College of Technology and Engineering

REGULATIONS
AND
COURSE DESCRIPTION

BACHELOR OF TECHNOLOGY

Electronics & Communication Engineering

Effective from 2019–20

Maharana Pratap University of Agriculture and Technology, Udaipur (Raj.) – 313 001

VISION OF ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT

- To create world-class Engineers, Researchers & Entrepreneurs in Electronics & Communication Engineering through holistic education.

MISSION OF ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT

- Provide strong theoretical & practical foundation of the domain.
- Creation of an eco-system for research and innovation to nurture the creativity.
- Experiential learning of cutting edge technologies to meet the challenges in the industry and society.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs) (5)

The Department of Electronics & Communication is guided by the following educational objectives. PEOs are broad statements that describe the career and professional accomplishments that the program is preparing the graduates to achieve.

PEOs of Electronics and Communication Engineering Department	
ECE/PEO-I	To provide students with a solid foundation of conceptual and applied aspects pertaining to Electronics and Communication Engineering, addressing wide range of engineering problems. This leads to lifelong learning in their professional domain as well as further studies.
ECE/PEO-II	To produce technically competent graduates with ability to analyze, design, develop, optimize and implement electronic systems.

ECE/PEO-III	To provide students with an academic environment that ignites the spirit of excellence, develop the urge of discovery, creativity, innovation, leadership and a passion to be the best by providing state-of-the-art facility and an overall ambience that fosters brilliance.
ECE/PEO-IV	To produce graduates with a professional outlook who can communicate effectively and interact responsibly with colleagues, clients, employers and the society.
ECE/PEO-V	To prepare the students for successful and productive career choices in both public and private sectors in the field of Electronics and Communication Engineering or other allied engineering fields.

SCHEME OF TEACHING AND EXAMINATION

(Electronics and Communication Engineering)

First Year B.Tech. (Common for All Branches)

SEMESTER-I

S. N.	Category	Course Code	Course title	Credits			Hrs/ week			Marks allotted		
				L	T	P	L	T	P	Th.	Pr.	MT
1	BSC	BS 111 (BSC)	Mathematics -I	2	1	0	2	1	0	80	0	20
2	ESC	ME 112 (ESC)	Mechanical Engineering	3	0	0	3	0	0	80	0	20
3.	ESC	ME 113 (ESC)	Workshop Practice	0	0	1.5	0	0	3	0	80	20
4	ESC	CE 114 (ESC)	Engineering Drawing	0	0	1.5	0	0	3	0	80	20
			NCC/NSS/NSO / Yoga/Scout	-	-	-	0	0	2	-	-	-
			Total	**5**	**1**	**3**	**5**	**1**	**8**			
GROUP I												
5.	BSC	BS 100P (BSC)	Engineering Physics	2	0	1	2	0	2	50	30	20
6.	ESC	CE 100 (ESC)	Engineering Mechanics	2	0	1	2	0	2	50	30	20
7.	ESC	EE 100 (ESC)	Electrical Engineering	3	0	1	3	0	2	50	30	20
8.	HSMC	REE100 (HSM)	Environmental Studies and Disaster Management	2	0	0	2	0	0	80	0	20
			Total	**9**	**0**	**3**	**9**	**0**	**6**			
GROUP II												
5	BSC	BS 100C (BSC)	Engineering Chemistry	2	0	1	2	0	2	50	30	20
6.	ESC	EC 100 (ESC)	Electronics and Instrumentation	2	0	1	2	0	2	50	30	20
7.	ESC	CS 100 (ESC)	Computer Programming for Problem Solving	0	1	2	0	1	4	0	80	20
8.	HSMC	BS100E (HSM)	Communication Skills and Personality Development	2	0	1	2	0	2	50	30	20
			Total	**6**	**1**	**5**	**6**	**1**	**10**			
			Total Credits	**21**								

Note :

1. NCC/NSS/NSO/YOGA/SCOUT is compulsory non credit course and the student will be assessed as satisfactory/ unsatisfactory at the end of IV semester.
2. The courses BS 100P, CE 100, EE 100, REE 100, BS 100C, EC 100, CS 100 and BS 100E shall be offered in both the semesters. The students will be divided in two groups in I semester itself and shall remain in the same group in II semester as well. However, they have to opt all the eight courses in first year.

SEMESTER-II

S. N	Category	Course Code	Course title	Credits			Hrs/ week			Marks allotted		
				L	T	P	L	T	P	Th.	Pr.	MT
1	BSC	BS 121 (BSC)	Mathematics -II	2	1	0	2	1	0	80	0	20
2	ESC	CE 122 (ESC)	Civil Engineering	1	0	1	1	0	2	50	30	20
3.	ESC	ME 123 (ESC)	Mechanical Drawing	0	0	1	0	0	2	0	80	20
4	ESC	ME 124 (ESC)	Workshop Technology	2	0	1	2	0	2	50	30	20
			NCC/NSS/NSO/ Yoga/ Scout	-	-	-	0	0	2	-	-	-
			Total	**5**	**1**	**3**	**5**	**1**	**8**			
GROUP I												
5	BSC	BS 100C (BSC)	Engineering Chemistry	2	0	1	2	0	2	50	30	20
6.	ESC	EC 100 (ESC)	Electronics and Instrumentation	2	0	1	2	0	2	50	30	20
7.	ESC	CS 100 (ESC)	Computer Programming for Problem Solving	0	1	2	0	1	4	0	80	20
8.	HSMC	BS100E (HSM)	Communication Skills and Personality Development	2	0	1	2	0	2	50	30	20
			Total	**6**	**1**	**5**	**6**	**1**	**10**			
GROUP II												
5.	BSC	BS 100P (BSC)	Engineering Physics	2	0	1	2	0	2	50	30	20
6.	ESC	CE 100 (ESC)	Engineering Mechanics	2	0	1	2	0	2	50	30	20
7.	ESC	EE 100 (ESC)	Electrical Engineering	3	0	1	3	0	2	50	30	20
8.	HSMC	REE100 (HSM)	Environmental Studies and Disaster Management	2	0	0	2	0	0	80	0	20
			Total	**9**	**0**	**3**	**9**	**0**	**6**			
			Total Credits	**21**								

Note :

1. NCC/NSS/NSO/YOGA/SCOUT is compulsory non credit course and the student will be assessed as satisfactory/ unsatisfactory at the end of IV semester.
2. Students have to undergo in house practical summer training [Branch Code 239 (PSI)] of 15 days at the end of II semester and will be assessed in III semester.

SECOND YEAR B.Tech.

III-SEMESTER

S. N.	Category	Course Code	Course title	Credits			Hrs/week			Marks allotted		
				L	T	P	L	T	P	Th.	Pr.	MT
1.	BSC	BS 231 (BSC)	Mathematics –III	2	1	0	2	1	0	80	0	20
2	HSMC	BS 232 (HSM)	Human Values	2	0	0	2	0	0	80	0	20
3	ESC	CS 233 (ESC)	Object oriented Programming with C++	2	0	1	2	0	2	50	30	20
4.	ESC	EE 234 (ESC)	Network Analysis	3	0	0	3	0	0	80	0	20
5.	PCC	EC 235 (PCC)	Digital Electronics	3	0	1	3	0	2	50	30	20
6.	PCC	EC 236 (PCC)	Electronic Devices and Circuits	3	0	1	3	0	2	50	30	20
7.	PCC	EC 237 (PCC)	Signals & Systems	3	0	0	3	0	0	80	0	20
8.	-	-	NCC/NSS/NSO/Yoga/Scout	-	-	-	-	-	2	-	-	-
9.	PSI	EC 239 (PSI)	Training –I	0	0	1	0	0	0	0	100	0
			Total Credits	**23**								

IV-SEMESTER

S. N.	Category	Course Code	Course title	Credits			Hrs/week			Marks allotted		
				L	T	P	L	T	P	Th.	Pr.	MT
1.	BSC	BS 241 (BSC)	Mathematics –IV	2	1	0	2	1	0	80	0	20
2.	ESC	CS 243 (ESC)	Data Structure	3	0	0	3	0	0	80	0	20
3.	ESC	EE 243 (ESC)	Control System Engineering	3	0	0	3	0	0	80	0	20
4.	PCC	EC 242 (PCC)	Electromagnetic Field Theory	3	0	0	3	1	0	80	0	20
5.	PCC	EC 245 (PCC)	Communication Theory	3	0	1	3	0	2	50	30	20
6.	PCC	EC 246 (PCC)	Microprocessor & Microcontroller	3	0	1	3	0	2	50	30	20
7.	PCC	EC 247 (PCC)	Analog Electronic Circuits	3	0	1	3	0	2	50	30	20
8.	PCC	EC 248 (PCC)	Electronic Workshop	0	0	2	0	0	4	0	100	0
			NCC/NSS/NSO/Yoga/Scout	-	-	-	-	-	2	-	-	-
			Total Credits	**26**								

NCC/NSS/NSO/YOGA/SCOUT is compulsory non-credit course and the student will be assessed as satisfactory/ unsatisfactory at the end of IV semester.

Note: Students have to undergo a Practical Training-II of 30 days (In house/ Field) at the end of IV Semester for which assessment will be made at the beginning of next semester as EC 359 (PSI)

B.Tech. - THIRD YEAR (ECE)

V-SEMESTER

S. N.	Category	Course Code	Course title	Credits			Hrs/week			Marks allotted		
				L	T	P	L	T	P	Th.	Pr.	MT
1.	PCC	EC 351 (PCC)	Digital Signal Processing	3	0	1	3	0	2	50	30	20
2.	PCC	EC 352 (PCC)	Digital Communication Engineering	3	0	1	3	0	2	50	30	20
3.	PCC	EC 353 (PCC)	Digital System Design	3	0	1	3	0	2	50	30	20
4.	PCC	EC 354 (PCC)	Antenna & Wave Propagation	3	0	0	3	0	0	80	0	20
5.	PCC	EC 355 (PCC)	Telecommunication & Switching Networks	3	0	1	3	0	2	50	30	20
6.	PCC	EC 356 (PCC)	Electronic Measurement and Instrumentation	3	0	1	3	0	2	50	30	20
7.	PSI	EC 359 (PSI)	Training –II	0	0	3	0	0	0	0	100	0
			Total Credits	**26**								

VI-SEMESTER

S. N.	Category	Course Code	Course title	Credits			Hrs/week			Marks allotted		
				L	T	P	L	T	P	Th.	Pr.	MT
1.	PCC	EC 361 (PCC)	VLSI Design	3	0	1	3	0	2	50	30	20
2.	PCC	EC 362 (PCC)	Microwave Theory & Techniques	3	0	1	3	0	2	50	30	20
3.	PCC	EC 363 (PCC)	Advanced Communication Systems	3	0	1	3	0	2	50	30	20
4.	PCC	EC 364 (PCC)	Electronic Design Automation Lab	0	1	2	0	1	4	0	80	20
5.	PEC	EC 365 (PEC)	Professional Electives-I (PE-I)	3	0	0	3	0	0	80	0	20
6.	PEC	EC 366 (PEC)	Professional Electives-II (PE-II)	3	0	0	3	0	0	80	0	20
			Total Credits	**21**								

EC 365 (PEC): Professional Electives-I (PE-I)

PE-I (a)	Low Power VLSI Design
PE-I (b)	Mixed Signal Design
PE-I (c)	System on Chip Design
PE-I (d)	Information Theory & Coding
PE-I (e)	Neural Networks

EC 366 (PEC): Professional Electives-II (PE-II)

PE-II (a)	Computer Architecture
PE-II (b)	Industrial Electronics
PE-II (c)	Nano-Electronics
PE-II (d)	Bio-Medical Electronics
PE-II (e)	AI & Expert Systems

Note: Students have to undergo a Practical Training-III of 30 days (In house/ Field) at the end of VI Semester for which assessment will be made in the next semester as EC 479 (PSI).

B.Tech. - FINAL YEAR (ECE)

VII-SEMESTER

S. N	Category	Course Code	Course title	Credits			Hrs/ week			Marks allotted		
				L	T	P	L	T	P	Th.	Pr.	MT
1.	PCC	EC 471 (PCC)	Mobile Communication & Networks	3	0	0	3	0	0	80	0	20
2.	PCC	EC 472 (PCC)	Embedded Systems	3	0	1	3	0	2	50	30	20
3.	PCC	EC 473 (PCC)	Optical Fiber Communication	3	0	1	3	0	2	50	30	20
4.	PCC	EC 474 (PCC)	Radar and Television Engineering	3	0	1	3	0	2	50	30	20
5.	PEC	EC 475 (PEC)	Professional Electives-III (PE-III)	2	0	1	2	0	2	50	30	20
6.	OE**	---- 478 (OE)	Open Elective (OE)	3/2	0	0/1	3/2	0	0/2	80/50	0/30	20
7.	PSI	EC 479 (PSI)	Training –III	0	0	3	0	0	0	0	100	0
			Total Credits	**24**								

EC 475 (PEC): Professional Electives-III (PE-III)

PE-III (a)	Testing & Verification of VLSI circuits
PE-III (b)	Internet of Things and its Application
PE-III (c)	Introduction to Machine Learning
PE- III (d)	Microwave Devices

****OPEN ELECTIVE**

Note: The students have to take one open elective out of the list given below:

Offering Department	Course Code	Course Title	Credit		
			Th.	T	P
Civil Engineering	CE478a (OE)	Urban Waste Management	2	0	1
	CE478b (OE)	Ground Improvement Techniques	2	0	1
Computer Sc. Engg	CS 478 (OE)	Introduction To Cyber Security	3	0	0
Mining Engineering	MI 478 (a) (OE)	Engineering Geology	2	0	1
	MI 478 (b) (OE)	Earth Moving Machinery	2	0	1
	MI 478 (c) (OE)	Tunnelling Engineering	2	0	1
Mechanical Engineering	ME 478(a) (OE)	Entrepreneurship And Industrial Management	2	0	1
	ME 478(b) (OE)	Bio Energy System Design	2	0	1
	ME 478(c) (OE)	Energy Conservation And Management	2	0	1
Electrical Engg.	EE 478(a) (OE)	Knowledge Based System	3	0	0
	EE 478(b) (OE)	Advanced Power Converters	3	0	0
	EE 478(c) (OE)	Power Electronics In Renewable Energy Systems	3	0	0
Renewable Energy Engineering	REE 478(OE)	Renewable Energy Technologies	2	0	1
Soil & Water Engineering	SWE 478(OE)	Aerial Photography, RS and GIS	2	0	1
Farm Machinery & Power Engineering	FMP 478(OE)	Machinery For Land Development	2	0	1
Processing & Food Engineering	PFE 478(OE)	Packaging Materials And Methods	2	0	1

VIII-SEMESTER

S. N	Category	Course Code	Course Title	Credits			Hrs/ week			Marks allotted		
				L	T	P	L	T	P	Th.	Pr.	MT
1.	PSI	EC 481 (PSI)	Seminar	0	0	3	0	0	-	0	100	0
2.	PSI	EC 482 (PSI)	Project**	0	0	15	0	0	-	0	100	0
			Total Credits	**18**								

** *The project can be done by the student in house or in industry as the case may be and as per the norms and guidelines of the college.*

COURSE CONTENT

FIRST YEAR B.TECH. (I SEMESTER)

BS 111 MATHEMATICS – I

Cr. Hrs. 3(2+1+0)

	L	T	P
Credit	**2**	**1**	**0**
Hours	**2**	**1**	**0**

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Expand function in Taylor's and Maclaurin's series.

CO2 : Trace the Cartesian and Polar curves.

CO3 : Apply the partial differentiation to compute the minima and maxima of functions of two variables.

CO4 : Compute areas and volumes by integration.

CO5 : Solve linear differential equations of higher order and homogenous differential equations with constant coefficients.

Unit-I

Differential Calculus: Taylor's and Maclaurin's expansions, Asymptotes and Curvature (Cartesian Coordinates only), Curve tracing (Cartesian and standard Polar Curves-Cardioids, Lemniscates of Bernoulli, Limacon, Equiangular Spiral).

Unit-II

Differential Calculus: Partial Differentiation, Euler's Theorem on Homogeneous Functions, Maxima & Minima of Two Independent Variables, Lagrange's Method of Multipliers, Jacobians.

Unit-III

Integral Calculus: Double Integral, Areas & Volumes by Double Integration, Change of Order of Integration, Triple integrals, Beta Function and Gamma Function (Simple Properties), Relation between Beta and Gamma functions.

Unit-IV

Differential Equations: Linear Differential Equations of Higher Order with constant coefficients, Homogeneous Linear Differential Equations with constant coefficient.

Text Books/ References

1. Guar, Y.N. and Koul, *C.L, Engineering Mathematics*, Vols. I & II, Jaipur Publishing House, Jaipur (2013).
2. Babu Ram, *Engineering Mathematics-I*, Pearson Education, India (2011).
3. B.V. Ramana, *Higher Engineering Mathematics*, Tata McGraw Hill, India (2012).
4. J.L. Bansal and H.S. Dhami, *Differential Equations*, Vols. I & II, Jaipur Publishing House, Jaipur (2012).
5. M.Ray and Chaturvedi, *A Text Book of Differential Equations*, Student Friend & Co. Publisher, Agra.
6. Rao V. Dukkipati, *Engineering Mathematics*, New Age International (P) Ltd, New Delhi (2012).
7. Gupta C.B., Malik A.K., Engineering Mathematics –I, New Age international Publisher.

ME 112 (ESC) MECHANICAL ENGINEERING

Cr. Hrs. 3(3+0+0)

	L	T	P
Credit	3	0	0
Hours	3	0	0

Course Outcomes: Upon completion of this course the students will be able to:

CO1: Apply the principles of conservation of mass, first and second laws of thermodynamics to analyse closed steady state systems and processes involving heat and work interactions.

CO2: Show understanding of concepts of reversibility, entropy and Carnot cycle.

CO3 Demonstrate knowledge of properties of steam and ability to compute them from steam tables and Mollier chart.

CO4: Understand construction and working of steam boilers, steam engines and their specific applications.

CO5: Compute efficiency, power output, etc. of various vapour and gas cycles.

CO6: Demonstrate knowledge about construction and working of IC engines.

Unit I

Thermodynamics: Thermodynamic properties, closed and open systems, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Application of First Law in heating and expansion of gases in non-flow processes only.

Second law of thermodynamics: Kelvin-Planck and Claussius statements. Reversible processes, Carnot cycle, Carnot theorem. Reversed Carnot cycle. Entropy, physical concept of entropy.

Unit II

Properties of Steam: Difference between gas and vapour, change of phase during constant pressure process. Generation of Steam, triple point and critical point. Internal energy and entropy of steam. Use of steam tables and Mollier chart, heating and expansion of vapour in non-flow processes.

Unit III

Vapour Power Cycles: Introduction to Carnot Cycle, Rankine cycle and modified Rankine cycle.

Steam Generators: Classification of steam boilers. Cochran, Lancashire, Locomotive and Babcock-Wilcox boilers, Boiler mountings and accessories.

Steam Engines: Introduction to simple and compound steam engines.

Unit IV

Gas Power Cycles: Introduction. Air Standard efficiency, other engine efficiencies and terms. Otto, diesel and dual cycles. Calculation of efficiency, mean effective pressure and their comparison.

Internal Combustion Engines: Introduction, Classification, terminology and description of IC Engines. Four stroke and two stroke petrol, gas and diesel engines. Comparison of petrol and diesel engines. Simple carburettor.

Text Books/References

1. M. L. Mathur and F. S. Mehta: Thermal Engineering, (Vol. I, SI Edition), Jain Brothers, New Delhi.
2. R. K. Purohit: Foundation of Mechanical Engineering, Scientific Pub. (India), Jodhpur.
3. P.K. Nag: Engineering Thermodynamics, TMH.

ME113 (ESC) WORKSHOP PRACTICE

	Cr. Hrs.	1.5(0 + 0 + 1.5)	
	L	T	P
Credit	0	0	1.5
Hours	0	0	3

Course Outcomes: Upon completion of this course the students will be able to:

CO1: Demonstrate knowledge of characteristics of various types of woods used in engineering applications.

CO2: Demonstrate knowledge of tools and operations in carpentry work, black smithy, fitting, sheet metal and plumbing works in engineering practice.

CO3 : Identify and use measuring instruments in workshop practice and pipe fittings.

CO4: Learn use of tools in the carpentry, fitting, smithy, sheet metal and plumbing shop to make simple jobs.

Carpentry Shop: Acquaintance with types of wood, tools and their uses. Simple exercises involving basic operations like sawing, planning, chiselling, etc. Preparation of simple joints, cross half lap joint, dovetail joint, bridle joint, tenon and mortise joint.

Smithy Shop: Acquaintance with types of tools and their uses. Simple exercises involving basic operations like bending, drawing, punching, shaping, upsetting, and riveting.

Fitting Shop: Acquaintance with tools, measuring and marking tools, precision measuring tools and their uses. Simple exercises involving basic operations like sawing, chipping, filling, drilling, reaming, threading with taps and dies.

Sheet Metal and Plumbing Shop: Demonstration of basic tools, pipe fittings and operations.

Texts books/References

1. S.K. Hajra Choudhury and A.K. Hajra Choudhury: Elements of Workshop Technology (Vol. I), Media promoters & Publishers Pvt. Ltd., Bombay.

CE 114 (ESC) ENGINEERING DRAWING

Cr. Hrs.	**1.5**	**(0+0+1.5)**	
	L	**T**	**P**
Credit	**0**	**0**	**1.5**
Hours	**0**	**0**	**3**

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Select, Construct and Interpret appropriate drawing scale as per the situation.

