing (RS), advantages and limitations of RS, possible use of RS techniques in assessment and monitoring of land and water resources; electromagnetic spectrum, energy interactions in the atmosphere and with the Earth's surface;

Unit II

Major atmospheric windows; principal applications of different wavelength regions; typical spectral reflectance curve for vegetation, soil and water; spectral signatures; different types of sensors and platforms; contrast ratio and possible causes of low contrast; aerial photography; types of aerial photographs, scale of aerial photographs, planning aerial photography- end lap and side lap;

Unit III

Stereoscopic vision, requirements of stereoscopic photographs; air-photo interpretation-

interpretation elements; photogrammetry- measurements on a single vertical aerial photograph, measurements on a stereo-pair- vertical measurements by the parallax method; ground control for aerial photography;

Unit IV

Satellite remote sensing, multispectral scanner- whiskbroom and push-broom scanner; different types of resolutions; analysis of digital data- image restoration; image enhancement; information extraction, image classification, unsupervised classification, supervised classification, important consideration in the identification of training areas, vegetation indices; microwave remote sensing. GI Sand basic components,

Unit V

Different sources of spatial data, basic spatial entities, major components of spatial data,
Basic classes of map projections and their properties, Methods of data input into GIS, Data editing, spatial data models and structures, Attribute data management, integrating data (map overlay) in GIS, Application of remote sensing and GIS for the management of land and water resources.

Practical

1. Familiarization with remote sensing and GIS hardware.
2. Use of software for image interpretation.
3. Interpretation of aerial photographs and satellite imagery.
4. Basic GIS operations such as image display.
5. Study of various features of GIS software package.
6. Scanning, digitization of maps and data editing.
7. Data base query and map algebra.
8. GIS supported case studies in water resources management.

Suggested Readings

1. Reddy Anji, M. 2006. Textbook of Remote Sensing and Geographical Information Systems.BS Publications, Hyderabad.
2. Elangovan, K. 2006. GIS Fundamentals Applications and Implementations. New India Publication Agency, New Delhi.
3. George Joseph. 2005. Fundamentals of Remote Sensing. 2nd Edition. Universities Press (India) Private Limited, Hyderabad.
4. Jensen, J.R. 2013. Remote Sensing of the Environment: An Earth Resource Perspective. Pearson Education Limited, UK.
5. Lillesand, T., R.W. Kiefer and J. Chipman. 2015. Remote Sensing and Image Interpretation. 7th Edition, John Wiley and Sons Singapore Pvt. Ltd., Singapore.
6. Sabins, F.F. 2007. Remote Sensing: Principles and Interpretation. Third Edition, Waveland Press Inc., Illinois, USA.
7. Sahu, K.C. 2008. Text Book of Remote Sensing and Geographic Information Systems. Atlantic Publishers and Distributors (P) Ltd., New Delhi.
8. Shultz, G.A. and E.T. Engman. 2000. Remote Sensing in Hydrology and Water Management. Springer, New York

AOE-483 Human Engineering and Safety

Course Category	:	Open Elective Courses
Pre-requisite Subject	:	NIL
Contact Hours/Week	:	Lecture : 3, Tutorial : 0 , Practical: 2

Number of Credits	:	4
Course Assessment Methods	:	Continuous assessment through tutorials, attendance, home assignments, Final Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

Topic Covered

Unit I

Human factors in system development – concept of systems; basic processes in system development, performance reliability, human performance.

Unit II

Information input process, visual displays, major types and use of displays, auditory and factual displays. Speech communications.

Unit III

Biomechanics of motion, types of movements, Range of movements, strength and endurance, speed and accuracy, human control of systems.

Unit IV

Human motor activities, controls, tools and related devices. Anthropometry: arrangement and utilization of work space, atmospheric conditions, heat exchange process and performance, air pollution.

Unit V

Dangerous machine (Regulation) act, Rehabilitation and compensation to accident victims, Safety gadgets for spraying, threshing, Chaff cutting and tractor & trailer operation etc.