CO2 : Draw simple curves like ellipse, cycloid and spiral.

CO3 : Draw Orthographic projections of points, lines and planes.

CO4 : Draw orthographic projection of solids like cylinders, cones, prisms and pyramids including sections.

CO5 : Layout development of solids for practical situations.

CO6 : Draw isometric projections of simple objects.

Introduction and letter writing. Construction and use of plain, diagonal and vernier scale. Methods of drawing ellipse, parabola and hyperbola. Methods of drawing cycloids, spirals. Orthographic projection and projection of points.

Projection of lines, projection of planes, projection of solids. Introduction of prism, pyramid, cylinder and cone.

Section of solids, introduction of intersection of surfaces. Development of plane and curved surface. Isometric projection.

Text Books / Reference

1. N.D. Bhatt. Elementary Engg. Drawing, Rupalee publication, Anand.
2. Lakshmi Narayan and Vaishwanar. A Text Book of Practical Geometry, Jain Brother, New Delhi.
3. R.B. Gupta. A Text Book of Engineering Drawing, SatryPrakashan, New Delhi.
4. Fundamentals of Technical Drawing, Parkinson.

BS 100P (BSC) ENGINEERING PHYSICS

Cr. Hrs. 3(2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Apply vector calculus approach to problems in electric field and magnetic field.

CO2 : Apply laws of physics to simple LRC circuits.

CO3 : Learn physics behind various types of lasers and their characteristics.

CO4 : Understand the interference and diffraction from wave optics concepts and know its applications.

CO5 : Understand polarization of light and its applications.

Unit-I

Electric Field: Line integral of electric field, Potential difference, Field as gradient of potential, Divergence of a vector function, Differential form of Gauss's law, Laplacian, Laplace equations, Curl of a vector function. Gauss's divergence theorem.

Magnetic Field: Curl and Divergence of a magnetic field, Magnetic scalar and vector potential.

Unit-II

Varying Field: Faraday's law-integral and differential form, Self and mutual inductance, Neumann's equation, Charge and discharge of a capacitor through register, Growth and decay of current in LR circuit, Energy stored in electric and magnetic field, Displacement current, Maxwell's equations.

Unit-III

Laser: Coherence, Einstein's coefficient, Spontaneous and stimulated emission, Population inversion, Laser gain (pumping), Spectral narrowing in laser, Coherence length, Ruby and He-Ne laser.

Interference: Division of amplitude, colour of thin films, Newton's ring, Febry-Perot interferometer-principle, operation, determination of wave length and difference in wave length.

Unit-IV

Diffraction: Double slit Fraunhoffer diffraction pattern, Fraunhoffer diffraction by a plane transmission grating, Formation of spectra.

Polarization: Analysis of linearly, circularly and elliptically polarized light (Half wave and quarter wave plates), Optical activity, specific rotations, Laurent's half shade polarimeter and its use for determination of specific rotation of sugar solution.

Practical

1. To find refractive index and dispersive power of material of prism by spectrometer.
2. To find wave length of light by Newton’s ring.
3. To find wave length of light by diffraction grating.
4. To find specific rotation of sugar solution by polarimeter.
5. To find wave length of light by Fresnel Biprism.
6. To find frequency of A.C. mains.
7. To determine dielectric constant of liquid using series resonance method.
8. To study charge and discharge of condenser through a resistor (C.R. Circuit).
9. To study LCR resonant circuit, resonance, quality factor and sharpness in (i) series circuit (ii) parallel circuit.

Text Books/References

1. K.K. Tiwari. (1995). Electricity and Magnetism, S. Chand and Company, New Delhi.
2. N. Subrahmanyam and Brijlal. (1993). A Text Book of Optics,

S. Chand and Company, New Delhi.

3. Ahmed and Lal. (1966). Electricity, Magnetism and Electronics, Unitech House, Lucknow.
4. D.S. Mathur. (1993). Mechanics, S. Chand and Company, New Delhi.
5. Gupta and Kumar. (1995). Practical Physics, Pragati Prakashan, Meerut.

CE 100 (ESC) ENGINEERING MECHANICS

Cr. Hrs. 3(2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of the course, the student will be able to:

CO1 : Draw free body diagrams and determine the resultant of forces and/or moments.

CO2 : Determine the centroid and second moment of area of sections.

CO3 : Apply laws of mechanics to determine efficiency of simple machines with consideration of friction.

CO4 : Analyse statically determinate planar frames.

CO5 : Analyse the motion and calculate trajectory characteristics.

CO6 : Apply Newton's laws and conservation laws to elastic collisions and motion of rigid bodies.

(A) STATICS

Unit-I

***Introduction of condition of equilibrium*:** Force, system of force, coplanar forces.

Moment and couples: Moment and parallel forces, Couples, General conditions of equilibrium

Practical Applications: Levers, Cracked levers, Steel yards. Sagging chains and toggle joints.

Centre of Gravity: Centre of parallel forces, C.G. in some simple cases, C.G. of Solids.

Moment of Inertia: Moment of inertia, Radius of gyration and perpendicular axis. Determination of moment of inertia of simple sections. Mass of moment of inertia.

Unit-II

Friction: Introduction, Critical angle of friction, Friction on horizontal planes, Friction on inclined planes, Wedge and block, Screw Jack

Machines: Introduction, Effects of friction, Loss of work, Reversible and irreversible machine, Law of machine, Wheel and axle, Differential wheel and axle, Pulley block, Screw jack, Single and double purchase crab, Worm and Worm wheel, System of pulleys.

Frames: Statically determinate plane frames, Method of joints, Method of sections.

(B) DYNAMICS

Unit-III

Rectilinear Motion: Motion under gravity, Projectiles equation of the path, Maximum height attained, Time of flight, Horizontal range. Angle of projection, Projectile from a given height, Projectile on an inclined plane, Problems.

Work, Power and Energy: Work, Power, Work done by torque, Energy, Law of conservation.

Unit-IV

Centripetal and centrifugal forces, Laws of motion: Newton's Law of motion and their explanation, Collision of elastic bodies; Impulse and impulsive force, Principle of conservation of momentum, Loss of kinetic energy during impact.

Practical

1. Verification of law of polygon of forces.
2. Verification of principle of moment in case of compound level.
3. Verification of principle of moment in case of bell crack level.
4. Determination of reaction in case simply supported beam with or without overhang.
5. To determine coefficient of friction between different surfaces on horizontal plane.
6. To determine coefficient of friction between different surfaces in inclined plane.
7. Study of different wheel and Axle.
8. Study of single purchase crab.
9. Study of worm and worm wheel.

10. Study of Weston's pulley block.
11. Determination of mechanical advantage, velocity ratio and efficiency of single purchase crab.
12. Determination of mechanical advantage, velocity ratio and efficiency of double purchase crab.
13. Determination of mechanical advantage, velocity ratio and efficiency of first system of pulley.
14. Determination of mechanical advantage, velocity ratio and efficiency of second system of pulleys.
15. Determination of mechanical advantage, velocity ratio and efficiency of third system of pulleys Flywheel.

Text Books / References

1. I.B. Prasad. Engineering Mechanics, Khanna Publisher, New Delhi.
2. R.S. Khurmi. Applied Mechanics, S. Chand & Company Ltd., New Delhi
3. S.B. Junnarkar. Applied Mechanics, Charotar Publishing House, New Delhi.
4. Saluja. Applied Mechanics, Satya Prakashan, New Delhi.

EE 100 (ESC) ELECTRICAL ENGINEERING

Cr. Hrs.	**4(3+0+1)**		
	L	**T**	**P**
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcome: At the end of the course, the student will be able to:

CO1 : Proficiency in solving DC network.

CO2 : Know-how of single phase AC circuits.

CO3 : Competency in solving three phase balanced AC circuits.

CO4 : Dexterity in using basic electrical instruments.

CO5 : Comprehension of transformer working principles.

Unit-I

Electro motive force, reluctance, laws of magnetic circuits, determination of ampere-turns for series and parallel magnetic circuits, hysteresis and eddy current losses.

Kirchoff's law, Delta-star and star-delta conversion, source conversion

Network theorems: Thevenin's, Norton's, superposition, and Maximum Power Transfer theorem.

Unit-II

Single Phase EMF generation, average and effective values of sinusoidal and linear periodic wave forms, instantaneous and average power, power factor, reactive & apparent power, solution of R-L-C- series, parrallel, series-parrallel circuits, complex representation of impedances, phasor diagram, series and parallel resonance.

Unit-III

Transformer*:* Faraday's laws of Electromagnetic induction, construction and principle operation of single phase transformer, EMF equation, voltage and current relationship and Phasor diagram for ideal transformer.

Fundamentals of DC machines: Working principle, operation and performance of DC machines (Motor and generator)

Unit-IV

Three phase A.C. circuits: Three phase EMF generation, delta and star connection, methods of three phase power measurement; power factor, reactive and apparent power, Series and parallel resonance.

Concept of Three phase induction motor: construction and operation. Basic introduction of single phase induction motor.

Practical

1. To Establish the Voltage-Current Relationship in an Electric Circuit and to Measure the Unknown Resistance by Ammeter-Voltmeter Method (Ohm's Law).
2. Experimentally Verify the Number of Resistance Connected in Series and parallel in an Electric Circuit can be replaced by in Equivalent Resistance without Disturbing the Circuit Condition.
3. Verify Kirchhoff's Current Law and voltage law for a DC Circuit.
4. Verify Superposition Theorem For A DC Circuit.

5. Verify Thevenin's Theorem for a Dc Circuit.
6. To Measure Power and power factor in a Single Phase A.C. Series R-L Circuit.
7. Determination of Choke Coil Parameter Resistance (R) and Inductance (L).
8. To Study The Characteristics of an L-C-R Series Circuit.
9. Testing of Single Phase Energy Meter by Direct Loading Method.
10. Determination of Percentage Regulation of a Single Phase Transformer by Direct Loading Method.
11. Determination of Efficiency of a Single Phase Transformer By Direct Loading Method
12. To perform open circuit and short circuit test for single phase transformer
13. To obtain load characteristics of D.C. shunt/series /compound generator
14. To perform no-load & blocked –rotor tests on 3 ph. Induction motor to obtain equivalent circuit parameters
15. To perform no load & blocked –rotor test on 1 ph. induction motor & to determine the parameters of equivalent circuit.

Text Books / References

1. B.L. Therja. Electrical Technology, S. Chand.
2. M.E. Van Valkenberg. Network analysis, PH.I
3. Soni and Gupta. Introduction to Electrical Network Theory, Dhanpat Rai Publisher.
4. Dr. R.A. Gupta and Dr. Nikhal Gupta. (2002). Fundamentals of electrical & Electronics Engineering, JPH.
5. H.P. Tiwari. (2002). Electrical & Electronics Engineering, College Book Centre, Jaipur.
6. J. B. Gupta. (2002). Fundamentals of Electrical & Electronics. S.K. Kataria and Sons. Dehli.

REE 100 (HSM)
ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT

Cr. Hrs. 2(2+0+ 0)

	L	T	P
Credit	**2**	**0**	**0**
Hours	**2**	**0**	**0**

Course Outcome: At the end of the course, the student will be able to:

CO1 : Develop an understanding of different natural resources including renewable resources.

CO2 : Realize the importance of ecosystem and biodiversity for maintaining ecological balance.

CO3 : Develop an understanding of environmental pollutions and hazards due to engineering/technological activities and general measures to control them.

CO4 : Demonstrate an appreciation for need for sustainable development and role of science.

CO5 : Aware of important acts and laws in respect of environment.

Unit-I

Environmental Studies: Definition, scope and importance. Natural Resources: Renewable and non-renewable resources and associated problems.

Forest resources: Use and over-exploitation. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects. Food resources: World food problems, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources.

Unit-II

Ecosystems: Concept, Structure and function. Energy flow in an ecosystem. Ecological succession, Food chains, food webs and

ecological pyramids. Introduction, types, characteristic features, structure and function of the various ecosystems.

Biodiversity and its conservation: Introduction, definition, genetic species & ecosystem diversity and biogeographical classification of India.

Value of biodiversity. Biodiversity at global, national and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation.

Unit-III

Environmental Pollution: definition, cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards.

Solid Waste Management: causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Social Issues and the Environment: Urban problems related to energy; Water conservation, rain water harvesting, watershed management.

Environmental ethics: Issues and possible solutions; Wasteland reclamation, Consumerism and waste products. Environment Protection Act.

Issues involved in enforcement of environmental legislation. Public awareness, Human Population and the Environment: population growth, Family Welfare Programme.

Environment and human health: Human Rights, Value Education, HIV/AIDS, Women and Child Welfare.

Role of Information Technology in Environment and human health.

Unit-IV

Natural Disasters: Meaning and nature, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Climatic change: global warming, Sea level rise, ozone depletion.

Man Made Disasters: Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, accidents.

Disaster Management: Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept

of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Armed forces in disaster response; Disaster response; Police and other organizations.

Text Books / References

1. Agarwal K.C., Environmental Biology, Nidi Publications, Bikaner, 2001.
2. Bharucha Erach. 2005. Text Book of Environmental Studies for Undergraduate Courses, University Grants Commission, University Press, Hyderabad.
3. Chary Manohar and Jaya Ram Reddy. 2004. Principles of Environmental Studies, BS Publishers, Hyderabad.
4. Chaudhary, B.L. and Jitendra Pandey: Environmental Studies, Apex Publishing House, Udaipur, 2005
5. Climate Change.1995: Adaptation and mitigation of climate change-Scientific Technical Analysis Cambridge University Press, Cambridge.
6. Gupta P.K. 2004, Methods in Environmental Analysis – Water. Soil and Air. Agro bios, Jodhpur.
7. Husain Majid. 2013, Environment and Ecology: Biodiversity, Climate Change and Disaster Management, online book.
8. Jhadav, H. & Bhosale, V.M.: Environmental Protection & Laws, Himalaya Pub. House, Delhi
9. Kaul S.N., Ashuthosh Gautam. 2002. Water and Waste Water Analysis, Days Publishing House, Delhi.
10. Rao, M.N. and A.K. Datta, Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd.
11. Sharma J.P. 2003, Introduction to Environment Science, Lakshmi Publications.
12. Sharma, B.K., Environmental Chemistry, Goel Publishing House, Meerut
13. Sharma, R.K. & Sharma, G. 2005, Natural Disaster, APH Publishing Corporation, New Delhi.
14. Singh Pratap, N.S. Rathore and A.N. Mathur: Environmental Studies, Himanshu Publications, Udaipur, 2004.
15. Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno Science Publications.

BS 100C (BSC) ENGINEERING CHEMISTRY

Cr.Hrs. 3(2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of the course, the student will be able to:

CO1: Demonstrate knowledge of science behind common impurities in water and methods to treat them.

CO2 : Describe the purpose and operational steps of key water treatment processes used to improve water quality including: Coagulation, Sedimentation, Filtration, Disinfection, Corrosion Control, Taste and Odour Control

CO3 : Know the methods to determine the calorific value of fuels, perform flue gas analysis and combustion analysis.

CO4 : Apply the science for understanding corrosion and its prevention.

CO5 : Apply the knowledge of Kinetics of Reactions

Unit- I

Sources of water, common impurities, requisites of drinking water in municipal water supply. Purification of water, sterilization, break point chlorination. Hardness, determination of hardness by Complex metric (EDTA) method, degree of hardness, Boiler troubles, carry over corrosion, Sludge and scale formation. Caustic embrittlement, cause of boiler troubles and their prevention.

Unit- II

Classification of fuels, solid fuels, Proximate and Ultimate analysis of coal, significance of constituents, theoretical method for calculation of Gross and net calorific values. Liquid fuels- Petroleum origin, Refining of Petroleum, knocking, octane number, anti knocking agents . Flue gas analysis by Orsat Apparatus, Calculations based on combustion.

Unit- III

Corrosion and its control: Definition and significance of corrosion, Mechanism of chemical (dry) and electrochemical (wet) corrosion, galvanic corrosion, concentration corrosion and pitting corrosion.

Protection from corrosion; protective coatings-galvanization and tinning, cathodic protection, sacrificial anode and modifications in design.

Unit- IV

Chemical Kinetics-Order and Molecularity of reaction, first and second order reaction, Derivation of equations for first and second order reaction, determination of order of reaction, Energy of activation and Arrhenius equations, Numerical of first and second order reactions.

Practical

1. Determination of viscosity of a liquid.
2. Estimation of free chlorine in a water sample.
3. Determination of temporary and permanent hardness by EDTA method.
4. Determination of Copper Sulphate iodometrically.
5. Estimation of Potassium dichromate iodometrically.
6. Determination of purity of Ferrous Ammonium Sulphate (Mohr's Salt) using Potassium Permanganate.
7. Estimation of available chlorine in Bleaching Powder sample.
8. Analysis of Brass.
9. Determination of Strength of Ferrous Ammonium Sulphate (FAS) using Potassium Ferricyanide as an external indicator.
10. Analysis of Common Salt.

Text Books / References

1. Jain and Jain. Engineering Chemistry, Dhanpat Rai Publishing Company(P) Ltd., New Delhi.
2. Jain and Gupta. A Text Book of Engineering Chemistry,Jaipur Publishing House,Jaipur
3. B.K. Sharma. Engg. Chemistry(General), Krishna Prakashan Media (P) Ltd., Merrut.
4. S.S. Dara. A Text Book of Engineering Chemistry, S.Chand & Co., New Delhi.
5. M.M. Uppal. A Text Book of Engineering Chemistry,Khanna Publishers, New Delhi.
6. S.S. Dara. A Text Book on Experiments and Calculations in Engg.Chem. S.Chand & Co., New Delhi.
7. Ameta and Yasmin. Practical Engineering Chemistry, Himanshu Publications, New Delhi

EC100 (ESC) ELECTRONICS AND INSTRUMENTATION

Cr.Hrs. 3(2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcomes : At the end of course, the students will be able to

CO1 : Analyze characteristics of various passive components (such as diode, LED, BJT, JFET etc.) commonly used in electronic devices.

CO2 : Understand basics of power amplifier and voltage regulators.

CO3 : Conceptualize feedback amplifier and different types of oscillator.

CO4 : Demonstrate functioning of basic electronic instruments (CRO, transducers etc.).

Unit-I

Passive Components: Construction and characteristics of various types of resistors, capacitors & inductors for electronic circuits, color coding of resistors. Semiconductor Devices: Basic theory of semiconductors, constructions and characteristics of PN diode, Zener diode, photodiode, LED, BJT & JFET.

Unit-II

Bipolar Junction Transistor: Introduction to BJT biasing circuits, Basic concept of class-A, class-B, class-AB, class-C amplifiers.

Power supply: Rectifier circuits and filters. Concept of voltage regulators, Zener diode voltage regulators, Transistor series regulator.

Unit-III

Feedback & Oscilloscopes: Concept of positive and negative feedback. Introduction to Oscilloscope. Barkhausen criteria. Working principle of RC- phase shift, Wien bridge, Hartley, Colpitts and Crystal Oscilloscopes.

Unit-IV

Transducers: Active and Passive transducers. Working principle of Thermocouple, LVDT, Strain Gauge and Tacho Generator. Instrumentation: Introduction to data acquisition system. Working

principle of Electronic Multimeter, Cathode Ray Oscilloscope, Digital Storage Oscilloscope and Spectrum Analyzer.

Practical

1. Identification and testing of different types of passive and active electronic components: Resistors, Capacitors, Inductors, Diodes, Transistors.
2. Plot the V-I characteristics in forward and reverse bias mode for
   (a) PN junction diode
   (b) ZENER diode and find the cut- in and breakdown voltage respectively.
3. Plot the V-I characteristics of LED diode in forward bias mode and find the glow voltage.
4. Determine the R.M.S value of output voltage and check the waveform on CRO for:
   (a) Half wave rectifier with and without filter.
   (b) Full wave centre tapped rectifier with and without filter.
   (c) Full wave bridge rectifier with and without filter.
5. Plot the input and output characteristics for two configurations of transistors:
   (a) NPN/PNP transistor in CE configuration.
   (b) NPN/PNP transistor in CB configuration.
6. Determine both theoretically and practically the frequency of oscillation for R-C Phase shift Oscilloscope.
7. Determine the output voltage of an amplifier: (a) with feedback (b) without feedback.
8. Study and perform basic measurement of Digital Multi Meter.
9. Study and perform basic measurement of Cathode Ray Oscilloscope/ Digital Storage Oscilloscope.
10. Study of Spectrum Analyzer and perform basic measurements.

NOTE: *The actual number of experiments may be more than the above mentioned list.*

Text Books / References

1. Millman and Halkias. Integrated electronics: Mc Grew Hill
2. W.D Cooper. Electronics Instrumentation and Measurement : PHI
3. M.L.Gupta. Electrical Engineering Materials
4. Melvin,o Principles of Electronics
5. John D. Ryder. Electronics Fundamentals

CS 100 (ESC)
COMPUTER PROGRAMMING FOR PROBLEM SOLVING

Cr. Hrs.	**3(0+1+2)**		
	L	**T**	**P**
Credit	**0**	**1**	**2**
Hours	**0**	**1**	**4**

Course outcome: At the end of the course, the student will be able to:

CO1 : Design, implement, test, debug, and document programs in C using conditional branching and iteration.

CO2 : To use arrays, understand how to write and use functions, how the stack is used to implement function calls, and parameter passing options

CO3 : Implement recursion functions & use of pointers and structures to formulate programs.

CO4 : To be able to create, read and write to/from files and to write simple searching and sorting algorithms

Unit I

Introduction to Programming, Algorithm, Flowchart, Arithmetic expressions and precedence: The Character set, constants, variables and keywords, data types, Type Conversion, Hierarchy of Operations, Conditional Branching: The if Statement, if-else Statement, Nested if-else, Ladder if-else, The Conditional Operators. Loops: While Loop, do-while loop, for Loop, Nesting of Loops, Multiple Initializations in for Loop, break Statement, continue Statement, Decisions using switch, Go to Keyword, finding roots of an equations.

Unit II

Arrays: Array Initialization, Bounds Checking, One and Two Dimensional Arrays, Memory Map of a 2-Dimensional Array, Strings: String Functions-strlen( ), strcpy( ), strcat( ), strcmp( ), Two-Dimensional Array of Characters. Function: Function Declaration and Prototypes, Parameter passing in functions: Call by Value and Call by Reference, Passing Array Elements to a Function, Passing an entire Array to a Function.

Unit III

Recursion: Recursion such as Finding Factorial, Fibonacci series, Ackerman function etc. Structures: Declaring a Structure, Array of Structures. Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures

Unit IV

File handling: create, open, insert, update, search and display operations. Basic Algorithms: Searching: linear & binary, Basic Sorting Algorithms (Bubble, Quick sort and Merge sort), Notion of linked list.

Text books / References

1. "Let us C", Yashwant Kanetkar, Allied Publishers.
2. "The C programming language", Kernighan and Ritchie, Prentice Hall of India.
3. "Programming in ANSI C", E. Balaguruswamy, Tata McGraw Hill.

BS100E (HSM) COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

Cr. Hrs. 3 (2 + 0 +1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of the course, students will be able to:

CO1 : Understand basic grammar principles, and apply them to synthesise and transform sentences and identify common errors in writing

CO2 : Demonstrate enhanced communicative ability in English, and develop sensitivity to cultural differences in communication

CO3 : Write structured paragraphs and essays, CVs, letters and professional emails

CO4 : Understand their personality type, develop leadership qualities and time-management techniques

CO5 : Understand the process and types of communication and the barriers to effective communication

CO6 : Show improved vocabulary and pronunciation

CO7 : Practice skills required for oral presentations, group discussions and interviews

Unit-I

Sentence and its types, Parts of Speech, Articles, Tenses, Concord, Modals, Narration and Voice.

Unit-II

Nissim Ezekiel – Goodbye Party for Miss Pushpa T.S. – Poem (Introduction to Indianisms and Difference between Indian English and Standard English).

George Orwell – Politics and the English Language – Essay (Writing process and what constitutes good or bad writing; rules of writing for effective communication).

Unit-III

C.V and Resume Writing, Letter Writing, E-mail Writing, Paragraph Writing (Topic sentence, inductive and deductive logic), Essay Writing (Narrative, Descriptive, Expository and Persuasive).

Unit-IV

Personality Traits (Big Five Model), *Skills of a Good Leader,* Effective Time Management Techniques, Communication: Process and Types (Verbal/Non-Verbal/Para-Verbal, Intrapersonal/Interpersonal, Upward/ Downward/Horizontal/Diagonal), Barriers to Effective Communication.

Practical (Language Lab)

Phonetics, Group Discussions, Mock Interviews, Presentations, Vocabulary Building (Synonyms, Antonyms, One-Word Substitutes, Idioms and Phrases), Listening Comprehension, Everyday Conversations.

Text books / References

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan. 2007
3. High School English Grammar and Composition. Wren and Martin. S. Chand. 2018
4. On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
6. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.

7. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.
8. The Ultimate Book of Common Errors. Terry O'Brien. Rupa Publications. 2015.
9. Technical Writing for Engineers and Scientists. Barry J. Rosenberg. Addison-Wesley Professional. 2005.
10. Spoken English: A Manual of Speech and Phonetics. R.K. Bansal & J.B. Harrison. Orient Longman. 2013.
11. English Phonetics & Phonology: A Practical Course. P. Roach. Cambridge University Press, London. 2010.
12. Handbook of the International Phonetic Association: A Guide to the Use of the International Phonetic Alphabet. Cambridge University Press.
13. Communicating Your Way to Success: The Success Stories. Dale Carnegie. Manjul Publishing House. 2018.
14. Talk like TED: The Public-Speaking Secrets of the World's Top Minds. Carmine Gallo. St. Martin's Press. 2014.
15. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success. Gopalaswamy Ramesh and Mahadevan Ramesh. Pearson Education. 2013.

FIRST YEAR B.TECH. (II SEMESTER)

BS121 (BSC) MATHEMATICS – II

Cr. Hrs. 3(2+1+0)

	L	T	P
Credit	**2**	**1**	**0**
Hours	**2**	**1**	**0**

Course Outcome: At the end of the course, the student will be able to:

CO1 : Show knowledge of vector calculus and its applications in engineering.

CO2 : Solve second order differential equations for application in their field of engineering.

CO3 : Solve partial differential equations of first order and higher orders (with constant coefficients).

CO4 : Solve simultaneous equations by matrix methods.

CO5 : Determine eigenvalues and eigenvectors.

CO6 : Diagonalise a matrix and invert a matrix.

Unit-I

Vectors Calculus: Scalar and Vector field, Differentiation of vector functions, Gradient, Divergence, Curl and Differential Operator, Integration of vector functions, Line, Surface and volume Integrals, Green's Theorem in a Plane, Gauss's and Stoke's Theorem (without proof) and their Applications.

Unit-II

Differential Equations: Second Order Ordinary Differential Equations with Variables Coefficients, Exact Forms, Part of Complimentary Function is known, Change of Dependent Variable, Change of Independent Variable, Normal Forms, Method of Variation of Parameter.

Unit-III

Partial Differential Equations: Formation of partial differential equations, Partial Differential Equations of First Order, Lagrange's Form, Standard Forms Higher order linear partial differential equations with constant coefficients.

Unit-IV

Matrices: Rank of a matrix, Inverse of a matrix by elementary transformations, Consistency and Solution of simultaneous linear equations, Eigen values and Eigen vectors, Cayley-Hamilton theorem (without proof), Diagonalization of matrix.

Text Books / References

1. Guar, Y.N. and Koul, C.L.(2013), *Engineering Mathematics,* Vols I and ll, Jaipur Publishing house.
2. Bansal, J.L. and Dhami, H.S.(2012), *Differential Equation* Vols I and ll, Jaipur Publishing house.
3. Babu Ram (2011), *Engineering Mathematics –I* , Pearson Education India.
4. B. V. Ramana (2012), *Heigher Engineering Mathematics*, Tata McGrew Hill, India.
5. M. Ray and Chaturvedi*, A text book of Differential Equation*, Student Friend & Co. Publisher, Agra.
6. Rao V. Dukkipati (2012), *Engineering Mathematics*, New Age International (p) Ltd., New Delhi.
7. Gupta C.B., Malik A.K., *Engineering Mathematics –II,* New Age international Publisher.

CE 122 (ESC) CIVIL ENGINEERING

Cr. Hrs. 2(1+0+1)

	L	T	P
Credit	**1**	**0**	**1**
Hours	**1**	**0**	**2**

Course Outcome: At the end of the course, the student will be able to:

CO1 : Demonstrate knowledge of various surveying methods.

CO2 : Conduct a compass survey.

CO3 : Conduct levelling survey and be able to do RL calculations.

CO4 : Demonstrate knowledge of properties of various building materials.

CO5 : Plot work profile.

(A) SURVEYING AND LEVELING

Unit-I

Principle and purpose of plane surveying.

Introduction of Chain Surveying: Instrument for chaining, Direct & indirect ranging. Introduction of laser based distance measurement

Compass Surveying: True & Magneticmeridian, whole circle bearing &quadrantal bearing system, construction & use of Prismatic & Surveyor Compass, Local attraction.

Introduction of plane table Surveying: Accessories and working operation.

Unit-II

Level and leveling: Definition of various terms used in leveling. Types of Bench mark and their uses. Construction and use of Dumpy level, Leveling staves. Temporary adjustment of Dumpy level. Simple, differential leveling, fly leveling, longitudinal and cross sectioning, plotting of profile leveling. Determination of level by line of collimation and rise and fall method, Arithmetical checks. Level book and record keeping, leveling difficulties and errors in leveling.

(B) BUILDING MATERIAL

Unit-III

Stones: Different types, properties of good building stones, common testing of stones, Dressing of stones and use of stones in construction.

Bricks: Types, raw materials, identification, composition. Properties and uses of ordinary bricks, fire resistant and chemical resistant bricks.

Limes: Definition, sources of lime, slaking of lime, ISI classification of lime.

Unit-IV

Cement: Chemical composition, types of cement, properties, uses and tests on cement.

Mortars: Proportioning, properties of ingredients and use of lime, cement and gauge mortars.

Cement Concrete: Ingredients, common proportions, properties of fresh hardened concrete, Water cement ratio, curing and compaction of concrete.

Timber: Properties of good quality timber. Decay and preservation of timber.

Practical

1. Study of accessories used in measurement of distances.
2. Ranging Direct and indirect and use of chain and tape.
3. Study of prismatic compass and taking bearings..
4. Study of Dumpy level, temporary adjustment and R.L. calculations.
5. Simply and differential leveling operation, record in level book, practice for staff reading line of collimation and Rise and fall method calculations.
6. Longitudinal sectioning.
7. Cross sectioning.
8. Fly leveling operation.
9. Plotting of working profile.
10. Introduction of laser based distance measurement.
11. Properties of good quality bricks.
12. Properties of good quality stone.
13. Properties of good quality timber.
14. Physical test of cement.

Text Books / References

1. S.C. Rangwala. Engineering Materials, Charotar Book Stall, Anand.
2. B.C. Punmiya. Surveying & Field Work (Vol. I), Laxmi Publications, New Delhi.
3. Kanetkar T. P., 'Surveying and leveling', Vol. I & II.
4. Duggal S. K., 'Text book-Surveying', Vol. I & II.

ME123 (ESC) MECHANICAL DRAWING

Cr. Hrs. 1(0+0+1)

	L	T	P
Credit	0	0	1
Hours	0	0	2

Course Outcomes: Upon completion of this course the students will be able to:

CO1: Demonstrate knowledge of conventional representation employed in machine drawing.

CO2: Make detailed drawings of simple machine parts in first/third angle projection by proper choice of sectioned views as per need.

CO3 Read, interpret and visualize machine parts from a given drawing.

CO4: Demonstrate knowledge of riveted, welded, threaded and screwed joints and fastenings.

Introduction, conventional representation of different materials used in machine drawing, Introduction to BIS codes.

Orthographic Projection: First and third angle methods of projection. Preparation of working drawing from models and isometric views. Drawing of missing views.

Dimensioning: Different methods of dimensioning.

Sectional Views: Concept of sectioning. Revolved and oblique section. Sectional drawing of simple machine parts

Riveted and Welded Joints: Types of rivet heads and riveted joints. Processes for producing leak proof joints. Symbols for different types of welded joints.

Screw Fastenings: Nomenclature, thread profiles, multistart threads, left and right hand threads. Square headed and hexagonal nuts and bolts. Conventional representation of threads. Different types of lock nuts, studs, machine screws, cap screws and wood screws. Foundation bolts.

Different types of joints: Knuckle joint, cotter joint and universal joint.

Text Books / References

1. N. D. Bhatt. Machine Drawing, Charotar Book Stall, Anand.
2. V. Laxminarayan and ML Mathur. A Text Book of Machine Drawing, Jain Brothers, New Delhi.
3. P. S. Gill. Machine Drawing, S. K. Kataria & Sons, New Delhi.

ME124 (ESC) WORKSHOP TECHNOLOGY

Cr. Hrs. 3(2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcomes: Upon completion of this course the students will be able to:

CO1: Understand welding principles, equipment and tools of arc-, gas and resistance welding, brazing and soldering.

CO2: Describe construction, operations and tools of lathe, shaper and drilling machines.

CO3 Understand basic hot and cold forming operations.

CO4: Demonstrate knowledge of types of patterns, cores, moulding sands and tools.

CO5: Understand sand, permanent mould and investments castings and casting defects.

Unit I

Welding: Introduction to types of welding. Principle of electric arc welding, welding tools and safety devices, welding positions, welding joints, types of welds, Resistance welding. Oxyacetylene gas welding, types of flames. Soldering and Brazing.

Unit II

Lathes: Constructional details of centre lathe. Main operations and tools used on centre lathes.

Shaper: Types of shapers. Constructional details of standard shaper, shaper tools and main operations.

Unit III

Drilling Machines: Types of drilling machines. Constructional details of pillar type and radial drilling machines. Main operations. Twist drills, drill angles and sizes.

Forming: Basic descriptions and applications of hot and cold working processes, forging, bending, shearing, drawing and forming operations.

Measurement and Inspection: Classification of measuring instruments, linear and angular measurement, comparators.

Unit IV

Foundry & Casting Practices: Introduction, types of patterns, Mouldings, moulding materials, cores, moulding tools and equipments. Moulding sands, properties of moulding sands. Casting defects. Casting methods: Permanent mould casting, investment casting.

Practical

Practical exercises on welding, pattern making, foundry and machining operations.

Text Books / References

1. Mathur Mehta and Tiwari: Elements of Mechanical Engineering, Jain Brothers, New Delhi.
2. S.K. Hajra Choudhury and A.K. Hajra Choudhury: Elements of Workshop Technology (Vol. I and II), Media promoters & Publishers Pvt. Ltd., Bombay.

III SEMESTER

BS231 (BSC) MATHEMATICS – III

Cr. Hrs. 3 (2 + 1 + 0)

	L	T	P
Credit	**2**	**1**	**0**
Hours	**2**	**1**	**0**

Course Outcome: At the end of the course, the student will be able to:

CO1 : Understand Finite differences, various difference operators and their relationships, factorial notation.

CO2 : Use numerical methods in modern scientific computing.

CO3 : Find the Inverse Laplace Transform by Partial Fractions.

CO4 : Use the Laplace Transform to solve differential equation with constant coefficients.

CO5 : Numerically integrate any function by Trapezoidal and Simpson's rule.

Unit-I

Interpolation: Finite differences, various difference operators and their relationships, factorial notation, Interpolation with equal intervals, Newton's forward and backward interpolation formulae, Lagrange's interpolation formula for unequal intervals.

Unit-II

Gauss forward and backward interpolation formulae, Stirling's and Bessel's central difference interpolation formulae.

Numerical Differentiation: Numerical differentiation based on Newton's forward and backward, Gauss forward and backward interpolation formulae.

Unit-III

Numerical Integration: Numerical integration by Trapezoidal, Simpson's rule.

Numerical Solutions of Ordinary Differential Equations: Picard's method, Taylor's series method, Euler's method, modified Euler's method, Runge-Kutta methods.

Unit-IV

Laplace Transform: Laplace transforms of elementary functions, Basic properties of Laplace transform, Initial value theorem, final value theorem and convolution property of Laplace transform, Inverse Laplace transforms, Applications of Laplace transform to solve ordinary differential equations.

Text Book/ References

1. H.C. Saxena, *Text Book of Finite Differences and Numerical Analysis*, S. Chand and Co.
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, *Numerical Methods for Scientific and Engineering computation*, New Age International (P) Ltd.
3. N.P. Bali and Manish Goyal, *A Text book of Engineering Mathematics*, Laxmi Publication Pvt. Ltd., New Delhi (VII Edition).
4. S.P. Goyal and A.K. Goyal, *Integral Transforms*, Jaipur Publishing House, Jaipur.
5. Bansal, Bhargava, *Numerical Analysis*, JPH, Jaipur.

BS232 (HSM) HUMAN VALUES

Cr. Hrs. 2 (2 + 0 + 0)

	L	T	P
Credit	**2**	**0**	**0**
Hours	**2**	**0**	**0**

Course Outcomes: At the end of the course, the students will be able to:

CO1 : Distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.

CO2 : Engage in a process of self-reflection and know what they 'really want to be' in their life and profession

CO3 : Understand the meaning of happiness and prosperity for a human being.

CO4 : Understand harmony at all the levels of human living, and live accordingly.

CO5 : Apply the understanding of harmony in existence in their profession, develop commitment and courage to act in order to lead an ethical life

Unit-I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Understanding the need, basic guidelines, content and process for value education; Self Exploration - content and process; 'Natural Acceptance' and Experiential Validation; Continuous Happiness and Prosperity with respect to Human Aspirations; Method to fulfil human aspirations: understanding and living in harmony at various levels

Unit-II

Understanding Harmony in the Human Beings and their Relationships - Harmony in Myself, Family and Society

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'; Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha; Understanding the Body as an instrument of 'I' ,Understanding the characteristics and activities of 'I' and harmony in 'I'; Understanding the harmony of I with the Body: Sanyam and Swasthya;

Understanding harmony in the Family; Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman);

Understanding harmony in the society , Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family

Unit-III

Understanding Harmony in Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature; Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature; Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all pervasive Space; Holistic perception of harmony at all levels of existence

Unit-IV

Implications of the above - Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values; Definitiveness of Ethical Human Conduct; Basis for Humanistic Education, Humanistic Constitution and

Humanistic Universal Order; Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, and develop appropriate technologies and management models; Strategy for transition from the present state to Universal Human Order at the level of individual and society

Note: In each unit, relevant practice exercises and case studies to be taken up. Mode of conduct should be through group discussions.

Text Books/ References

1. R R Gaur, R Sangal, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, Excel Books, 2009. ISBN: 978-9-350-62091-5.
2. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
3. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
4. Annie Leonard, 2010, The Story of Stuff, Free Press
5. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
6. R. Subramanian, Professional Ethics includes Human Values, Oxford Univ. Press.
7. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
9. A Nagraj, 1998, Jeevan Vidya: Ek Parichay, Divya Path Sansthan, Amarkantak.
10. A N Tripathy, 2003, Human Values, New Age International Publishers.
11. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
12. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.

13. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co.

14. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

CS 233 (ESC)-OBJECT ORIENTED PROGRAMMING WITH C++

Cr. Hrs. 3(2+0 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcomes: Students will be able to

CO1: Modularize computing problems into classes, objects and functions for implementing OOPs concepts.

CO2: Design, develop and analyze C++ programs with various concepts and constructs of OOP such as constructors, destructors, polymorphism, inheritance etc.

CO3: Demonstrate the ability to model simple data structures like arrays, strings, linked lists etc. with efficiency using suitable memory allocation concepts.

CO4: Apply various advance features of C++ such as exception handling, templates, built-in Standard Template Library, I/O streams etc. for making the program more organized, reusable and user-friendly

Unit-I

Concept of Object Oriented Programming, Objects Classes, Encapsulation, Inheritance, and Polymorphism. C/C++. C++ core language. Program structure, Functions. Primitive Data types, Variables, Header and Pre-Processor Directives, cin, cout, iomanip.h. for, while, do-while loops, if, if-else, nested if-else, switch, logical and, or and not operators, break, continue, goto and exit statements, functions, declarations, definitions, returns, Parameters by values by reference,

default arguments, Inline functions, Automatic, external, static, variables. Const function arguments. Structures, Defining, Accessing Members, Structure within Structure, Class, Classes and Objects, Objects as Data Types.

Unit-II

Constructors, Overloading, Copy Constructors, Objects and Memory allocations, const and Classes, Objects as Arguments to functions. Arrays and Strings, Arrays as parameters to functions, C++ String class, Operator

Overloading: Arithmetic, Logical, Assignment. Pointers, pointer to void, pointers and arrays, pointers and functions, new and delete operators, pointers to objects, Array of pointers to objects, A Linked List example, Pointers to pointers.

Unit-III

Inheritance, Derived class and base classes, Derived class constructors, Overriding member functions, Class Hierarchies, Multiple Inheritances. Virtual Functions, Friend Functions, Static functions, Dynamic Type Information.

Unit-IV

ios, istream, ostream, iostream classes, stream errors, Disk I./O with streams, file pointers, overloading cin, cout operators, multi file programs and projects, Exceptions, Exceptions with arguments, Templates, Linked

List using templates.

LIST OF PRACTICAL EXPERIMENTS

Based on theory

Text Books/References

1 Bjarne Stroustrup. The C++ Programming Language, Addison-Wesley, Third Edition.

2 Robert Lafore. Object Oriented Programming with C++,Techmedia Publications.

EE 234 (ESC) - NETWORK ANALYSIS

Cr. Hrs. 3 (3+0+ 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Appreciate the electrical network theorems and apply Laplace transform for steady state and transient state analysis.

CO2: Conceptualize Non sinusoidal input responses and understand the notion of coupling circuits.

CO3: Apprehend Z, Y, T, H parameters to define the weight of the circuit.

CO4: Compute network functions and analyze the synthesis of RL & RC circuits.

Unit-I

Network Theorems: Thevenin's, Norton's, reciprocity, Superposition, Compensation, Miller's Tellegen's and maximum power transfer theorems. Network with dependent sources.

Transient Analysis: Impulse, step, ramp and sinusoidal response Analysis of first order and second order circuits. Time domain & transform domain (frequency, Laplace) analysis. Initial and final value theorems.

Unit-II

Linear Network Response To Non-Sinusoidal Inputs: Complex periodic waves and their analysis by Fourier analysis. Different kind of symmetry. Power in circuit.

Coupling Elements & Coupled Circuits: Conductively coupled circuits. Inductively coupled circuits-mutual inductance, coefficient of coupling and mutual. Inductance between portions of same circuits and between parallel branches. Transformer equivalent. Inductively and conductively coupled circuits.