Practical

Unit-I

1. Calibration of the subject in the laboratory usingbi-cycle ergo-meter.
2. Study and calibration of the subject in the laboratory using mechanical treadmill.
3. Use of respiration gas meter from human energy point of view.
4. Use of Heart Rate Monitor.
5. Study of general fatigue of the subject using Blink ratio method.
6. Familiarization with electro-myograph equipment.
7. Anthropometric measurements of selected subjects.
8. Optimum work space layout and locations of controls for different tractors.
9. Familiarization with the noise and vibration equipment.
10. Familiarization with safety gadgets for various farm machines

Suggested Readings

1. Chapanis A. 1996. Human Factors in System Engineering. John Wiley & Sons, New York. Dul J. and Weerdmeester B.1993. Ergonomics for Beginners. A Quick Reference Guide. Taylor and Francis, London.
2. Mathews J. and Knight A. A. 1971. Ergonomics in Agricultural Equipment Design. National Institute of Agricultural Engineering.
3. Astrand P. And and Rodahl K. 1977. Textbook of Work Physiology. Mc Hill Corporation, New York.
4. Mark S. Sanders and Ernest James McCormick. 1993. Human Factors in Engineering and Design.
5. Mc Hill Corporation, New YorkKeegan J J, Radke AO. 1964. Designing vehicle seats for greater comfort. SAE Journal;72:50~5.

6. Yadav R, Tewari V.K. 1998. Tractor operator workplace design-a review. Journal of Terra mechanics 35: 41-53.

COMPUTER SCIENCE & ENGINEERING

COE-481 DATABASE MANAGEMENT SYSTEM, DATA MINING & WAREHOUSING

Course Category	:	Open Elective Coures
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, midterm examination and Final Examination
Course Outcomes	:	The students are expected to be able to demonstrate th following knowledge, skills and attitudes after completing thi course

1. To educate students with fundamental concepts of Database Management System, Data Models, Different Data Base Languages.
2. To analyze Database design methodology.
3. To understand the basic principles, concepts and applications of data warehousing and data mining
4. To introduce the task of data mining as an important phase of knowledge recovery process
5. Ability to do Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment
6. Have a good knowledge of the fundamental concepts that provide the foundation of data mining

Topics Covered

UNIT-I

Introduction: An Overview of Database Management System, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. 9

Data Modeling using Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.

UNIT-II

Relational Data Model and Language: Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. 9

Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQL Data Type and Literals. Types of SQL Commands. SQL Operators and their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL

UNIT-III

Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. 9

Distributed Database: Distributed Data Storage, Concurrency Control, Directory System.

Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.

UNIT-IV

Data Mining & Warehousing: Introduction to Data Warehouse, Building A Data Warehouse, Data Warehouse Architecture, OLAP Technology, Introduction to Data Mining, Data Pre-Processing, Mining Association Rules, Classification and Prediction, Cluster Analysis, Advanced Techniques of Data Mining and its Applications. 9

Textbooks

1. Korth, Silbertz, Sudarshan, Database Concepts, McGraw Hill
2. Jiawei Han, Micheline Kamber, Data Mining Concepts & Techniques, Elsevier
3. Elmasri, Navathe, Fundamentals of Database Systems, Addison Wesley

Reference books

1. Date C J, An Introduction to Database Systems, Addison Wesley
2. J. D. Ulman, Principles of Database and Knowledge base System, Computer Science Press.
3. M. H. Dunham, Data Mining: Introductory and Advanced Topics. Pearson Education
4. Mallach, Data Warehousing System, McGraw –Hill

COE-482 OBJECT ORIENTED TECHNIQUES & JAVA PROGRAMMING

Course Category	:	Program Elective Courses
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 and Final Examination
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Knowledge of how to develop and deploy applications and applets in JAVA.
2. Knowledge of how to develop and deploy GUI using JAVA Swing and AWT.
3. Design, develop and implement interactive web applications.
4. Be able to implement, compile, test and run JAVA programs comprising more than one class and to address a particular software problem.
5. Develop programs using the JAVA Collection API as well as the JAVA standard class library.