Unit-III

Two Port Networks: Two port; parameters and their interrelations - z-parameters, y-parameters, h-parameters, ABCD parameters. Equivalence of two ports, transformer equivalent, interconnection of two port network. Image parameters Attenuation & phase shift in symmetrical T and networks.

Unit-IV

Network Functions: Terminals and terminal pair, driving point impedance transfer functions, poles and zeros. Procedure of Finding network functions for general two terminal pair networks. Stability & causality.

Network Synthesis: Hurwitz polynomial, positive real function, RL & RC networks synthesis, Foster First & Second form, Cauer forms.

Text Books/References

1 Kuo, F Franklin. Netwrok analysis and sysnthesis, II Ed, 1999, Jhon Wiley & sons

2 C. Desoer and E.S.E.S. Duh. Basic circuit theory, Mc Graw Hill.

3 M.E Van Valkenburg. Network Analysi, Prentice Hall, India.

4 Schaum's Outling series on circuit analysis.

5 W. Hayt and Kinmmerly. Engineering circuit analysis, Mc Graw Hill, Inc.

6 A. Sudhakar and Mohan S.P. Chyam. Circuits and Networks, Tata Mc Graw Hill. India

7 K. Lata Parag. Practical Digital Logic Design and Testing - PHI.

8 Sandise. Modern Digital Design - MGH.

9 Kohavi. Switching and Automata Theory.

EC 235 (PCC) –DIGITAL ELECTRONICS

Cr. Hrs. 4 (3+0 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcome: The student will be able to

CO1: Understand minimization using K-map.

CO2: Design and analyze various combinational logic circuits.

CO3: Design and analyze various sequential circuits.

CO4: Appreciate the concept finite state machine and static timing analysis.

Unit-I

Number System & Codes: Introduction to Logic Family, Radix and Radix conversion, Sign, magnitude and complement notation, Binary codes, Fixed and floating point arithmetic, BCD addition and subtraction. Boolean Algebra And Digital Logic Gates: Introduction to Boolean algebra, postulates of Boolean algebra, Theorems of Boolean algebra, Logic Gates, their block diagrams and truth tables, Boolean functions, POS (product of sums) /SOP (sum of products) representation, Don't care conditions, Simplification using K-Map 5 variables, Prime Implicants, NAND and NOR implementation of functions and Quine-Mccluskey method.

Unit-II

Combinational Systems: Introduction to Combinational logic circuit design, Full adder, Subtractor, Binary, serial and parallel adders, Magnitude comparator BCD adder, BCD to 7-segment Decoder, Multiplexer, De-multiplexer, Encoder, Design of logic circuits by Multiplexers, Encoder, Decoders, and De-multiplexer.

Unit-III

Sequential Systems: Latches, flip flops, R-S, D, J-K, T, Master Slave flip flops, Conversion of flip- flops, Asynchronous (ripple), Synchronous decade counter, Modulus counter, skipping state counter, counter design, Ring counter, Counter applications, Registers, buffer registers, shift register.

Unit-IV

Finite State Machines: Mealy and Moore Model, Finite state machine design, state minimization, state assignment, Data Converters: Sample and Hold circuits, A/D and D/A converters, Static Timing Analysis.

LIST OF PRACTICAL EXPERIMENTS

1 Design a circuit for gray to excess-3 code conversion and vice-versa.

2 Design a circuit for BCD to excess-3 code conversion and vice-versa.

3 Design the following basic logic gates with the help of NAND and NOR gates on bread board: AND, OR and NOT.

4 Design XOR and XNOR gates with the help of NAND gates.

5 Design the following combinational logic circuits and verify their truth tables: Half Adder and Full Adder.

6 Design the following combinational logic circuits and verify their truth tables: Half Subtractor and Full Subtractor.

7 Design a 4:1 MUX and 1:4 DEMUX using logic gates.

8 Design a circuit to display the BCD numbers on a 7-segment display using BCD to 7-segment decoder.

9 Design the following flip flops using logic gates and verify their truth table: SR, JK, D and T flip flop.

10 Design a 3-bit asynchronous counter using T flip flops and verify its count sequence.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1 Morris Mano. Digital Circuit & Logic Design; Prentice Hall of India.

2 A.P. Malvino& D.P. Leach. Digital Principles & Applications, Tata Mc-graw Hill, Delhi.

3 Tocci. Digital Systems, Pearson Education.

4 Gree. Digital electronics, Pearson Education.

5 Bartee. Digital Computer Fundamentals, Tata Mc-Graw Hill.

EC 236 (PCC) - ELECTRONIC DEVICE AND CIRCUITS

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcome: The student will be able to

CO1: Develop the understanding of internal structure of P-N junction and its operation.

CO2: Comprehend and analyze characteristics and biasing techniques of BJT.

CO3: Appreciate the concept of BJT amplifiers and working of BJT at low frequencies.

CO4: Envisage the characteristics and working of Field Effect Transistor.

Unit-I

Semiconductor physics: Mobility and conductivity, charge densities in a semiconductor. Fermi dirac distribution, carrier concentration of Fermi level in semiconductor Generation and recombination of charges diffusion and continuity equation Mass action Law, Hall effect. Diode circuits: Diode as a circuit element, load line concept, clipping and clamping circuits, voltage multipliers.

Unit-II

Diodes and Transistor characteristics: Junction transistor, Transistor current components, The transistor as an Amplifier, Transistor construction, The common base configuration, The common emitter configuration, The CE cut-off Region, The CE Saturation Region, Typical Transistor-Junction Voltage Values, Common-Emitter current gain, The Common-Collector configuration, Analytical Expressions for Transistors Characteristics, Maximum Voltage rating. Transistor Biasing and Thermal Stabilization: The operating point, Bias stability, Self-Bias, or Emitter Bias, Stabilization against variations in ICO, VBE, and β, Bias compensation, Biasing techniques for Linear Integrated Circuits, Thermistor and Sensistor Compensation, Thermal Runaway, Thermal Stability.

Unit-III

The Transistor at low frequencies : Graphical Analysis of the CE configuration, Two-Port devices and the hybrid Model, Transistor hybrid model, The h-parameter, Conversion formulas for the parameters of the three transistor Configuration, Analysis of a transistor Amplifier Circuit using h parameters, The Emitter follower, Comparison of transistor amplifier configurations, Linear Analysis of a Transistor Circuit, Cascading Transistor Amplifiers, Simplified Common-Emitter Hybrid Model, Simplified calculations for the Common-Collector Configuration. The Common-Emitter Amplifier with an emitter resistance, High input resistance transistor circuits.

Unit-IV

Field Effect Transistors: The Junction Field Effect Transistor, The Pinch-off voltage, The JFET Volt-Ampere characteristics, The FET Small-Signal model, The Metal-Oxide-Semiconductor FET (MOSFET), The Low-Frequency Common-Source and Common-Drain Amplifiers, The FET as a Voltage-variable Resistor (VVR).Working and characteristics of Photo Transistor, diode, LDR, UJT, SCR, DIAC and TRIAC.

LIST OF PRACTICAL EXPERIMENTS

1 Design and measure output waveform of following clipper circuits : Positive clipper | Negative clipper | Biased clipper

2 Design of following multiplier circuits: Voltage doublers | Voltage Tripler | Voltage quadruples

3 Design clamper circuit and observe the output waveform on CRO.

4 Design CC amplifier :

(A) To measure the voltage gain of amplifier. (B) To plot the frequency response characteristic of amplifier.

5 Design the following biasing circuits and compare their stabilities: Fixed bias | Collector to base bias | Self bias

6 Design CE amplifier and measure their h parameter using: (a) Graphical method (b.) Analytical method

7 Design circuit for Photo Transistor and plot the V-I characteristics of it.

8 To plot the V-I characteristics of JFET in Common source and Common Drain configuration and to determine threshold voltage.

9 Design and develop circuit for SCR and plot their V-I characteristics.

10 To demonstrate JFET as a Voltage Variable Resistor

11 Design circuit for DIAC and plot their V-I characteristics.

12 To plot V-I characteristics of TRAIC.

13 To plot V-I characteristics of MOSFET.

NOTE: The actual number of experiments may be more than the above mentioned list.

Text Books/References

1 J Millman & C.C. Halkias. Integrated Electornics; Tata Mc-Graw Hill. Pearson Education.

2 Rebert Boylestad & L. Nashelsky. Electronic Devices and Circuit Theory.

3 Sedra Smith. Micro Electronic Circuits. Oxford Press, India.

4 Floyd. Electronic Devices, Pearson Education.

5 hur. Physics of Semiconductor Devices. Prentice Hall of India.

6 D. Nagchoudhuri. Microelectronics devices, Pearson education.

7 G. Streetman Ben. Solid state devices, PHI/Pearson.

EC 237 (PCC) – SIGNALS AND SYSTEMS

Cr. Hrs. 3 (3+0 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Analyze different types of signals and characteristics of Linear Time Invariant (LTI) systems

CO2: Represent continuous and discrete systems in time and frequency domain using different transforms.

CO3: Appreciate the concept Laplace transform and Z-transform.

CO4: Appreciate the concept of Sampling and reconstruction of a signal.

Unit-I

Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Linear Time Invariant (LTI) systems, impulse response and step response, convolution, input output behaviour with aperiodic convergent inputs. Characterization of causality and stability of Linear Time Invariant (LTI) systems. System representation through differential equations and difference equations.

Unit-II

Periodic and semi-periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases,

Unit-III

The Laplace Transform, notion of eigen functions of LTI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and

system behaviour. The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis.

Unit-IV

State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems..

Text Books/References

1 A.V. Oppenheim, A.S. Willsky and I.T. Young, “Signals and Systems”, Prentice Hall, 1983.

2 R.F. Ziemer, W.H. Tranter and D.R. Fannin, “Signals and Systems - Continuous and Discrete”: 4th edition, Prentice Hall, 1998.

3 Papoulis, “Circuits and Systems: A Modern Approach”, HRW, 1980.

4 B.P. Lathi, “Signal Processing and Linear Systems”, Oxford University Press, c1998.

5 Douglas K. Lindner, “Introduction to Signals and Systems”, McGraw Hill International Edition: c1999.

IV SEMESTER

BS 241 (BSC) - MATHEMATICS-IV

Cr. Hrs. 3(2 + 1+0)

	L	T	P
Credit	**2**	**1**	**0**
Hours	**2**	**1**	**0**

Course Outcomes: Students will be able to

CO1: Demonstrate proficiency in solving Fourier Series.

CO2: Solve Algebraic and Transcendental Equation.

CO3: Solve Wave equation and Laplace's equations.

CO4: Show competence in Statistics, Correlation and regression.

Unit-I

Fourier Series: Fourier series, even and odd functions; Half range series; Change of interval; Exponential form of Fourier series; Harmonic analysis

Unit-II

Roots of Nonlinear (Algebraic and Transcendental) Equations: Bisection method, False position method, Newton Raphson method; Convergence of False position and Newton Raphson method. Complex roots of polynomials by Bairstow's method.

Unit-III

Partial Differential Equations: Classifications of partial differential equations; Method of separation of variables to solve Heat equation, Wave equation and Laplace's equations.

Unit-IV

Statistics: Correlation and regression; Principle of least square method and curve fitting.

Probability Distribution Functions: Random variable; Mathematical expectations; Moment generating functions; Discrete and continuous distribution functions; Binomial, Poisson and Normal distributions.

Text Books/References

1 J.L. Bansal and H.S. Dhami, Differential Equations (Vols.-II), Jaipur Publishing House, Jaipur (2005).

2 N.P. Bali and Manish Goyal, A Text book of Engineering Mathematics (VII Edition), Laxmi Publication Pvt. Ltd., New Delhi.

3 S.C. Gupta and V.K. Kapoor, Mathematical Statistics, Sultan Chand & Sons, New Delhi.

CS 243 (ESC) - DATA STRUCTURE

Cr. Hrs. 3(3+0+ 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: Students will be able to

CO1: Understand and analyze the implementation and application of basic data structures such as arrays and linked lists.

CO2: Evaluate and analyze the implementation and application of various ADTs such as stacks and queues.

CO3: Evaluate and analyze the implementation and application of tree based data structures Binary Tree, BST, AVL tree, m-way tree etc.

CO4: Evaluate and analyze the implementation and application of graph and hashing based data structure.

Unit-I

Concepts. Data Representation: Linear Lists, Formula based representation, Linked List Representations, Circular and Doubly Linked Lists, Indirect Addressing.

Unit-II

Stacks: Abstract Data Type, Derived Classes and Inheritance, Formula based Representation, Linked Representation. Applications. Queues: Abstract Data type, Formula based Representation, Linked List Representation.

Unit-III

Trees: Introduction, Binary Trees, Formula based and Linked Representation of Binary Trees, Common Operation and Traversal, Abstract Data Type Binary Tree. Priority Queues and Tournament Trees. Search Trees: Binary Search Tree, ADT (abstract Data Type)'s BS Tree and Indexed BS Tree. AVL Trees. B-Trees, m-way tree search, B-Tree order of m, Height, Searching, Insertion and deletion in B-Tree. Node Structure in B-Tree.

Unit-IV

Graphs: Definitions and Applications. ADTs Graph and Disgraph. Graphs Iterators, Graph Search Methods. Skip Lists and hashing. Linear List Representation, Skip List Representation.

Text Books/References

1. Sartaj Sahni. Data Structure, Algorithms and Applications in C++, WCB McGraw- Hill.

EE 243 (ESC) - CONTROL SYSTEM ENGINEERING

Cr. Hrs. 3(3+0 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: Students will be able to

CO1: Make measurements of a system and determine a transfer function.

CO2: Implement a proportional control system and make performance predictions, including SSE, response speed and relative stability.

CO3: Understanding of stability, transient, and steady-state behaviour of linear dynamic systems.

CO4: Demonstrate the ability to identify a dynamic system from its time or frequency response

Unit-I

Introduction: Concepts of open loop and closed loop systems. Mathematical models for feedback systems. Examples and applications of open loop and closed loop systems. Brief idea of multi-variable control systems.

Representation of physical systems: (Electro-mechanical) by differential equations, Determination of transfer function by block diagram, Reduction technique and signal flow graphs techniques.

Unit-II

System Performance and stability: Time domain and frequency domain specifications and their correlations. Time response analysis of first and second order systems. Transient response analysis steady state error and error constants.

Unit-III

Absolute and relative stability. Routh's stability criterion. Root locus method of analysis. Polar plots Nyquist stability criterion. M and N locii, Nichol's chart. Frequency domain methods, Bode plot, Design specification in frequency domain.

Unit-IV

State Variable analysis: Concept of state, state variables and state model. State models for linear continuous time systems. Diagonalization transfer functions. Solutions of state equations. Concept of controllability and observability.

Elementary idea of compensating networks: Lag, Lead and lag-Lead networks. Brief idea of proportional, derivative and integral controllers.

Text Books/References

1 Gopal Nagrath. Control System Engg.

2 Ogata. Modern Control System.

3 B.S. Manke. Linear Control System - Khanna Publisher.

EC 242 (PCC) ELECTROMAGNETIC FIELD THEORY

Cr. Hrs. 3(3+0+ 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**1**	**0**

Course Outcomes: The student will be able to

CO1: Compute the spatial variation of physical quantities in various coordinate systems.

CO2: Comprehend the idea of Uniform plane wave and assimilate the basics of wave polarization.

CO3: Understand the concept of transmission line and its application.

CO4: Develop the notion of waveguides and understand wave propagation in waveguides.

Unit-I

Introduction: Vector Relation in rectangular, cylindrical, spherical and general curvilinear coordinate system. Basics of Vectors, Vector calculus, Concept and physical interpretation of gradient. Divergence and curl, Green's & Stoke theorems, Basic laws of Electromagnetic, Maxwell's Equations, Boundary conditions at Media Interface.

Unit-II

Uniform Plane Wave: Uniform plane wave, Propagation of wave, Wave polarization, Poincare's Sphere, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor Plane Waves at a Media Interface- Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary

Unit-III

Transmission Lines: Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart,

Admittance Smith Chart, Applications of transmission lines: Impedance Matching. Attenuators, filters and their applications.

Unit-IV

Wave propagation in parallel plane waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide.

Text Books/References

1 W.H. Hayt Jr. Engineering Electromagnetics, Tata Mcgraw Hill.

2 Cheng. Field and Wave Electromagnetic, Pearson Education.

3 David Change, Sadiku. Elements of Electromagnetics, Oxford Press

4 E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India

5 Narayana Rao, N: Engineering Electromagnetic, 3rd ed., Prentice Hall, 1997

6 Balanis. Applied Electromagnetics

EC 245 (PCC) - COMMUNICATION THEORY

Cr. Hrs. 4 (3+0 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcomes: The student will be able to

CO1: Understand the basics of communication system and modulation processes.

CO2: Conceptualize amplitude modulation and design AM transmitters and receivers.

CO3: Comprehend the knowledge of Angle modulation and analyze the various characteristics of the receiver circuit.

CO4: Impart qualitative and quantitative behaviour of analog modulations systems in presence of noise.

Unit-I

Introduction to Communication systems, source of information, communication channels, base band pass band signals, representation of signals and systems, probabilistic considerations, modulation process, primary communication resources, analog versus digital communication, applications of communications systems.

Unit-II

Amplitude Modulation: Block diagram of communication system, modulation and their need in communication , amplitude modulation and their types, Analysis of standard AM waves , spectrum & power relation in different types of AM system (AM-DSB,AM-DSB/SC, AM-SSB, AM-VSB). Methods of Generation and reconstruction of different AM signal: Different circuits for amplitude modulation and their comparison. Methods of generating DSBSC, SSB and vestigial side band AM and their characteristics. Envelop and coherent demodulation methods for standard AM, DSB-SC, SSB signals. AM transmitter and receiver circuit.

Unit-III

Angle modulation: Instantaneous frequency; phase and frequency modulation. Single tone FM and its spectral analysis. NBFM and WBFM. Bandwidth requirements of angle modulated signals. Demodulation of angle modulated signals. Analog Pulse Modulation: Generation and Demodulation of Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation, PAM/TDM System, Spectra of Pulse Modulated Signals, SNR Calculations for Pulse Modulation Systems.

Unit-IV

Noise in Communication systems: Thermal noise, shot noise and white noise. Noise equivalent bandwidth, noise figure and noise temperature. Time domain representation of narrowband noise. Properties of narrowband noise. Noise in CW modulation systems. Figure of merit: Noise performance of linear and exponential modulation. Pre-emphasis and de-emphasis in FM.

LIST OF PRACTICAL EXPERIMENTS

a) 1. Design and demonstrate the generation of AM signal and demodulation of AM signal. Measure modulation index of AM signal.

b) Draw the spectrum of AM signal and measure frequency and power.

a) 2. Demonstrate the generation and detection of DSB-SC AM signal. Using balanced modulator and product modulator.

b) Draw the spectrum of DSB-SC signal and measure frequency and power.

a) 3 Demonstrate the generation of SSB-SC AM signal and demodulation of SSB-SC AM signal using product modulator.

b) Draw the spectrum of SSB-SC AM signal and measure frequency and power.

4 Demonstrate the generation and detection of FM signal using varactor modulator and ratio detector.

5 Demonstrate the detection of FM signal using various detection methods.

6 Demonstrate the generation of PPM signal and demodulation of PPM signal using low pass filter.

7 Demonstrate the generation of PWM signal and demodulation of PWM signal using low pass filter.

a) 8 Demonstrate the generation of PAM signal and demodulation of PAM signal using low pass filter.

b) Demonstrate various types of sampling process.

9 Develop the time division multiplexing and frequency division multiplexing.

10 Study of super-heterodyne radio receiver and measure signal at various test points.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1 Communication System by Simon Haykin John Wiley & sons. 3rd Edition.

2 Principles of Communication System by Taub & Schilling ,TMH 4th Edition.

3 Communication Systems by Proakis John Wiley & sons. 2nd Edition.

4 Modern analog and digital communication by B.P. Lathi , Oxford 4th Edition.

5 Electronic Communication Systems by Kennedy , Tata McGraw-Hill.

EC 246 (PCC)
MICROPROCESSOR AND MICROCONTROLLER

Cr. Hrs. 4(3+0 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcomes: Student will be able to

CO1: Describe the basic architecture, hardware details, instruction formats and instruction timings of 8085 microprocessor and 8051 microcontroller.

CO2: Design assembly language programs using instruction set of 8085 microprocessor for various applications.

CO3: Interface 8085 microprocessor with external peripherals like A/D converter, D/A converter, serial communication interface etc.

CO4: Use the instruction set of 8051 microcontroller and use them in designing of embedded system applications.

CO5: Describethe AVR microcontroller and PIC microcontroller, architecture and programming.

Unit-I

The 8085 Microprocessor: Block diagram, pins & their description, de-multiplexing of buses, control signals & flags. Introduction to 8085 based microcomputer system. Instruction & Timings: Instruction classification, instruction formats, addressing modes, Instruction timings and status. Interrupts. Programming & Programming Techniques of the 8085: 8085 instruction set. Instructions related to stack operations. Looping, counting's and indexing, counters & time delays. Subroutines

Unit-II

Interfacing Concepts & Peripherals: Basic interfacing concepts. Memory mapped and peripheral mapped I/O. Description, programming & interfacing 8255, 8279 with 8085. Direct memory Access: Basic concepts FDMA techniques. Description, Programming and interfacing of DMA controller 8257.Description, programming and interfacing of 8253 and 8259A with 8085 microprocessor. A/D and D/A converters, Serial I/O & Bus stands: Interfacing of AD558, AD7522, ADC0801, 0808 with 8085. Basic concepts in serial I/O, Software controlled serial I/O. RS232C and standard parallel port of PC.

Unit-III

The 8051 Microcontroller: Introduction, The 8051 microcontroller hardware. I/O pins, Port, External memory. Counters and Timers, Serial data. Interrupts. 8051 Assembly Language Programming: Addressing modes, External data moves, Instruction set, Interrupts & returns

Unit-IV

The AVR microcontroller: History and features, architecture, AVR programming in C, AVR Hardware Connection, and HEX file and flash loaders for ATMEGA32. The PIC microcontrollers: History and features, Microcontrollers and Embedded Processors, Overview of the PIC18 family, PIC architecture, PIC programming in C.

LIST OF PRACTICAL EXPERIMENTS

1 Develop an assembly language code in 8085 to perform the addition and subtraction of two 8-bit numbers.

2 Develop an assembly language code in 8085 to perform the multiplication and division of two 8-bit numbers.

3 Develop an assembly language code in 8085 to perform the addition of 10 consecutive 8-bit numbers stored in memory starting from address 2000H.

4 Develop an assembly language code in 8085 to find out the largest and the smallest number from an array of data using the concept of subroutine.

5 Develop an assembly language code in 8085 to arrange an array of ten 8-bit numbers in ascending and descending order.

6 Develop an assembly language code in 8085 to generate a delay of 1 second assuming the clock frequency to be 3 MHz.

7 Interface 8253 keyboard display controller with 8085 and verify its operation in six different modes.

8 Interface 8279 Keyboard display controller with 8085 using assembly language coding.

9 Interface A/D converter ADC 0808 with 8085 and develop the assembly language code to convert the analog signal into digital form.

10 Interface D/A converter AD 7523 with 8085 and develop the assembly language code to generate square and saw tooth waveforms and observe them on CRO.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1 R. Gaonkar. Microprocessor Architecture, Programming & Applications, Wiely Eastern Ltd.

2 D. V. Hall. Microprocessor & Interfacing

3 P. Mathur. Introduction to Microprocessors.

4 K.N. Ayala. The 8051 Microcontroller. Penram International.

5 M.A. Mazidi and J.G. Mazidi. The 8051 Microcontroller and Embedded Systems, Pearson Education Asia.

EC 247 (PCC) - ANALOG ELECTRONIC CIRCUITS

Cr. Hrs. 4(3+0 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcomes: Students will be able to

CO1: Understand the characteristics of diodes and transistors

CO2: Design and analyze various rectifier and amplifier circuits

CO3: Design sinusoidal and non-sinusoidal oscillators

CO4: Understand the functioning of OP-AMP and design OP-AMP based circuits

Unit-I

Diode Circuits, Amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain,

input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.

Unit-II

High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues. Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.

Unit-III

Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators. Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load. Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR.

Unit-IV

OP-AMP design: design of differential amplifier for a given specification, design of gain stages and output stages, compensation. OP-AMP applications: review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications. Active filters: Low pass, high pass, band pass and band stop, design guidelines. Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. Analog to-digital converters (ADC): Single slope, dual slope, successive approximation, flash etc.

LIST OF PRACTICAL EXPERIMENTS

1 Design and assemble an Inverting and Non-Inverting amplifier using IC 741 and measure its performance on CRO.

2 Design and assemble an Inverting and Non-Inverting Adder circuit using IC 741 and measure its performance on result both practically and theoretically.

3 Design and assemble a Subtractor circuit using IC 741 and measure its performance on result both practically and theoretically.

4 Design an Integrator and Differentiator circuits using IC 741 and measure its performance on CRO.

5 Design and assemble a RC phase shift oscillator using IC-741 and find its operating frequency.

6 Design First Order High pass filter and Low pass filter. Draw its frequency response and find its cut off frequency.

7 Design narrow and wide band pass filter. Draw its frequency response and find its cut off frequency.

8 Design narrow and wide band stop filter. Draw its frequency response and find its cut off frequency.

9 Design and assemble a comparator circuit using IC-741 and measure its performance on CRO.

10 Study and demonstrate the characteristics of PLL LM565.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1 J.V. Wait, L.P. Huelsman and GA Korn, Introduction to Operational Amplifier theory and applications, McGraw Hill, 1992

2 J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988.

3 P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.

4 A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College11Publishing, Edition IV.

5 Paul R. Gray and Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley, 3rd Edition

EC 248 (PCC) ELECTRONIC WORKSHOP

Cr. Hrs. 2(0+0+2)

	L	T	P
Credit	**0**	**0**	**2**
Hours	**0**	**0**	**4**

Course Outcomes: Student will be able to

CO1: Demonstrate testing procedures for various electronic components, hot and cold test related to checking of components.

CO2: Analyze data sheet of various electronic components, demonstrate the IC testing procedures.

CO3: Design of artwork layout of electronic circuit with PCB simulations. Demonstrate various workshop practices as soldering, drilling, Tinning related to PCB.

CO4: Construction of minor and major electronic projects & analyze the testing and working of projects

LIST OF PRACTICAL EXPERIMENTS

1 Testing and identification of various electronics components using DMM and CRO.

2 Study of technical symbols used for various electronic components.

3 Study of data sheet of various electronic components e.g. Transistors, diodes ,capacitors etc.

4 Testing of various digital and analog integrated circuits using IC tester.

5 Demonstrate and perform operation of soldering and de-soldering on general purpose PCB.

6 Demonstrate and perform operation of drilling on PCB.

7 Design PCB artwork for a given electronic circuit on a simulator e g. Express PCB.

8 Demonstrate PCB fabrication procedure for preparation of PCB on a PCB fabrication machine.

9 Demonstrate various technical faults observed and their rectification on CRO trainer kit.

10 Design a minor project of at least 20 components and demonstrate the working of same.

11. Design a project using surface mount devices.

Note: The actual number of experiments may be more than the above mentioned list.

B.Tech. - THIRD YEAR (ECE)

V SEMESTER

EC 351(PCC) - DIGITAL SIGNAL PROCESSING

Cr. Hrs. 4(3+0 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcomes: The student will be able to

CO1: Develop the understanding of sampling and conceptualize the LTI system and its frequency transform analysis.

CO2: Apprehend the knowledge of Discrete Time Systems

CO3: Comprehend and design FIR filter and IIR filter using various techniques.

CO4: Grasp the notion of Discrete Fourier Transform and able to implement LTI systems using DFT.

Unit-I

Sampling: Discrete time processing of Continuous-time signals, continuous-time processing of discrete-time signals, changing the sampling rate using discrete-time processing.

Transform Analysis of LTI Systems: Time domain representation of Linear Time Invariant (LTI) systems, Properties of LTI systems, frequency response of LTI systems. Introduction of Z transform, ROC, Properties of Z-transform, Inverse Z-transform, Applications of Z-transform in the analysis of discrete time lti systems.

Unit-II

Structures for Discrete-Time Systems: Block diagram and signal flow graph representation of LCCD (LCCD-Linear constant Coefficient Difference) equations, General solution and Particular solution of LCCD equation. Basic structures for IIR and FIR systems. Transposed forms.

Unit-III

Filter Design Techniques: Introduction, Design of Discrete-Time IIR filter from Continuous-time filters, filter design by impulse invariance, Bilinear transformation and Design of FIR filters by Windowing-examples of FIR filter design by the kaiser window method. Butterworth, Chebyshev and Elliptic filters.

Unit-IV

The Discrete Fourier Transform: The discrete Fourier series (DFS) Properties of the DFS, The discrete Fourier transform (DFT), Properties of the DFT, Implementing LTI systems using the DFT, Efficient computation of the DFT, The Goertzel Algorithm, Decimation-in-Time and decimation-in frequency FFT Algorithms, Implementation of the DFI using convolution.

LIST OF PRACTICAL EXPERIMENTS

1 Develop a code for the FSK digital modulation & demodulation technique using simulation tool.

2 Develop a code for generation of sine and cosine wave using simulation tool.

3 Develop a code for multiplication of two matrix using simulation tool.

4 Develop a code for unit impulse, step, ramp function and its folded sequence with delay using simulation tool.

5 Develop a code for any random expression and verify the same using simulation tool.

6 Develop a code for determine the average power of sequence using simulation tool.

7 Develop a code to generate a music notes Sa, Re, Ga , Ma, Pa, Dha , Ni, Sa using simulation tool.

8 Develop a code to find the z-transform of random data using simulation tool.

9 Develop a code to plot the magnitude phase, real part and imaginary part of given signal using simulation tool.

10 Develop a code to check whether a given function is linear or not liner using simulation tool.

11 Develop a code to find the convolution of given function using simulation tool.

12 Develop a code to verify the sampling theorem using simulation tool.

13 Develop a code to verify power spectral density using simulation tool.

14 Develop a code to verify fast Fourier transform using simulation tool.

15 Develop a code to compute and verify the discrete time Fourier transform using simulation tool.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1 S.K.Mitra, Digital Signal Processing: A computer based approach.TMH.

2 J A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.

3 John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms And Applications, Prentice Hall, 1997.

4 L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall, 1992.

5 J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall, 1992.

6 D.J.DeFatta, J. G. Lucas and W.S.Hodgkiss, Digital Signal Processing, John Wiley & Sons, 1988.

EC 352 (PCC) - DIGITAL COMMUNICATION ENGINEERING

Cr. Hrs. 4(3+0 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcomes: Students will be able to:

CO1: Analyze the continuous and discrete signals and demonstrate the various code modulations.

CO2: Compute and compare the performance parameters of different line codes.

CO3: Apprehend the concept of signal space and its properties.

CO4: Apprehend different digital modulation techniques and their performances.

Unit-I

Sampling Theorem for Band Pass Signals, Quantization of signals: Uniform Quantization- Mid Tread and Mid Rise Quantization and Non Uniform Quantization- A law and μ law, Quantization error, PCM, Companding and multiplexing of PCM signals, DPCM, Delta Modulation, Adaptive Delta Modulation, Baseband Shaping for Data Transmission: Discrete PAM Signals, Power Spectra of Discrete PAM Signals.

Unit-II

Line Coding: Properties of line codes, PSD of various line codes, Polar signalling, ON-OFF signalling, Bipolar Signalling and Signaling with Duo-Binary Pulses. Pulse Shaping, Inter Symbol Interference, Nyquist Criterion for Zero ISI & for Distortion-less Baseband Binary Transmission, , Eye Diagram, Equalization, Adaptive Equalization for Data Transmission, Scrambling and Descrambling.

Unit-III

Signal space concepts: Analogy between Signals and Vectors, Geometric Structure of the Signal Space, Decomposition of a Signal and Signal Components, Complex Signal Space and Orthogonality, Orthogonal Signal Set, Base-Band Pulse Data Transmission, Gram-Schmidt Orthogonalization Procedure.

Unit-IV

Digital modulation schemes: Coherent Binary Schemes: ASK, FSK, PSK, MSK, and GMSK. Coherent M-ary Schemes, Non-Coherent Schemes, Calculation of Average Probability of Error for Different Modulation Schemes, Power Spectra of Digitally Modulated Signals, Performance Comparison of Different Digital Modulation Schemes. DQPSK, QPSK, OQPSK, pi/4 QPSK, 8-PSK, QAM. Trellis Coded Modulation, GSM, CDMA

LIST OF PRACTICAL EXPERIMENTS

1 Demonstrate the different types of sampling techniques (natural, flat top and sample and hold) and to establish relationship between sampling rate and signal frequency.

2 Demonstrate the time division multiplexing of signals and de-multiplexing of signals.

3 Demonstrate the noise generator circuit and matched filter detection and to measure the output parameters.

4 Demonstrate the generation and detection of PCM signal and to measure the output parameters.

5 Demonstrate the generation of Delta modulator and demodulator signal and to measure the output parameters.

6 Demonstrate the generation and detection of ASK, PSK, FSK, signal and to measure the output parameters.

7 Demonstrate the generation and detection of DPSK signal and to measure the output parameters.

8 Demonstrate the generation and detection of QAM signal and to measure the output parameters.

9 To develop a code for the ASK, FSK, PSK digital modulation & demodulation technique using simulation tool.

10 To develop a code for the Shannon Fano and Huffman coding technique to calculate the code efficiency and redundancy using simulation tool.

11 To develop a code for the linear block/Cyclic coding technique for user input data using simulation tool.

12 Study of different section of mobile phone trainer and measure test point voltages and test point waveform and observe different faults.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1 Digital Communication Systems by Simon Haykin; John Wiley & Sons. 2009.

2 Modern Digital and Analog Communication, 3rd Edition by B.P. Lathi; Oxford University Press. 2009.

3 Digital Communication, 2E by Sklar; Pearson Education. 2001.

4 Digital and Analog Communication Systems by K.Shanmugham; John Wiley & Sons. 1994.

5 Analog and Digital Communication by Couch, Pearson Education.

6 Digital Communications by John G. Proakis; McGraw Hill. 2000.

EC 353 (PCC) - DIGITAL SYSTEM DESIGN

Cr. Hrs. 4(3 +0+ 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcomes: Students will be able to

CO1: Design simple Combinational circuits and Sequential circuits.

CO2: Design synchronous sequential machines.

CO3: Develop the understanding of Hardware Description Languages (Verilog) and write (Verilog) HDL codes for basic designing of digital systems.

CO4: Grasp notion of Programmable Logic Devices and System Controllers.

Unit-I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra, SOP & POS forms, Canonical forms, K-Maps (5 variable), Binary codes, Code Conversion. Combinational logic design like Comparators, Multiplexers, Encoder, Decoder, Serial and Parallel Adders, BCD Adder, ALU, etc. Sequential Logic Design Flip-flops, Ripple and Synchronous counters, Shift registers.

Unit-II

Finite state machines: Design of synchronous sequential machines: Mealy and Moore machine, Counter design using sequential Machines, Multimode Counters, Reduction of state table and state assignment, Design of sequence detectors and code converters, Timing and Triggering consideration in sequential machine, Clock skew.

Unit-III

Hardware Description Languages (Verilog): Fundamentals of Verilog, Overview of Digital Design with Verilog HDL, Hierarchical Modeling Concepts: Top-down and bottom-up design methodology, Modules and Port, Gate-Level Modeling, Dataflow Modeling, Behavioural Modeling, Tasks and Functions, RTL Description of Simple Machine and Design from RTL description.

Unit-IV

Programmable Logic Devices and System Controllers: Use of MSI Decoders and MSI Multiplexers in system Controllers, Architecture of

ROM, PROM, PAL and PLA controller, design using PROM, PAL and PLA System. Reconfigurable Device Architectures: Classification of FPGA, Basic architecture of CPLD and FPGA, Xilinx's CPLD and FPGA architecture.

LIST OF PRACTICAL EXPERIMENTS

1 To develop VERILOG code for Full Adder using Half Adder using simulation tool and verify the same on FPGA board.

2 To develop the VERILOG code for 16-to-1 Multiplexer using 4-to-1 Multiplexer using simulation tool and verify the same on FPGA board.

3 To develop the VERILOG code for BCD to 7-Segment display using simulation tool and verify the same on FPGA board.

4 To develop the VERILOG code for Encoders and Decoders using simulation tool and verify the same on FPGA board.

5 To develop the VERILOG code for 4-to-2 priority Encoder using simulation tool and verify the same on FPGA board.

6 To develop the VERILOG code for Code Converters using simulation tool and verify the same on FPGA board.

7 To develop the VERILOG code for Flip-Flops using simulation tool and verify the same on FPGA board.

8 To develop the VERILOG code for Shift Registers using simulation tool and verify the same on FPGA board.

9 To develop the VERILOG code for Moore Machine using simulation tool and verify the same on FPGA board.

10 To develop the VERILOG code for Mealy Machine using simulation tool and verify the same on FPGA board.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1 Samir Palnitkar, Verilog HDL : A Guide to digital design and synthesis, Prentice Hall

2 Morris Mano. Digital Logic & Computer Design, Prentice Hall of India.

3 Z.Navabi. Analysis and Modeling of Digital Systems, Tata Mc-Graw Hill.

4 C H Roth, Digital system design using VHDL, PWS publishing, 1998.

EC 354 (PCC) - ANTENNA AND WAVE PROPAGATION

Cr. Hrs. 3(3+0 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Develop an understanding of antenna and its parameters.

CO2: Calculate and compare the performance parameters for different Aperture and Dipole Antennas.

CO3: Assimilate the knowledge of Reflector and Micro strip Antennas.

CO4: Compute and design various HF and VHF antenna arrays.

Unit-I

Fundamental Concepts- Physical concept of radiation, 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. Radiation from Wires and Loops- Infinitesimal dipole, finite-length dipole, linear elements near conductors.

Unit-II

Aperture and Dipole Antennas - Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts. Long wire, V and Rhombic antennas, Folded dipole, Yagi-Uda antenna, Frequency independent antennas, Log- periodic antennas

Unit-III

Reflector and Micro strip Antennas - Prime-focus parabolic reflector and cassegrain antennas. Broadband Antennas- Log-periodic and Yagi-Uda antennas, frequency independent antennas, broadcast antennas. Basic characteristics of micro strip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas.

Unit-IV

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, Woodward-

Lawson method. Basic Concepts of Smart Antennas- Concept and benefits of smart antennas, fixed weight beam forming basics, Adaptive beam forming.

Text Books/References

1 D. Kraus, Antennas, McGraw Hill, 1988.

2 C.A. Balanis, Antenna Theory - Analysis and Design, John Wiley, 1982.

3 R.E. Collin, Antennas and Radio Wave Propagation, McGraw Hill, 1985.

4 R.C. Johnson and H. Jasik, Antenna Engineering Handbook, McGraw ill, 1984.

5 I.J. Bahl and P. Bhartia, Micro Strip Antennas, Artech House, 1980.

6 R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill, 2005

7 R.E. Crompton, Adaptive Antennas, John Wiley

EC 355 (PCC)
TELECOMMUNICATION AND SWITCHING NETWORKS

Cr. Hrs. 4(3+0 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcomes: The student will be able to

CO1: Conceptualize the knowledge of carrier telephony and identify the various issues (like crosstalk) in transmission

CO2: Comprehend the basic concepts of automatic telephony, principle of electronic exchange and recent advancements in telecommunication

CO3: Analyze a number of Data link and Network Layer protocols and compare the performances of these protocols.

CO4: Conceptualize the essential principles of transport layer protocols and identify the network security issues and the methods that address them.

Unit-I

Telephone Transmission: Introduction to Cross talk and DTMF, Trunking and Grade of service. Introduction to switching networks, classification of switching systems. Circuit switching, Packet switching, Hybrid switching. Principle of Electronic Exchange. EPABX and SPC Exchange.

Unit-II

Network structure, network architectures. The OSI reference model, services, standardization. The Physical Layer: Transmission media, EIA RS-232C, EIA RS-449. PCM FDM & TDM. Polling. CCITT X.21. Ethernet.

Unit-III

The Data Link Layer: Basic link protocols. Character oriented and bit oriented protocols. The ALOHA protocols. IEEE standard 802 for LAN. The Network Layer: Routing Algorithms. Congestion control Algorithms. The Transport Layer: Connection management. The Upper OSI Layers: The session, presentation and application layers design Issues. Introduction to Cryptography-Private and Public Key Cryptography. Protocol. Introduction to Data Compression.

Unit-IV

Internet Issues: Study of Internet and ATM transport layer protocols, Principles of bridges and routers. The TCP/IP Protocol suite: Overview of TCP/IP. Addressing, Sub netting and network layer protocols. Application layer services: DNS, DHCP, FTP, TFTP, SMTP, SNMP, HTTP, WWW.

LIST OF PRACTICAL EXPERIMENTS

1 Design open and short transmission line using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss).

2 Design transmission line using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss).

3 Measure the input impedance at different length of transmission line.

4 Determine the stationary wave ratio at different length of transmission line.

5 Demonstrate the working of different sections of telephone handset instrument.

6 Measure test point voltages and test point waveforms for different sections.

7 Design an attenuation circuit using T-type and π-type network to attenuate a signal.

8 Demonstrate the Characteristics of band pass filter using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss).

9 Design T-type impedance matched transformer using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss)

10 Design π-type impedance matched transformer using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss).

11 Design T-type power attenuator using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss).

12 Design π-type power attenuator using RF analyzer and measure S_{11} (return loss) and S_{21} (insertion loss)

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1 W. Fraser. Telecommunications (BPB Publication)

2 Andrew S. Tanenbaum. Computer Networks, PHI India.

3 Vishvanathan. Telecommunication switching systems & Networks. Prentice Hall of India.

4 Forouzan. Data Communication and Networking, TMH

5 Cole. Introduction to Telecommunication. Pearson Education.

6 Floyd. Telecommunication Switching Traffic and Networks, Pearson Education.

7 S. Rappaport Theodore. Wireless Communications: Principles & Practices.

8 C. Y. Lee William. Mobile Cellular Telecomm.

9 Schiller. Mobile Communication. Pearson Education India

EC 356 (PCC) -
ELECTRONIC MEASUREMENT AND INSTRUMENTATION

Cr. Hrs. 4 (3+0 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcomes: Student will be able to

CO1: Understand and apply the principles behind errors, uncertainty related to measurement devices, and various parameters related to theory of errors.

CO2: Analyze various instruments related to measurements of basic electrical parameters, measurements related to basic electronic components.

CO3: Conceptualize various types of transducers & functioning of energy conversion using transducers. Analysis of various circuits related to signal generation.CO4: Classify various display devices and analyze technology behind working of recorders.