Topics Covered

UNIT-I

Introduction: Introduction to Programming Languages, The Evolution of JAVA, Object-Oriented Programming Concepts and JAVA, Differences between C++ and JAVA, Primary Characteristics of JAVA, The Architecture, Programming with JAVA, Operator, Data type, Variable, Arrays, Control Statements, Methods. 9

UNIT-II

Core JAVA: Classes, Inheritance, Package and Interface, Exception Handling, Multithread Programming, I/O, JAVA Applet, String Handling, Networking, Event Handling, Introduction to AWT, AWT Controls, Layout Managers. 9

UNIT-III

JAVA Swing: Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and Feel, Labels, Text Fields, Buttons, Tabbed Panes. 9

UNIT-IV

JDBC: Connectivity Model, JDBC/ODBC Bridge, JAVA.SQL Package, Connectivity to Remote Database, **JAVA Beans**: Application Builder Tools, The Bean Developer Kit(BDK), JAR files, Introspection, Developing a Simple Bean, **Servlet:** Introduction to JAVA Servlet: Servlet Basics, Servlet API Basic, Life Cycle of a Servlet, Running Servlet.

Textbooks

1. Naughton, Schildt, The Complete Reference JAVA2, TMH Publication
2. Balaguruswamy E, Programming in JAVA, TMH Publication

Reference books

1. Margaret Levine Young, The Complete Reference Internet, TMH Publication
2. Dustin R. Callway, Inside Servlets, Addison Wesley.
3. Mark Wutica, JAVA Enterprise Edition, QUE. teven Holzner, JAVA2 Black book, Dreamtech

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COE-483 INTRODUCTION TO WEB TECHNOLOGY

Course Category	:	Open Elective Courses
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, Final Examination

Topics Covered

UNIT-I **9**

Introduction: 8 Introduction and Web Development Strategies, History of Web and Internet, Protocols governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. Core Java: Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers.

UNIT-II

Web Page Designing: 8 HTML: list, table, images, frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML. 9

UNIT-III

Scripting: 8 Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, VB Script, Introduction to Java Beans, Advantage, Properties, BDK, Introduction to EJB, Java Beans API. 9

UNIT-IV

Server Site Programming: 8 . Introduction to active server pages (ASP), Introduction to Java Server Page (JSP), JSP Application Design, JSP objects, Conditional Processing, Declaring variables and methods, Sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, development of java beans in JSP, Introduction to Servelets, Lifecycle, JSDK, Servlet API, Servlet Packages, Introduction to COM/DCOM/CORBA.

UNIT-V

PHP (Hypertext Preprocessor): 8 Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form, mail, file upload, session, error, exception, filter, PHP-ODBC.

Text books:

1. Burdman, Jessica, "Collaborative Web Development" Addison Wesley
2. Xavier, C, " Web Technology and Design" , New Age International
3. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication
4. Bhave, "Programming with Java", Pearson Education
5. Herbert Schieldt, "The Complete Reference:Java", TMH. Hans Bergsten, "Java Server Pages", SPD O'Reilly
6. Ullman, "PHP for the Web: Visual QuickStart Guide", Pearson Education
7. Margaret Levine Young, "The Complete Reference Internet", TMH
8. Naughton, Schildt, "The Complete Reference JAVA2", TMH
9. Balagurusamy E, "Programming in JAVA", TMH

References:

1. Ramesh Bangia, "Internet and Web Design" , New Age International
2. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication
3. Deitel, "Java for programmers", Pearson Education
4. Chris Bates, "Web Programing Building Internet Applications", 2nd Edition, WILEY, Dreamtech
5. Joel Sklar , "Principal of web Design" Vikash and Thomas Learning
6. Horstmann, "CoreJava", Addison Wesley

ELECTRONICS AND COMMUNICATION ENGINEERING

EOE-481 NON-CONVENTIONAL ENERGY RESOURCES

Course Category : Open Elective Courses

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, Final Examination

UNIT-I

Introduction

Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.

Solar Cells:

Final of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations.

UNIT-II

Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III

Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.

Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations.

Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT-IV

Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations.

Wind Energy: Wind power and its sources, site selection, criterion, momentum Final, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

UNIT-V

Bio-mass: Availability of bio-mass and its conversion Final.