Unit-I

Theory of error & uncertainty analysis: Accuracy & precision limits of errors, systematic & random errors and modeling of errors, probable error combination of error.

Unit-II

Electronic instruments for measuring basic parameters: Transistor voltmeter- with transistor balanced bridge TVM. Digital voltmeter ramp type, integrating type, DVM. Measurement of time, phase frequency using digital instruments, Q meter.

Unit-III

Signal generation & analysis: The sine wave generator, pulse, square and function generators, wave analyzer, harmonic distortion analyzer and spectrum analyzer. Instrumentation amplifier.

Transducers as input elements to instrumentation systems: Classification constructional & operational features, strain gauges,

displacement, velocity, force, torque and pressure transducers and photosensitive devices.

Unit-IV

Display devices and recorders: Classification of display devices and systems. Cathode ray tube, light emitting diodes. Incandescent, electroluminescent and liquid-crystal displays, plasma LCD displays, Recorders. Signal Transmission and telemetry: Modulation and encoding methods, transmission media; time and frequency division multiplexing.

LIST OF PRACTICAL EXPERIMENTS

1 Measure values of different components using LCR-Q meter and evaluate the error between theoretical and practical values.

2 Demonstrate measurement and control of temperature using PT 100, thermocouple, thermistor temperature sensor.

3 Demonstrate and plot characteristics of strain gauge using strain gauge transducer.

4 Measure displacement using linear variable differential transducer and plot the characteristic parameters.

5 Demonstrate and verify the load values using load cell and evaluate the percentage error between theoretical and observed values.

6 Demonstrate using an distortion meter the distortion level and audio signal level in a given audio signal.

7 Measure distance using ultrasonic sensor and evaluate the error between theoretical and observed values.

8 Measure the relative humidity using humidity sensor.

9 Determine relative phase shift between two signals using Lissajous pattern.

10 Design a minor project using LM-35 to validate temperature transducer action.

11 Study of spectrum analyzer.

12 To measure the spectral component of a signal using spectrum analyzer.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1. H.S. Kalsi. "Electronic Inst. & Measurement, Tata Me. Hill.
2. W.D. Cooper. "Electronic Inst. & Measurement Techniques,Prentice Hall of India.
3. A.K. Sawhney . "Electrical & Electronic Measurement & Inst., Dhanpat Raj & Sons.
4. F.E. Terman & J.M. Pettit. "Electronic Measurements McGraw Hill Book Co.
5. S. Talbar & Upadhyay. Electronic Instrumentation, Dhanpat Rai Sons.

VI SEMESTER

EC 361 (PCC) - VLSI DESIGN

Cr. Hrs. 4(3+0 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcomes: Student will be able to

CO1: Able to draw band diagram for semiconductor materials.

CO2: Describe and simulate MOS Inverter characteristics.

CO3: Explain various dynamic MOS circuits.

CO4: Comprehend and design Semiconductor Memories.

Unit-I

Semiconductor Physics: Metal, Insulators, Semiconductor, Electronic transport in semiconductors, continuity equation, diffusion, drift, mobility, PN junction, Forward Bias PN Junction, Reverse Bias PN Junction, Band diagram analysis of PN junction (open, forward and reverse bias), and Band diagram analysis of Hetero-junctions.

Unit-II

Introduction to MOS Technology: MOS structure, MOS capacitor, Structure and operation of MOSFET transistor, Current-Voltage Characteristics, MOSFET scaling and short channel effects, MOS Inverters: Static Characteristics (Resistive load inverter, Inverter with n-type MOSFET load, CMOS Inverter).

Unit-III

Combinational MOS Logic Circuits: MOS logic circuits with depletion nMOS loads, CMOS logic circuits, CMOS transmission gates. Sequential MOS Logic Circuits: SR Latch, Clocked Latch and flip-flop circuits, CMOS D- Latch, Edge triggered flip-flop. Dynamic MOS logic circuits: Dynamic Pass Transistor circuits, Dynamic CMOS transmission gate circuits, Domino CMOS logic gates, NORA CMOS (NP- Domino Logic).

Unit-IV

Semiconductor Memories: ROM circuits, SRAM circuits, DRAM circuits, Basic physical design of simple Gates and Layout issues, Layout issues for inverter, Layout for NAND and NOR Gates, Complex Logic gates Layout, Layout optimization for performance, Designing with programmable logic devices ROM, PLA, PAL, and PLD. Features and internal structure of CPLDs, FPGAs.

LIST OF PRACTICAL EXPERIMENTS

1 Design and verify INVERTER, two input NAND, and two input NOR gate circuit using simulation tool.

2 Design and verify two input OR, and two input AND gate circuit using simulation tool.

3 Design and verify two input XOR, and two input XNOR gate circuit using simulation tool.

4 Design and verify Half adder and Full adder circuit using simulation tool.

5 Design and verify four bit Full adder circuit using simulation tool.

6 Design and verify Half Subtractor and Full Subtractor circuit using simulation tool.

7 Design and verify four bit Full Subtractor circuit using simulation tool.

8 Design and verify two bit comparator circuit using simulation tool.

9 Design and verify MUX 4:1 circuit using simulation tool.

10 Design and verify two bit multiplier circuit using simulation tool.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1 Sung Mo Kang and Yusuf Leblebici CMOS Digital Integrated Circuits Analysis and Design, McGraw-Hill

2 Neil H.E. Weste. Kamran Eshraghian-Principles of CMOS VLSI Design

3 A. Douglas Pucknell. Kamran Eshraghian-Basic VLSI Design

4 Michael John, Sebastian Smith. Application specific Integrated Circuit

5 BehzadRazavi. Design of Analog CMOS Integrated Circuits, Mc-Graw Hill.

6 M. Lundstrom, “Fundamentals of Carrier Transport”, Cambridge University Press, 2000.

7 C. Snowden, “Introduction to Semiconductor Device Modeling”, World Scientific, 1986.

8 Y. Tsividis and C. McAndrew, “MOSFET modeling for Circuit Simulation”, Oxford University Press, 2011.

EC362 (PCC) - MICROWAVE THEORY AND TECHNIQUES

Cr. Hrs. 4(3+0 + 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcomes: Student will be able to

CO1: Understand and apply principle of microwave engineering along with functioning and applications of various components and devices used to accomplish microwave experiments in the laboratory.

CO2: Conceptualize the working of microwave tubes like klystron, reflex klystron and multi cavity klystron along with computation of performance parameters.

CO3: Understand working, types and applications of travelling wave tube along with computation of performance parameters.

CO4: Understand working types and applications of Magnetron microwave wave tube along with its performance parameters.

Unit-I

Microwave wave guides & Components: Introduction of microwaves and their applications, microwave signal propagation and transit time effect, Rectangular wave guides and Introduction of circular wave guides, Basic idea of TE, TM, TEM waves propagation, Scattering matrix representation of network, rectangular and circular cavity resonators, wave guide E and H plane Tees, Magic Tee and Hybrid Rings, Microwave corner, Bends, Twists, Directional couplers, Circulators and Isolators.

Unit-II

Klystrons: Construction and operation of two cavity & multi-cavity Klystron, Velocity modulation and electron bunching (analytical treatment), Applegate diagram and applications of two cavity Klystron, Construction, working and operation of Reflex Klystron, Applications and practical considerations, Velocity modulation, power output and frequency characteristics of a Reflex Klystron, Electron admittance.

Unit-III

Travelling Wave Tubes (TWT): Construction, Operation and practical consideration of helix type TWT, Introduction of CW power, pulsed dual mode TWT, Coupled cavity TWT, Application of TWT.

Unit-IV

Magnetron: Types of Magnetron, operation and practical considerations of travelling wave (cavity) magnetron, Introduction of Coaxial, Voltage Tuneable and frequency- Agile Coaxial magnetrons, Cylindrical Magnetron Oscillator. Anechoic Chamber.

LIST OF PRACTICAL EXPERIMENTS

1 To measure the power distribution of various wave guide Tee i.e. E plane, H plane, Magic Tee and draw E and H patterns.

2 Measurement of various parameters like coupling factor, directivity, insertion loss, isolation, power division etc. for given microwave components like magic tees, circulators etc

3 To develop experimental setup and Plot V-I characteristics of Gunn diode & Determine threshold voltage.

4 To verify the relationship between power and Repeller Voltage in reflex klystron and determine the frequency and tuning range

5 To design an experimental setup for TWT microwave tube for the measurement of its characteristics

6 Development of an experimental setup for measurement of VSWR using double minima methods and cross verification of the experimental result

7 Design an experiment to develop I-V characteristics of microwave Gunn diode and to measure output power and frequency as a function of bias voltage using microwave test bench. .

8 Study of Vector network analyzer.

9 Development of test setup for measurement of Scattering parameters of various microwave components.

10 Development of Polar Plot and Cartesian plot of Azimuth and Elevation planes on Log/Linear scales for radiation pattern of micro strip Antenna.

11 To measure coupling factor Isolation & Directivity of Hybrid ring rat race coupler.

12 Study of Anechoic Chamber and calculation of S_{11} for a text antenna.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1 S.Y. Laio. 'Microwave devices and Circuits', Prentice-Hall of India.

2 K.C. Gupta. 'Microwaves', New Age International.

3 R.E. Collin. 'Foundations for microwave Engineering', Mc-Graw Hill.

4 T.C. Edwards. 'Foundation for Microstrip circuit Design', John Wiley & Sons.

5 Kulkarni, ‘Microwave Engineering’ Umesh Publications, New Delhi

6 B.Bhat & S.K. Koul. 'Stripline like Transmission Lines for Microwave Integrated Circuits, Wiley Eastern Limited.

EC 363 (PCC) - ADVANCED COMMUNICATION SYSTEMS

Cr. Hrs. 4(3 +0+ 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcomes: The student will be able to

CO1: Understand the concept of Radio Propagation and path loss model.

CO2: Understand and apply the principles of fading channels, spread spectrum techniques, Ground based & Satellite based Line-of-sight Microwave Communication.

CO3: Conceptualize the conce pts of satellite communication & functioning of various onboard building blocks.

CO4: Understand and analyze the effect of system parameters on Satellite link design.

Unit-I

Radio Propagation and Path Loss model: Free Space attenuation, attenuation over reflecting surfaces, effects of earth curvature, radio wave propagation. Tropo-scatter propagation. Fundamentals of fading. Diversity: Different Reception Techniques, multipath channels.

Unit-II

Capacity in AWGN, Capacity of flat fading channels, capacity of frequency selective channels. Spread Spectrum signals: Line of Sight Microwave Communication: Link Engineering, Frequency planning, Free space loss, Fresnel zone clearance, Bending of radio beam, Effective earth radius, Building blocks of Transmitter-Receiver.

Unit-III

Elements of Satellite Comm.: Satellite frequency bands. Frequency reuse, orbital period & velocity, coverage angle and slant Range, Eclipse. Satellite Description: Comm. Sub-system, Telemetry, Command & Ranging sub-system, Attitude control sub-system and Electrical Power sub system, Study of Indian satellites like INSAT series & IRS series etc.

Unit-IV

Satellite link design: Basic link analysis, Interference analysis, Rain induced attenuation & cross polarization. Multiple access techniques: frequency division multiple access - time division multiple access - code division multiple access – access protocols for data traffic. Performance analysis and comparative analysis of FDMA, TDMA and CDMA. Direct-sequence spread spectrum signals, p-n sequences, Frequency-hopped spread spectrum signals, Code-division multiplexing.

LIST OF PRACTICAL EXPERIMENTS

1 To Study Satellite Trainer kit.

2 To set up an active satellite link and demonstrate link fail operation.

3 To communicate voice signal through satellite link.

4 To establish analog /digital Communication link and transmit and receive three Signals (audio, video, tone) simultaneously using satellite communication trainer

5 To transmit and receive PC data through satellite link.

6 To find the link C/N Ratio

7 Evaluation of SNR in Satellite Links

8 To observe effect of Fading margin of received signal in satellite link

9 To Study Analysis of Link Power Budget Equation

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1 Wireless Communications: Principle & Practice, S.Rappaport, PHI

2 Andrea Goldsmith, “Wireless Communication”, Cambridge University Press, 2005.

3 Satellite Communication, Dennis Roddy, McGraw Hill

4 Satellite Communication Systems, by Richharia M.; Macmillan Press

5 Satellite Communication, by Gagliardi R.M.; CBS

6 Digital Satellite Communication, by Ha T.T.; McGraw Hill.

EC 364 (PCC) – ELECTRONIC DESIGN AUTOMATION LAB

Cr. Hrs. 3(0+1 +2)

	L	T	P
Credit	**0**	**1**	**2**
Hours	**0**	**1**	**4**

Course Outcomes: The student will be able to

CO1: Analyze the basic concept of microcontroller and Arduino hardware and their programming techniques.

CO2: Design external modules required for interfacing with microcontroller and Arduino using analog and digital logic circuits.

CO3: Design any embedded system using sensors, microcontroller, Arduino and external modules with their testing on hardware.

CO4: Analyze the core requirements of robotics and system designing with the help of robotics.

LIST OF PRACTICAL EXPERIMENTS

1 Introduction to Arduino & CC3200: Installing and getting started with Energia software

2 Introduction to various components/sensors (Led, Ultrasonic sensor, DHT11(Temperature & Humidity sensor), HC05 (bluetooth), LCD, etc) and interfacing them with Arduino & CC3200.

3 Sensing data and sending it to thing speak cloud using CC3200

4 Appliance control (light) through webpage using CC3200

5 Interface ADC 0808 with AT89C51 (8051 family) microcontroller and write the assembly language code to convert analog signal in digital form.

6 Design a temperature based switching system using temperature sensor LM 35, AT89C51 microcontroller and SPDT relay.

7 Design a traffic light system using assembly language coding in AT89C51 (8051 family) microcontroller.

8 Design an infra red based security system using AT89C51 microcontroller that turns on the alarm on the entrance of any person in restricted zone.

9 Design a light based system using LDR or photodiode that senses the light in a particular area and turns on a DC motor when the light level crosses a threshold value. Use operational amplifier uA741 as a comparator.

10 Design a circuit to interface LCD with AT89C51 (8051 family) microcontroller and display any text on it.

11 To develop assembly or C language code for ATmega32 microcontroller to make the robot function as a line follower.

12 To develop assembly or C language code for ATmega32 microcontroller to make the robot function as an obstacle avoider.

13 Design a half wave dipole antenna at a frequency of 300 MHz using PCAAD. Plot the radiation pattern of the antenna, measure its directivity and 3 dB beam width.

14 Design a 5-element Yagi-Uda antenna at a frequency of 300 MHz using PCAAD. Plot the radiation pattern of the antenna, measure its directivity and 3 dB beam width.

The actual number of experiments may be more than the above mentioned list.

Text Books/References

1 M.A. Mazidi and J.G. Mazidi. The 8051 Microcontroller and Embedded Systems, Pearson Education Asia.

2 M.A. Mazidi. The AVR Microcontroller and Embedded Systems using assembly and C, Pearson Education.

3 Antenna Simulation Software: PCAAD.

EC 365 (PEC) - PE-I(a) LOW POWER VLSI DESIGN

Cr. Hrs. 3 (3 +0+ 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Understand the concept of VLSI and important parameter for low power design.

CO2: Apprehend the knowledge of low power design and circuit simulations.

CO3: Conceptualize the low power techniques in Chip designing.

CO4: Understand and analyze low power architecture and systems power and performance management.

Unit-I

Introduction: Evolution of VLSI, Small channel effects: velocity saturation, DIBL, Punch through, narrow channel effects, hot carrier effects, Need for low power VLSI chips, Power and Energy basics, Sources of power dissipation, important parameters for low power design, Low power design approaches. Device & Technology Impact on Low Power.

Unit-II

Low power design flow, SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power, gate level capacitance estimation, architecture level analysis, data correlation analysis in DSP systems. Monte Carlo simulation. Probabilistic power analysis: Random logic signals, probability &amp frequency, probabilistic power analysis techniques, signal entropy.

Unit-III

Low Power Techniques: Circuit level: Power consumption in circuits. Dynamic Power Optimization: multiple supply voltages, transistor sizing, and Static power Optimization: Multiple thresholds transistor Flip Flops and Latches design, high capacitance nodes, low power digital cells library. Logic level: Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic.

Unit-IV

Low power Architecture and Systems Power & performance management, switching activity reduction, parallel architecture with voltage reduction, flow graph transformation, low power arithmetic components, low power memory design. Low power Clock Distribution: Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip & package co design of clock network.

Text Books/References

1 Low Power Design Methodologies by J. M. Rabaey, M.Pedram, KAP.

2 Practical Low Power Digital VLSI Design by Gary K. Yeap, KAP, 2002

3 Digital Integrated Circuits: A Design Perspective, Second Edition by J. M. Rabaey, A. P.Chandrakasan and B. Nikolic, PH/Pearson

4 Low-Power CMOS VLSI Circuit Design by K. Roy and S. C.Prasad Wiley

5 Low-Power CMOS Design,P. Chandrakasan and RW Broderson, IEEE Press.

EC 365 (PEC) - PE-I(b) MIXED SIGNAL DESIGN

Cr. Hrs. 3(3 +0+ 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Understand analog and discrete-time signal processing and basics of analog discrete-time filters.

CO2: Comprehend the knowledge of Switched-capacitor filters and data converters.

CO3: Develop the notion for Interconnection and data transmission in mixed signal layout.

CO4: Apprehend the concept of frequency synthesizers and synchronization.

Unit-I

Analog and discrete-time signal processing, introduction to sampling theory; Analog continuous time filters: passive and active filters; Basics of analog discrete-time filters and Z-transform

Unit-II

Switched-capacitor filters- Non idealities in switched-capacitor filters; Switched-capacitor filter architectures; Switched-capacitor filter applications. Basics of data converters; Successive approximation ADCs, Dual slope ADCs, Flash ADCs, Pipeline ADCs, Hybrid ADC structures, High-resolution ADCs, DACs

Unit-III

Mixed-signal layout, Interconnects and data transmission; Voltage-mode signalling and data transmission; Current-mode signalling and data transmission.

Unit-IV

Introduction to frequency synthesizers and synchronization; Basics of Phase Locked Loop (PLL), Analog PLLs; Digital PLLs; DLLs.

Text Books/References

1 R. Jacob Baker, CMOS mixed-signal circuit design, Wiley India, IEEE press, reprint 2008.

2 Behzad Razavi , Design of analog CMOS integrated circuits, McGraw-Hill, 2003.

3 Rudy V. dePlassche, CMOS Integrated ADCs and DACs, Springer, Indian edition, 2005.

4 Arthur B. Williams, Electronic Filter Design Handbook, McGraw-Hill, 1981.

5 R. Schauman, Design of analog filters by, Prentice-Hall 1990 (or newer additions).

EC 365 (PEC) - PE-I(c) SYSTEM ON CHIP DESIGN

Cr. Hrs. 3(3 +0+ 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Understand the basics of System Architecture and its Components.

CO2: Apprehend the knowledge of processors and its selection for system on chip.

CO3: Develop the idea of memory design for system on chip.

CO4: Comprehend the SOC interconnection customization and configuration.

Unit-I

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

Unit-II

Processors: Introduction, Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

Unit-III

Memory Design for SOC: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Virtual to real translation, SOC Memory System, Models of Simple Processor – memory interaction.

Unit-IV

Interconnect Customization and Configuration: Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, SOC Customization: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

Text Books/References

1 Computer System Design System-on-Chip by Michael J. Flynn and Wayne Luk, Wiley India Pvt. Ltd. 2002.

2 ARM System on Chip Architecture – Steve Furber by 2nd Ed., 2000, Addison Wesley 2000.

3 Design of System on a Chip: Devices and Components by Ricardo Reis, 1st Ed., Springer 2004.

4 Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) by Jason Andrews Newnes, 1995.

5 System on Chip Verification Methodologies and Techniques by Prakash Rashinkar Peter Peterson, Leena Singh, Springer 2002.

EC 365 (PEC) - PE-I(d) INFORMATION THEORY AND CODING

Cr. Hrs. 3(3+0 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Understand the basic concepts of information theory and entropy.

CO2: Apprehend the idea of Shannon's theorem for coding and its application.

CO3: Develop the notion for channel detection and estimation.

CO4: Understand and apply different channel coding and decoding techniques.

Unit-I

Basics of information theory, entropy for discrete ensembles; Shannon's noiseless Coding theorem; Encoding of discrete sources

Unit-II

Markov sources; Shannon's noisy coding theorem and converse for discrete channels; Calculation of channel capacity and bounds for discrete channels; Application to continuous channels.

Unit-III

Detection and Estimation: Review of Gaussian Random Process, Detection of Known Signals in Noise, Optimum Threshold Detection, Optimum Receiver for AWGN Channel, Matched Filter and Correlation Receivers, Decision Procedure: Maximum A- Posteriori Probability Detector- Maximum Likelihood Detector, Probability of Error, Bit Error Rate, Wiener Filter for Waveform Estimation, Linear Prediction

Unit-IV

Techniques of coding and decoding; Huffman codes and uniquely detectable codes; Cyclic codes, convolution arithmetic codes

Text Books/References

1 Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983.
2 N. Abramson, Information and Coding, McGraw Hill, 1963.
3 M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987.
4 R.B. Ash, Information Theory, Prentice Hall, 1970.

EC 365 (PEC) - PE-I(e) NEURAL NETWORKS

Cr. Hrs. 3 (3 +0+ 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Understand and analyze artificial neural system concepts, applications, models, neural processing and leaning rules.

CO2: Understand, apply and implement back propagation training algorithm.

CO3: Understand and apply linearly non-separable pattern classification and various delta learning rules of multilayer feedback network.

CO4: Understand and analyze concepts of dynamic systems and Hopfield networks for single layer feedback networks.

Unit-I

Introduction: Biological basis for NN, background and brief history, classification of NN models & implementations

Back Propagation Model: - topology, Calculations, training.

Unit-II

Self-organization Model: Topology, network initialization, training calculations, testing.

Systems considerations: Various problems, developing a system specifications, various roles of neural networks, NN software, implementation issues.

Unit-III

Development Environment and Hardware Implementations: NN modeling languages, specifying NN models, the transporter, using transducers.

Unit-IV

Performance Metrics & Network Analysis: Percentage correct, average sum-square error, normalized error, network analysis, divide-by three problem, square-within -a square problem, analyzing weights in Trained Networks.

Case Studies: Issues in Radar Signal Processing, optical Character Recognition.

Text Books/References

1 Freeman / Skapura. Neural Networks (Pearson Education India).

EC 366 (PEC) - PE-II(a) COMPUTER ARCHITECTURE

Cr. Hrs. 3 (3+0 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Understand and analyze fundamentals of CPU organization for RISC and SISC based processors along with instruction types and formats.

CO2: Understand and analyze the micro-programmed and hardwired control design concepts of CPU.

CO3: Understand and analyze memory organization along with different types of memory architecture and their significance.

CO4: Understand the basic concepts of SIMD, MIMD and array and pipelined architecture of processor design.

Unit-I

Processor Basic: CPU organization: Fundamentals, Concept of RISC and SISC processor and their comparison, Data Representation: Word length, Fixed-point numbers, Floating-point number, Instruction Sets: Format, Types.

Unit-II

Control Design: Concepts, Hardwired control, Micro-programmed Control, Basic Structure, Addressing Sequence, Design of Control Unit and Pipeline Control.

Unit-III

Memory Organization: Memory Technology: Types, performance, access modes. Random Access Memories: RAM Organization and Design. Auxiliary Memories: Access methods and Organization, Magnetic Disk, tapes and Optical Memories. Memories hierarchies and Associative Memory.

Unit-IV

Cache Memories: Organization and mapping. Principles of virtual memory, Segmentation and paging. Introduction to SIMD, MIMD, array processor and pipelined architecture.

Text Books/References

1 J. P. Hayes Computer Architecture and Organization, 3rd edition McGraw Hill International edition.

2 Andrew S Tenenbaum, Structured Computer Organization, PHI New Delhi

EC 366 (PEC) - PE-II(b) INDUSTRIAL ELECTRONICS

Cr. Hrs.	**3 (3 +0+ 0)**		
	L	**T**	**P**
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Understand the concepts of Thyristors and other Semiconductor Switches.

CO2: Classify and analyze the rectifier based on operations and application.

CO3: Conceptualize the power electronics converters and its analysis.

CO4: Envisage the operations and characteristics of inverters and cycloconverters.

Unit-I

Semiconductor Power Devices: Characteristic of power diodes, power transistor, IGBTS, TRIAC, DIAC, SUS, SBS & SCS.

SCR: Construction & its characteristics, Methods of turning on & turning off. Rating & rating extension by series/parallel operation. Specification & ratings. String efficiency. Simple firing circuit using UJT. Protection of SCR against over current & voltage surges.

Unit-II

Controlled Rectifiers: Principle of phase control, single phase half wave circuit with RL, RLE, and effect of fly wheel diode. Full wave controlled rectifier, mid-point converter, bridge converter.

Three phase thyristor converter circuit: Three phase full converter & three phase semi- converter.

Unit-III

Choppers: Principle, control strategies, types of chopper circuits, step-up & step-down choppers, thyristor commutation in chopper circuits, voltage & current commutated choppers, load commutated chopper & multi phase choppers.

Power Supply: DC Power Supply: switch mode DC power supply, resonant DC power supply, bidirectional DC power supply. AC Power Supply: switch mode AC power supply, resonant AC power supply, bidirectional AC power supply.

Unit-IV

Inverters: Principle of operation, single phase bridge inverter & three-phase bridge inverter. Current source inverters.

Cycloconverter: Principle of operation, single phase to single phase step-up & step-down cycloconverter, mid-point cycloconverter & bridge type cycloconverter. Three phase half wave cycloconverter, three - phase to three phase cycloconverter, load commutated cycloconverter.

Text Books/References

1 P.C. Sen. Power Electronics.

2 Dubey. Power Electronics.

3 Ramamurthy. Power Electronics.

4 G.K. Mittal. Industrial Electronics.

5 Agarwal. Power Electronics Systems. Pearson Education India).

EC 366 (PEC) - PE-II(c) NANO-ELECTRONICS

Cr. Hrs. 3(3 +0+ 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Understand the basics of Quantum Mechanics and meso structures.

CO2: Apprehend the knowledge of Shrink-down approaches and system integration issues.

CO3: Conceptualize the idea of Resonant Tunneling Diode, Coulomb dots and Quantum confinement in semiconductor nanostructures.

CO4: Understand the concept of Carbon nanotube electronics.

Unit-I

Introduction to nanotechnology, meso-structures, Basics of Quantum Mechanics: Schrodinger equation, Density of States. Particle in a box Concepts, Degeneracy. Band Theory of Solids. Kronig-Penny Model. Brillouin Zones.

Unit-II

Shrink-down approaches: Introduction, CMOS Scaling, The Nanoscale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.).

Unit-III

Resonant Tunneling Diode, Coulomb dots, Quantum confinement in semiconductor nanostructures: quantum wells, quantum wires, quantum dots, super-lattices, band offsets, electronic density of states, Single electron Transistors.

Unit-IV

Carbon nanotube electronics, Band structure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation, Introduction of, Electrochemical Sensors, Sensors Based On Physical Properties, Nanobiosensors, Smartdust-Sensor for the future.

Text Books/References

1 G.W. Hanson, Fundamentals of Nano electronics, Pearson, 2009.

2 W. Ranier, Nano electronics and Information Technology (Advanced Electronic Material and Novel Devices), Wiley-VCH, 2003.

3 K.E. Drexler, Nano systems, Wiley, 1992.

4 J.H. Davies, The Physics of Low-Dimensional Semiconductors, Cambridge University Press, 1998.

5 C.P. Poole, F. J. Owens, Introduction to Nanotechnology, Wiley, 2003 problems.

EC 366 (PEC) - PE-II(d) BIO-MEDICAL ELECTRONICS

Cr. Hrs. 3(3+0 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Analyze electrical, mechanical & chemical activity of human body subsystem, principle transducers related to measurements and conversion of activity of human body.

CO2: Conceptualize cardiovascular effects and their measurements, instrumentation related to clinical laboratory.

CO3: Analyze the electrical activity related to neuromuscular and brain, analytical approach to graphical measurements related to neuromuscular systems.

CO4: Demonstrate the biotelemetry & computer application related to medical field, analyze monitoring systems related to patients

Unit-I

Principles of biomedical instrumentation and techniques, Interfacing problems of biomedical, electronic equipments with living systems. ECG, EEG, EMG instruments for measuring bio signals. Biomedical transducers. Bio-magnetic measurement and imaging. Cardiac output measurement techniques. Diagnostic and therapeutic instruments, Prosthetic devices such as pacemaker, hearing aid and myoelectric arm.

Unit-II

Functional electrical stimulation and algorithms for extremity control. Biotelemetry of biological signals, biosensors. Neonatal monitoring. Special aspects such as safety of medical electronic equipment.

Unit-III

Introduction to analog and digital computer simulation in biological sciences. Simulation of normal and pathological states. Pattern identification and tissue and cell typing. Automated examination and interpretation of X-ray films of lungs and hearts. Assembly of three dimensional images.

Unit-IV

Overview of Patient Monitoring Systems, Arrhythmia and Ambulatory Monitoring Instruments, Patient Safety, Digital Radiography, Nuclear Medical Imaging Systems, Magnetic Resonance Imaging System, Ultrasonic Imaging Systems, Thermal Imaging Systems, Pacemakers and Defibrillators, Automated Drug Delivery Systems.

Text Books/References

1 Biomedical Instrumentation: Technology and Applications by R. S. Khandpur. Tata McGraw Hill Publishers. 2003

2 Handbook Of Biomedical Instrumentation by Khandpur, R.S.; Tata McGraw Hill Publishers.

3 Biomedical Instrumentation and measurement by Cromewel, Wibell, Pfeiffer, 2nd edition, PHI.

4 Medical Instrumentation: Theory and Design, 3rd Ed by John Webster; Wiley India.

EC 366 (PEC) - PE-II (e) AI & EXPERT SYSTEMS

Cr. Hrs. 3 (3 +0+ 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Develop a basic understanding of AI concepts and programming languages.

CO2: Conceptualize different methods and rules to represent AI knowledge and fuzzy logic.

CO3: Analyze different strategies to organize AI knowledge and to manipulate it.

CO4: Apprehend the knowledge of systems architecture

Unit-I

Introduction to AI Knowledge: Importance of AI. Knowledge Base System Knowledge organization & manipulation, Conceptual Introduction to LISP and other AI programming Languages.

Unit-II

Knowledge Representation: Syntax Semantics, Inference Rules, Non deductive Inference methods, and representation using rules, forward chaining and backward chaining. Fuzzy Logic & Natural languages computations, Probabilistic Reasoning, Object Oriented Representations.

Unit-III

Knowledge Organization & Manipulation: Search & control strategies, matching techniques, knowledge organization & management, Genetic Algorithms based search techniques.

Unit-IV

Knowledge Systems Architecture: Rule based, non-production, uncertainty knowledge system building tools.

Knowledge Acquisition: General concepts, learning by induction.

Text Books/References

1 AI & ES. Dan W.Patterson.

2 Luger. Artificial Intelligence.

3 Jockson. Introduction Expert Systems Knigh- Artifical Intelligence, Tata Mc-Graw Hill.

VII Semester

EC 471 (PCC) - MOBILE COMMUNICATION AND NETWORKS

Cr. Hrs. 3 (3+0 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Understand fundamentals of mobile and wireless communication along with the prevailing and upcoming technologies in this area.

CO2: Design theory of cellular telephony along with international standards, channel assignments and frequency allocation.

CO3: Develop various propagation strategies by understanding indoor/outdoor models which are used to design cellular network in the field.

CO4: Understand various multiple access techniques like FDMA/TDMA/CDMA and diversity techniques along with brief introduction of various cutting edge technologies like Bluetooth and wireless LAN networks.

Unit-I

Mobile Radio Systems: Historical background of mobile radio communication, Mobile radio standards around the world. Working and operation of cellular (Hexagonal cell structure) communication, Call origination and Termination, Introduction of 2G, 2.5G, 3G ,4G and 5G Cellular networks and introduction of MIMO networks.

Unit-II

Cellular System Design Fundamentals: Introduction, Frequency reuse, Hand off strategies, Interference & system capacity, Improving coverage and capacity in cellular system, Call routing in GSM, GSM frequency allocation and frame structure and channel assignments.

Unit-III

Mobile Radios Propagation: Free space model, Ground- reflection model, Knife- edge diffraction model, Okumura model, Indoor

propagation models. Small Scale Fading & Multipath propagation: Impulse responses model of a multipath channel, Doppler shift Multipath measurements, Parameters of mobile multipath channels, Types of small scale fading, Clark's model & Two – ray Rayleigh fading model.

Unit-IV

Multiple Access Techniques for Wireless Communication: FDMA, TDMA, SDMA, CDMA, Diversity techniques.

Data Transmission: Introduction of Wireless technique for data transmission & standards. Bluetooth and wireless LANs.

Text Books/References

1 S. Rappaport Theodore. Wireless Communications: Principles & Practices.

2 C. Y. Lee William. Mobile Cellular Telecomm.

3 Schiller. Mobile Communication. Pearson Education India.

4 Raymond Steele, Mobile Radio Communications, IEEE Press, New York, 1992.

EC 472(PCC) - EMBEDDED SYSTEMS

Cr. Hrs. 4(3 +0+ 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcomes: The student will be able to

CO1: Understand the general structure of embedded systems and their design requirements.

CO2: Design embedded system hardware and software programs to control embedded system.

CO3: Test hardware and software of embedded system. Learn Real Time Operating System and write Device Drivers.

CO4: Understand and apply bus protocols for design of embedded system.

Unit-I

Introduction: Embedded Systems overview, characteristics of embedded systems, applications, common design metrics, and design challenges, Processor technology, IC technology, Design Technology, Types of Embedded systems, Hardware and software units of embedded systems, embedded system development tools, examples of embedded systems.

Unit-II

Processors and Controller: ARM Embedded Systems, ARM Processor Fundamentals and Architectures, ARM Instruction Set, ARM advanced Family processors, PIC Microcontroller and its Architecture. Real Time Operating Systems: OS services, Network OS, RTOS in embedded systems, RTOS scheduling models, task enrolment and scheduling, task prioritization, context switching, multitasking, pre-emptive and cooperative inter task communication, event management, and locking mechanism, interrupt handling, Introduction to Open Source RTOS like uCOS, Free RTOS etc. and overview of Mobile OS.

Unit-III

Device Drivers: Introduction to device drivers, their functions, architecture, types, and implementations. Bus Protocol and Networks for Embedded Systems: USB (Universal Serial Bus), SPI (Serial peripheral interface), I2C, CAN (Controller area network) Bus, Distributed embedded architecture.

Unit-IV

Embedded Programming: Tools and Languages Embedded System Design (C, Python, Rust, etc): Unified Modeling Language (UML), C language, Case Study based on Recent Trends in Architecture and Applications.

LIST OF PRACTICAL EXPERIMENTS

1 Write an assemble language program to generate 10Khz square wave.

2 To study implementation and interfacing of display device like LCD, LED & seven segment display with microcontroller 8051/AT89C51.

3 To study implementation and interfacing of different motors like stepper motor, DC motor & Servo motor.

4 Write ALP for temperature & pressure measurement.

5 Write a program to interface a graphical LCD with 89C51.

6 To study program for transmission and reception of data through serial port & parallel port.

7 To interface PWM based voltage regulator using PIC Microcontroller

8 Study and analysis of interfacing of Graphical LCD using PIC controller.

9 Study and interfacing of IR (RC5 protocol) and RF communication using PIC controller.

10 Study of SD/MMC card interfacing using 18F4550.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1 Shibu K. V, Introduction to Embedded Systems, TMH.

2 Frank Vahid, Tony Givargis, Embedded system design: A unified Hardware/Software introduction, Wiley.

3 Steve Furber, ARM System-on-Chip Architecture, Addison-Wesley.

4 Andrew N. Sloss, Dominic Symes and Chris Wright, ARM System Developer's Guide, Designing and Optimizing System software., Elsevier.

5 Muhammad Alimazidi, PIC Microcontroller And Embedded Systems: Using Assembly And Cn., Pearson education India.

EC 473 (PCC) - OPTICAL FIBER COMMUNICATION

Cr. Hrs. 4(3 +0+ 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcomes: The student will be able to

CO1: Conceptualize and demonstarte the guided transmission and reception of optical signal through dielectric solid cylindrical waveguide.

CO2: Analyze characteristics of OFC channel, system components and signal degradation mechanisms influencing its performance.

CO3: Compute structural & design parameters of various light sources & light detectors for Optical Fibre Communication.

CO4: Design, Demonstrate an Optical Fibre Communication link and compute its performance parameters.

Unit-I

Optical Fibers: Basic optical laws and definitions, Principles of light propagation in fibers, Ray theory, Optical fiber modes and configurations, Step index and graded index fibers, Monomode and multimode fibers, Fiber materials, fiber fabrication, Fiber optic cables. Signal Degradation in Optical Fibers: Attenuation, signal distortion in optical fibers, dispersion-intra modal & inter modal, Dispersion shifted and flattened fiber.

Unit-II

Optical Sources: LED's- Structure, Materials, Characteristics, Modulation, Power and efficiency, Laser Diodes-Basic concepts, Structure, properties and modulation.

Unit-III

Optical Detectors: PIN and avalanche photo diodes, photo detector noise, detector response time, Avalanche multiplication noise. Photo diode materials. Fundamental of Optical Receiver Operation.

Unit-IV

Optical Fiber Communication Systems: Source to fiber coupling, fiber to fiber joints, fiber splicing, fiber connectors. Principal components. Link design calculation, Application, Wavelength division multiplexing. Optical Fiber Measurements: Measurements of Fiber attenuation. Dispersion, refractive index profile, Numerical aperture & diameter.

LIST OF PRACTICAL EXPERIMENTS

1 To set up analog and digital link using fibre optical trainer kit.

2 Plot V-I and P-I characteristics of LASER source at 1550 nm.

3 Plot V-I and P-I characteristics of LED source at 850 nm.

4 Measurement of Numerical Aperture of a given optical cable using fibre optical trainer kit..

5 Measurement of Bending loss of a given fibre cable w.r.t. radius of the bend using fibre optical trainer kit.

6 Establish analog and digital signal transmission using 1550 nm LASER source.

7 Measurement of propagation loss of a given fiber cable using fibre optical trainer kit.

8 Demonstrate the generation of FM signal and transmit using fibre optic trainer kit.

9 Demonstrate the working of WDM using optical fibre trainer.

10 To develop and observe the eye pattern on DSO using eye pattern module and measure the BER.

11 To obtain intensity modulation of an analog signal, transmit it over a fibre optic cable and demodulate the same at the receiver to recover the original signal.

12 To obtain intensity modulation of an digital signal, transmit it over a fibre optic cable and demodulate the same at the receiver to recover the original signal.

13 Demonstrate the working of PWM using optical fibre trainer.

14 To study working of optical spectrum analyzer.

15 Measurement of performance parameters of OFC using OSA.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1 Gerd Keiser. Optical Fiber Communications, Tata Mc-Graw lHill.

2 J.N. Senior. Optical Fiber Communications, Prentice Hall of India.

3 J.Gowar. Optical Communications system, Prentice hall of India.

4 J.Wilson & Hawkes. Opto Electronics-An Introduction, Prentice Hall of India.

5 Joseph C. Palais. Fiber Optic Communications, LPE, Pearson Education Asia.

EC 474 (PCC) – RADAR & TELEVISION ENGINEERING

Cr. Hrs. 4(3 +0+ 1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

Course Outcomes: The student will be able to

CO1: Conceptualize radar systems, radar types & various analytical parameters related to transmission & receiving of signal using radar.

CO2: Analyze color & monochrome television system; analyze composite video signals, aircraft landing systems.

CO3: Conceptualize TV transmission systems, transmitting antennas, TV cameras.

CO4: Analyze TV receiver systems and concepts behind working of picture tubes, signal segregation in receiver systems.

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Unit-I

Radar: Radar Block diagram, frequencies and applications, Radar range equation, Continuous wave (CW) & FM radar; Moving target indicator (MTI): Delay line cancellers, blind velocity Pulse Doppler Radar. Tracking radar sequential lobbing, Conical scan and mono-pulse radar, Types of display, Radar receivers, Noise figure.

Unit-II

Navigational aids: Principle of operation of Radar direction finder & range system, LORAN system, DME, TACAN, Aircraft landing systems. TV Engineering Introduction: Theory of scanning standards, Principles of Monochrome and colour T.V. system (PAL, SECAM, NTSC). Composite video signal analysis.

Unit-III

Transmission: Monochrome & colour T.V. cameras, Image orthicon, plumb icon, Videocon and CCD camera tubes, and Picture, colour and sound carriers. Vestigial side band transmission. Encoding picture information. Chrominance modulation. Compatibility of colour and monochrome T.V. systems. Block diagram of T.V. transmitters. TV transmitting antennas.

Unit-IV

Reception: Types of Monochrome and colour picture tubes, set-up adjustments, Decoding picture information. Functional block diagram of T.V. receiver, R.F. Tuner, I.F. amplifier, Video detector, video amplifier, AGC, Synch. Separation, Sync. Processing and AFC. Deflection oscillators, vertical & horizontal deflection and sound system circuits. EHT generation. Common faults and their diagnosis T.V. receiving antennas.

LIST OF PRACTICAL EXPERIMENTS

1 Investigate the fundamental concept of Doppler Radar, Set up radar and tune it for best performance and measure speed of fan using radar also find out the time period and frequency of a moving pendulum for different length

2 Measure the speed of moving object using velocity simulator.

3 Understand the working of SMPS section and isolate the fault of DC main supply and identify the fault caused by picture tube by changing the load of the SMPS

4 Determine the faults in LED TV trainer kit for sound and keypad section.

5 Identify the faults in LCD TV trainer kit for sound, remote and power section.

6 Identify the fault that may be responsible for cracking/faulty audio. By understanding the effect of cutting of power supply of audio amplifier transistor “t601” and understand the role of controlling voltage by volume control signal transistor “t901” in the working of color television on the color TV trainer kit.

7 Understand the division of RF range between three bandwidth of the incoming cable signal for VI, VH & UHF range and also understand the reason behind applying horizontal alignment to the picture tube by coming from the horizontal driver circuit and control by the transistor switch “t404” D1877.

8 Understand the Various Section of Color TV trainer kit.
- EHT Section
- Vertical & Horizontal Section
- Memory Section
- Remote Control Section

9 Study the block diagram and working principle of DTH receiver and demonstrate faults and also observe voltage and waveforms.