Ocean Thermal Energy Conversion (OTEC): Availability, Final and working principle, performance and limitations.

Wave and Tidal Wave: Principle of working, performance and limitations.Waste Recycling Plants.

Text/References Books:

1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. Koteswara Rao, " Energy Resources: Conventional & Non-Conventional " BSP Publications,2006.
4. D.S. Chauhan,"Non-conventional Energy Resources" New Age International.
5. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press

EOE-482 INDUSTRIAL ELECTRONICS

Course Category	:	Open Elective Courses
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, Final Examination

Thyrestor Characteristics, Two-Transistor Model of Thyristor, thyristor Turn-On di/dt Protection, dv/dt Protection, Thyristor Turn-On, Series Operation of Thyristors, Parallel Operation of Thyristors, Snubber Circuits' Reverse Recovery Transients.

Thyristor Commutation Techniques
Natural Commutation, Forced Commutation, Self Commutation, Impules Commutation, resonant pulse commutation, complementary commutation, External Pulse commutation, Load side commutation, line side commutation.

Controlled rectifiers
Introduction, principle of phase controlled converter operation, single-phase semiconverters, single phase full converters, single phase dual converters, single—phase series converters, three phase half wave converters three phase semiconverters, three phase full converters, three phase dual converters.

AC Voltage Controllers
Introduction, principle of on—of control, principle of phase control, single-phase bidirectional controllers A S with resistive loads, single phase controllers with Inductive loads. Three phase half wave controllers, three phase full wave controllers, three phase bi—directional delta connected controllers, single phase transformer tap changers, cycloconverters, single phase cycloconverters, three phase cyclocon converters, reduction of output harmonics.

DC Choppers
Introduction, principle of step-down operation, Step—down choppers with RL Load principle of step-up operation, performance parameters, switch-mode regulators, thyristor, chopper circuits' Impulse- commutated choppers, Effects of source and load inductance, Impulse—commutated three thyristor choppers, Resonant pulse choppers.

Inverters
Introduction, principle of operation, performance parameters, single phase bridge Inverters, three phase inverters, voltage control of three phase inverter, Harmonic Reductions.

Suggested Text Books & References

- Rasid , "Power Electronics", Prentice Hall
- Sen, P.C., "Power Electronics", Wiley eastern.
- Dubey, G.K., "Thermistor Engineering", Prentice Hall

EOE-483 PRODUCT DEVELOPMENT

Course Category	:	Open Elective Courses
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, Final Examination

UNIT-1
Concept of Product, definition and scope. Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical relaibility & economic feasibility of design concepts.

UNIT –II
Murphology of design, divergent, transformation and convergent phases of product design,

identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour.

Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.

UNIT –III

Transformations, Brainstorming& Synetics, Morephological techniques. Utility Concept, Utility Valaue, Utility Index, Decision making under Multiple Criteria. Economic aspects, Fixed and variable costs, Break-even analysis.

UNIT-IV

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations. Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthroprometric data and its importance in design. Application of Computers in Product development & design.

UNIT-V

Existing techniques, such as work-study, SQC etc. for improving method & quality of product. Innovation versus Invention. Technological Forecasting. Use of Standards for Design.

Text/Reference Books:

1. A.K. Chitab& R.C. Gupta "Product design & Manufacturing" – Prentice Hall (EE)
2. R.P. Crewford, "The Technology of creation Thinking" Prentice Hall.
3. C.D. Cain, "Product Design & Decision" Bussiness Books.
4. C.D. Cain, "Engg. Product Design" Bussiness Books.

BOE-481 ENTREPRENEURSHIP DEVELOPMENT

Course Category	:	Open Elective Courses
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, Final Examination

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control:

The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. Profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

1. Forbat, John, "Entrepreneurship" New Age International.
2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International
3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India.

BOE-482 ENTERPRISE RESOURCE PLANNING

Course Category	:	Open Elective Courses
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, Final Examination

Unit I

Manufacturing Industry-Management Characteristics and Information Requirements

Industry classification, Product/Market/process Characteristics, Manufacturing planning and control techniques, ERP Concept & Evaluation History: MRP-1, MRP-II, EPR. Information Technology Advancement: Client server technology, RDBMS.

Unit II

Sales, Purchase & Inventory Control, Concepts

Classification/coding of material & finished goods, sales enquire, quotation, order, invoicing, delivery, finished good valuation, purchase requisition, enquiry, supplier quotation, purchase order, Material receipts, Material issues, methods of issue valuation (FIFO/LIFO/Weighted Average Cost/Std. Cost), Returns from operations, Returns of supplier, Stock Adjustments, Physical Stock verification, ABC analysis. Lot and Locations control, Replenishment order control (safety stocks, report point, economic order quantity)

Manufacturing

Product configuration, Bill of material, Master Production Scheduling, Material Requirement planning, capacity Requirement Planning, Loading and Scheduling. An over view of man power planning and customer manufacturing planning.

Unit III

Financial and Cost Accounting

Basic accounting principles, Day book-Cash, Bank, Journal, Purchase and Sales. Ledger-General, Supplier, Customer, Advances, etc. Bank Reconciliation, Trial Balance, Profit & Loss/Income & Expenditure account and Balance Sheet. Fix Ed assets and depreciation. Budgeting-Revenue, Capital Cash, Cost Elements-Direct material, Direct Labour, Direct expenses and overheads. Margin at costing and Break even analysis, Standard Costing, Activity based costing .

Unit IV

Introduction to A Typical ERP Software

Overview of ERP modules and tools of a software like BaaN.

Unit V

Distribution Module

Module architecture-an overview, item data, Purchase ordering/control, Sales ordering/control, Replenishment order control, Electronic Data Interchange.

Manufacturing Module

Module architecture-an overview, Capacity Requirement, Planning, Engineering change control, Engineering data Management, Master Production Scheduling Material requirement Planning, Product Classification/configuration , Production Planning/control, Repetitive Manufacturing.

Finance Module

Module architecture-an overview, Accounts payable, Accounts receivable, General ledger, Cost allocation, Cash management, Activity based costing, fixed assets, Financial budgeting system.

Suggested Text Books and References

1. Joseph Orlicky, " Materials Requirement Planning, The New Way in Production and Inventory Management". McGraw Hill book company, New Delhi, 1975.
2. BaaN Student Manuals, BaaN Education Centre, Hyderabad, 1996.

BOE-483 E-COMMERCE & IT

Course Category	:	Open Elective Courses
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, Final Examination

Topic Covered

UNIT 1

Introduction

What is E-Commerce, Forces Behind E-Commerce Industry Framework, Brief history of E-Commerce, Inter Organization Commerce Intra Organization Commerce, and Consumer to Business Electron e-Commerce, Architectural Framework.

UNIT- II

Mobile Commerce

Introduction to Mobile Commerce, Mobile Computing Application, Wireless Application Protocols, WAP Technology, Mobile Information Devices.

UNIT-III

Encryption

World Wide Web & Security, Encryption, Transaction security, Secret Key Encryption, Public Key Encryption, Virtual Private Network (VPM), Implementation Management Issues.

UNIT-IV

Electronic Payments

Overview of Electronics payments, Digital Token Based Electronics payment System, Smart Cards, Credit 1 Debit Card based EPS, Emerging Financial Instruments, Home Banking online Banking.

Reference books:

1. E.Turban, D. King, D. Viehland, J. Lee, "Electronic Commerce 2006: A Managerial Perspective", Pearson education 2006
2. M. Khosrow-pour, Encyclopedia of E-Commerce, E Government, and Mobile Commerce, Idea Group, 2006.
3. Nabeel Al-Qirim, Electronic Commerce in Small to Medium-Sized Enterprises: Frameworks, Issues, and Implications, Idea Group, 2004
4. P. Candace Deans (editor), E-Commerce and MCommerce Technologies, IRM Press, 2005.
   5) Darie, C., Balanescu, E., and Bucica, M., Beginning PHP and PostgreSQL E-Commerce: from novice to professional, Apress, 2006.

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