NOTE: ***The actual number of experiments may be more than the above mentioned list.***

Text Books/References

1 M.I.Skolink. 'Introduction to Radar System', Mc-Graw Hill.

2 N.S. Nagaraja. 'Elements of Electronic navigation', Tata Mc-Graw Hill.

3 R.R. Gulati. Monochromic and Colour Television, Wiley Eastem.

4 Dhake. Television Engineering. Tata Mc-Graw Hill.

EC 475 (PEC) - PE-III (a)
TESTING AND VERIFICATION OF VLSI CIRCUITS

Cr. Hrs. 3(2 +0+ 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcomes: The student will be able to

CO1: Understand the basics of testing and its importance in VLSI circuits.

CO2: Understand the concepts of verification, verification methods and its importance in VLSI circuits.

CO3: Conceptualize the idea of fault modeling and testability measures.

CO4: Develop the notion of design for testability, different testability techniques, DFT and BIST techniques in given electronic design.

Unit-I

Introduction to Testing: Testing philosophy, Role of testing, Digital and analog circuit testing, Technology trends affecting testing, Test Equipment's, Economics and Quality: Test economics, Defining cost, Benefit-cost analysis, the rule of Ten Yield.

Unit-II

Verification: Importance of verification, Verification plan, Verification flow, Levels of verification, Verification methods and languages, Functional Verification: Introduction to test bench, Test bench architecture, Types of test benches.

Unit-III

Fault Modeling: Defects- Errors-Faults, Functional Versus Structural Testing, Level of fault models, A glossary of fault models, Single stuck at fault, Multiple stuck at faults, Fault equivalence, Automatic Test Pattern Generation: Digital circuit testing, Testability measures: Controllability, Observability, Basic ATPG, Combinational ATPG Algorithms.

Unit-IV

Design For Testability: Ad-hoc Design for Testability techniques, Structured DFT, Scan-Chain insertion, Scan architecture, Test for scan circuits, Full serial integrated scan, Multiple scan, Partial scan isolated serial scan, Non isolated scan, Built In Self-Test: Introduction to BIST concepts, Hardcore, Level of test, Test pattern generation for BIST, Generic off line BIST architectures, System Level Test: Introduction to Boundary scan standards, JTAG-1149.1 standard, TAP/TAM, Memory test, IP core testing, Delay testing.

LIST OF PRACTICAL EXPERIMENTS

1 Functional Verification Tools Bus functional model (BFM)

2 Test Bench generation using HDL based simulators

3 PLI / FLI ,TCL / Tk, Test Pattern Generator

4 Inserting Scan-Chain in the design

5 DFT and BIST software Tools used for testing and verification

6 Verifying functional coverage, in the design

7 Timing Verification in the design

NOTE: ***The actual number of experiments may be more than the above mentioned list***

Text Books/References

1 M. L. Bushnell and V. D. Agrawal, Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits, Kluwer.

2 Janick Bergeron, Writing Testbenches, Functional Verification of HDL Models, Springer.

3 Abramovici, M. A. Breuer and A. D. Friedman, Digital Systems Testing and Testable Design, Wiley/IEEE Press.

4 Terng Wang et al., VLSI Test Principals and Architecture:, Morgan Kaufman.

EC 475 (PEC) - PE-III (b)
INTERNET OF THINGS AND ITS APPLICATION

Cr. Hrs. 3(2+0 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcomes: The student will be able to

CO1: Understand the basics of sensing, actuation and sensor networks.

CO2: Develop arduino programming. Interfacing sensors, Python programming and introduction to Raspberry Pi.

CO3: Learn to implement IoT using Raspberry Pi.

CO4: Understand the concepts of fog computing, smart cities, smart homes and Connected vehicles.

Unit-I

Introduction to IoT: Sensing in IoT, Actuation in IoT, Basics of Networking, Introduction of Sensor Networks .and types of Communication Protocols

Unit-II

Interoperability and Interfacing of sensors in IoT: Machine-to-Machine Communications, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino, Introduction to Python programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi.

Unit-III

Introduction to SDN and Cloud computing: SDN for IoT, Data Handling and Analytics, Cloud Computing, Cloud Computing Sensor-Cloud.

Unit-IV

Applications of IoT: Fog Computing, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT, Case Study: Agriculture, Healthcare, Activity Monitoring.

LIST OF PRACTICAL EXPERIMENTS

1 Introduction to Arduino and language.

2 Interfacing sensor with arduino.

3 Introduction to Raspberry Pi and language.

4 Interfacing sensor with Raspberry Pi.

5 Raspberry and Cloud interfacing.

6 Smart home Raspberry Pi.

NOTE: ***The actual number of experiments may be more than the above mentioned list***

Text Books/References

1 The Internet of Things: Enabling Technologies, Platforms, and Use Cases", byPethuru Raj and Anupama C. Raman (CRC Press).

2 "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti(Universities Press).

EC 475 (PEC) – PE-III (c)
INTRODUCTION TO MACHINE LEARNING (PEC)

Cr. Hrs. 3(2+0 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcomes: The student will be able to

CO1: Understand the concepts of Regression Techniques and Classification Techniques.

CO2: Apprehend the knowledge of Artificial Neural Networks.

CO3: Develop the notion of Unsupervised Learning and clustering.

CO4: Understand and apply Reinforcement learning and Evaluation Techniques.

Unit-I

Regression Techniques and Classification Techniques: Regression, Simple Linear Regression – Gradient Descent and Normal Equations Method, Multiple Linear Regression, Non-Linear Regression, Linear Regression with Regularization, Support Vector Regression, Evaluation Measures for Regression Analysis, Naïve Bayes Classification: Fitting Multivariate Bernoulli Distribution, Gaussian Distribution and Multinomial Distribution, K-Nearest Neighbours, Classification Trees, Support Vector Machines: Hard Margin and Soft Margin, Kernels and Kernel Trick, Evaluation Measures for Classification

Unit-II

Artificial Neural Networks: Biological Neurons and Biological Neural Networks, Perceptron Learning, Activation Functions, Multilayer Perceptrons, Back-propagation Neural Networks, Learning with Momentum, Winner-take-all Learning, Competitive Neural Networks.

Unit-III

Unsupervised Learning and clustering: K-means clustering, fuzzy c-means clustering, Mean-shift clustering, Hierarchical Agglomerative Clustering, Density based spatial clustering of applications with noise, Self-Organizing Maps, Mixture models and EM, Hidden Markov models.

Unit-IV

Kernel Methods, Reinforcement learning and Evaluation Techniques: Support Vector Machine, Sparse kernel machines, Graphical Models, Approximate Inference, Sampling Methods, Q Learning, Non deterministic rewards and Actions. Evolutionary computing: Genetic Algorithms, Genetic Programming, The PAC and mistake bound learning framework VC dimension, Minimum description length principle.

LIST OF PRACTICAL EXPERIMENTS

1 Generating Normal and multivariate Gaussian distribution with few different means and variances and plot their pdf.

2 Generate 3-dimensional Gaussian distributed data with mean [2.3.5],[0,2,2] and variances [2,0,0;0,2,0;0,0,2],[5,1,1;1,4,0;1,0,3] respectively . Draw 1000 data points from each distribution and perform Naive Bayes Classification

3 Perform classification on UCI machine learning repository iris data using Naive Bayes Classifier.

4 Draw samples from p(x) = P1.p1(x) + P2.p2(x) where, P1 = 0.6, P2 = 0.4, p1(x) ~ N(5,10) and p2(x) ~ N(10,15). Use KDE to derive PDF

5 Implement k-means clustering algorithm. Use IRIS data to evaluate performance of the algorithm

6 Implement Fuzzy c-means clustering algorithm. Use IRIS data to evaluate performance of the algorithm.

7 Perform k-NN classification on IRIS data. Validate your results with 5-fold validation

8 Perform SVM classification on IRIS data

9 Mini Project 1

10 Mini Project 2

NOTE: ***The actual number of experiments may be more than the above mentioned list***

Text Books/References

1 T.M. Mitchell, Machine Learning, McGraw-Hill.

2 Ethern Alpaydin, Introduction to Machine Learning, MIT Press.

3 Duda R.O. and Hart P.E., Pattern Classification and Scene Analysis, John Wiley & Sons, NewYork.

4 Chris Bishop. Pattern Recognition and Machine Learning, Springer.

5 N. Cristianini and J. Shawe-Taylor, “An Introduction to Support Vector Machines”, Cambridge Univ. Press.

6 C. Bishop, Pattern Recognition and Machine Learning, Springer.

7 R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification and Scene Analysis, Wiley.

8 Kishan Mehrotra, Chilukuri Mohan and Sanjay Ranka, Elements of Artificial Neural Networks, Penram International.

EC 475 (PEC) - PE-III (d)
MICROWAVE DEVICES

Cr. Hrs. 3(2 +0+ 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcomes: The student will be able to

CO1: Understand Microwave measurement techniques used to measure various performance parameters of microwave devices.

CO2: Model the microwave semiconductor devices like microwave diodes, transistors and JFET devices and analyze its characteristics.

CO3: Understand manufacturing process of developing microwave semiconductor devices in industries and their types.

CO4: Understand various micro strip filters along with directional couplers and power dividers and to analyze their performance and design parameters.

Unit-I

Microwave Measurement: Detection of microwaves, Microwave power measurement, and Impedance measurement, Measurement of scattering parameters, Frequency measurement, and VSWR measurements.

Unit-II

Microwave Semiconductor Devices: Operation and Practical applications of PIN diode, Varactor and Tunnel diode, Gunn diode, IMPATT, TRAPTT diodes, BJT, JFET, MESFET, CCD, MASER and LASER.

Unit-III

Monolithic Microwave Integrated Circuits: Introduction, Materials, MMIC Growth, MOSFET fabrication thin film formation, Hybrid integrated circuit fabrication, Advantages & Difficulties of MICs.

Unit-IV

Microwave Lines and Filters: Introduction to micro strip lines, Parallel strip lines. Coplanar strip lines, Shielded strip lines, Slotted lines. Construction, Introduction to Micro strip filters, Directional coupler (Branch line & parallel coupled), Hybrid rings, Power dividers, Micro strip phase shifter.

LIST OF PRACTICAL EXPERIMENTS

1 Development of an experimental setup to carry out square wave modulation through PIN diode.

2 Development of test setup for measurement of scattering parameters of various microwave components.

3 To determine the different characteristics like S parameter of various waveguide TEE.

4 Designing of MMIC structure using Advance Designing Software (ADS).

5 Determine various characteristics of GUNN diode on Vector Network Analyzer

6 Measure power division and various characteristics of micro strip Wilkinson power divider using VNA.

7 To find out the antenna radiation pattern in Anechoic Chamber lab.

NOTE: ***The actual number of experiments may be more than the above mentioned list***

Text Books/References

1 S.Y. Laio. 'Microwave devices and Circuits', Prentice-Hall of India.

2 Mathew M. Radmanesh, “Radio Frequency & Microwave Electronics”, Pearson Education Asia, Second Edition

3 Reinhold Ludwig and Powel Bretchko,” RF Circuit Design – Theory and Applications”, Pearson Education Asia, First Edition.

4 David M. Pozar, “Microwave Engineering, 4th Edition” Wiley

5 Devendra K. Misra ,”Radio Frequency and Microwave Communication Circuits – Analysis and Design “John Wiley & Sons, Inc.

6 Ulrich L. Rohde and David P. New Kirk, “RF / Microwave Circuit Design”, John Wiley & Sons USA.

****OPEN ELECTIVE**

Note: The students have to take one open elective out of the list given except the subjects offered by their own branch.

CE 478a (OE) URBAN WASTE MANAGEMENT

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of the course, the student will be able to:

CO1: Demonstrate knowledge of Problems & National & global scenario of solid waste management.

CO2: Demonstrate knowledge of solid waste seperation, collections, transfer and transport.

CO3: Analysis of solid waste & chemical characteristic of refuse.

CO4: Understand composting and incineration.

CO5: Understand sanitary land filling.

CO6: Monitor effects of solid waste on environment.

Unit -I

General: Problems associated with Solid Waste Disposal. National & global scenario of solid waste management.

Generation of Solid Waste: Objectives of solid waste management, Classification of solid waste. Activities associated with generation of solid waste, quantity of waste generation, factors affecting solid waste generation.

Unit -II

Types of Solid Waste: Sources of solid waste. Food & biodegradable waste, recyclable waste. hazardous waste.

***Waste Collections, Transfer and Transport*:** Storage of waste at source & source separation of waste. Primary collection of waste, secondary storage of waste. Waste storage depot. Transportation of waste.

Unit-III

Analysis of Solid Waste: Need for physio-chemical analysis of municipal solid waste. Physical characteristic of refuse : specific weight & category analysis.

Chemical Characteristic of Refuse: Determination of moisture content, volatile solid, pH, carbon, nitrogen, phosphorus, potassium & calorific value.

Composting & incineration, their advantages & disadvantages.

Unit-IV

SanitaryLandFilling: Introduction, approach to design of sanitary land filling. Typical component of land-fill cover. Various guide lines for design of land-fill. Trench of municipal solid waste disposal. Environmental quality monitoring at land-fill site. Recommendation for problems of municipal solid waste.

Practical: As per theory syllabus.

Suggested Books & References

1. G. Techobanogious, H. Theisen& R. Blassen, 'Solid Waste Engineering, Principles and Management Issues', McGraw Hills, Book Co. New York.
2. C.L. Mentell, 'Solid Waste Management, 'John Whely, New York.
3. Bhide & Sundrashen, 'Solid Waste Management in Developing Countries'.

CE 478b (OE)
GROUND IMPROVEMENT TECHNIQUES

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of the course, the student will be able to:

CO1: Ground Improvement Techniques & Methods of soil stabilization.

CO2: Understand soil cements stabilization.

CO3: Stabilize dune sand by lime fly ash

CO4: Demonstrate knowledge of Soil Bituminous stabilization and Thermal stabilization.

CO5: Understand Granular column and soil reinforcement.

CO6: Demonstrate knowledge of Dynamic compaction.

Unit -I

Ground Improvement Techniques: Shallow and deep techniques. Soil stabilization; Purpose, mechanical mixing of different types of soils, grading land plasticity charcteristics.

Soil Lime Stabilisation: Base exchange, Pozzolinic reaction, curing, Types of soils, stabilised, density, effect on consistency properties. Effect of lime on liquid limit, plastic limit, plasticity index and shrinkage limit. Relationship of strength with curing period & density.

Unit -II

SoilCement Stabilisation: Soilcement stabilisation, Mechanism of soilcement stabilisation. Various theories; Modified soil cement & plastic soil cement. Effect of density, curing period and surface area on strength.

Soil Fly-Ash Stabilisation: Soil-lime fly ash stabilisation, principles of pozzolanic reaction. Proportions used in practice. Stabilisation of dune sand by lime fly ash.

Unit-III

Soil Bituminous Stabilisation: Soil bituminous stabilization Intimate mix theory & plug theory. Effect of mixing, moisture, aerating, density & compaction.

Thermal Stabilisation: Theory of thermal stabilisation, Electroosmotic drainage. Double layers, 'Ke' electro osmotic coefficient of permeating, Full scale field test, Electro osmotic chemical hardening Field construction methods and equipment.

Dynamic compaction of soil Equipments used, tests performed in field, Pre compression and Vertical Drains.

Unit -IV

Granular Columns: Methods of construction, bearing capacity of composite soil. Empirical methods/charts, Theory of determination of settlement of composite soil. Vibro-flotation &vibro-compaction.

Soil Reinforcement: Geosynthetics, Geomembrane,

Practicals : As per theory syllabus.

Suggested Books & References

1. Purushotham, P. Raj, 'Ground improvement Techniques'.
2. Venkaramiah, C., 'Ground Improvement'.
3. Madhav, M.R., 'Development in Reinforcement of Ground and Slopes'.

CS 478 (OE)
CSE-OE: INTRODUCTION TO CYBER SECURITY

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course outcome: At the end of the course, the student will be able to:

CO1: Describe and analyze the term ethics related to cyber security.

CO2: Evaluate designs related to ethical hacking, penetration testing, privacy and security of system.

CO3: Analyse and compare symmetric-key encryption public-key encryption schemes based on different security models.

CO4: Identify issues to protect digital assets in compliance with cyberwarfare.

Prerequisite: *Prior knowledge of using open source operating system, shell programming, open source security tools and ability to design a cryptosystem is desirable.*

Unit – I

Introduction to Ethics: the field of ethics, how it differs from either law or religion, why it is still necessary when we have both law and religion; The Ethical Frameworks: introduction to three stances applied to thinking about ethics: virtue ethics, utilitarianism, and deontological ethics.

Unit – II

The Ethical Hacker: Introduction to the notion of ethical hacking, the hacker code and the particular problem of penetration testing; The Problem of Privacy: What is privacy?, how is it different from security?, ethical issues related to privacy.

Unit – III

Cryptography Techniques: Plain Text and Cipher text, Substitution techniques, Transposition techniques, Encryption & decryption, Computer-

based Symmetric key Cryptography Algorithms: Algorithms types and modes, overview of symmetric key cryptography, data encryption standards (DES), Advance encryption standards (AES), Shannon's theory of confusion and diffusion. Computer- based Asymmetric key Cryptographic Algorithms: RSA algorithms, MD5 Digital Signature.

Unit – IV

The Problem of Surveillance: Introduction to surveillance, types of surveillance, surveillance practices; The Problem of Piracy: the problem of piracy and intellectual property theft.

Problem of Cyberwarfare: What is cyberwarfare?, the players involved, ethics of cyberwarfare; The Way Forward: some thoughts about what a Code of Ethics contains and what it means to practice professionalism in one's craft, future of cyber security, introduction to some ethical issues.

Text Books/References

1. "Cybersecurity Ethics: An Introduction", Mary Manjikian, Taylor & Francis Group.
2. "Cybersecurity and Cyberwar: What everyone needs to know", P. W. Singer and Allan Friedman, Oxford University Press.
3. "Cryptography and Network Security", Atul Kahate, Tata McGraw-Hill Publishing Company Ltd.
4. "Cryptography and Network Security", William Stallings, Pearson Asia.

MI 478 (a) (OE) ENGINEERING GEOLOGY

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of course, the students will be will able to:

Identify the structure of earth; Distinguish between different rocks and their properties; Select sites for different structures in different zones and Explore subsurface using different techniques.

Unit-I

General Geology: Subdivision of Geology. Importance of Geology in Civil Engineering. Internal Structure of the Earth, physical properties of minerals, weathering and erosion. Geological work of wind, river and ocean. Stratigraphic aspects of rocks for civil engineers. Geological Time Scale, rock provinces.

Unit-II

Petrology: Origin & classification of rocks. Texture & Structures of Igneous, Sedimentary and Metamorphic Rocks. Engineering Properties of rocks. Rocks and dimensional stones as a construction material. Suitability of rocks for different Civil Engineering purposes. Structural Geology: Causes & Classification of fold, fault, joints & unconformities. Outcrop pattern. Recognition of structure from rock outcrops.

Unit- III

Natural Disasters and Geological Investigations (in reference to Civil Engineering): Earthquake, its causes, intensity scale and seismic zone of India. Site selection for dam, tunnels, multistoried buildings, reservoirs and bridge structures Improvement Techniques: Sites improvement techniques practiced in different civil engineering projects. Introduction to drilling methods.

Unit-IV

Geophysical Methods for Subsurface Exploration: Electrical resistivity, Seismic refraction & Ground Penetrating Radar method of civil engineering importance. Remote Sensing: Introduction and applications in Civil Engineering. Image acquisition, image interpretation (visual and digital, digital terrain model, airborne lithological identification). Remote sensing software used in civil engineering interpretation.

Practical: As per theory part**.**

Text Books/References

1. Goodman, R. E., 'Engineering Geology - Rock in Engineering Construction', John Wiley and Sons.
2. Parbin Singh, 'Text Book Engineering Geology'.
3. Blyth, F.G. and De Freitas, M.H., 'A Geology for Engineers', (7th Edition), Edward Arnold.
4. N.Chenna Kesavulu, 'Text Book of Engineering Geology'.
5. Leggot R.F., 'Geology for Engineers'.
6. Kryinine & Judd, 'Engineering Geology and Geo-techniques'.
7. John Pitts, 'Manual of Geology for Civil Engineers'.
8. Tony Waltham, 'Foundations of Engineering Geology.

MI 478 (b) (OE) EARTH MOVING MACHINERY

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of course, the students will be will able to:

Understand construction and working of various heavy earth moving machinery, pumping system used in mines, maintenance aspects

Unit-I

Construction and operation of blast hole drills, rippers, shovels, hydraulic excavators, scraper, dragline, dumpers, wheel loaders, dozers, graders, surface miners, BWE, spreader, stacker & reclaimer.

High capacity belt conveyors – constructional detail and selection procedures; High angle conveyor, Cable belt conveyor;

Unit-II

Aerial rope ways – classification, layout and constructional features.

Classification, application and constructional features of crushers, breakers and feeders; In pit crushers

Compressors: Basic theory, classification and application of compressors used in mines; Construction and operation of centrifugal and axial flow compressors; Performance characteristics of compressors; Selection of compressors for mining application.

Unit-III

Centrifugal Pumps: Principle of operation; theoretical and actual head, construction of impeller, multistage centrifugal pumps, axial thrust balancing, performance characteristics, parallel and series operations of pumps, capacity, selection of mine pumps; Pumping system layout for mines.

Construction and operation of slurry, submersible, air lift and mono pumps; installation and maintenance of pumps

Unit-IV

Recent trends and development of surface mining equipment: Automation and control in HEMM. Selection criteria of open cast mining equipment. Safety aspects related to open cast mining equipment: Fire protection system used in HEMM.

Faults and their rectification in HEMM and their maintenance.

Practical: As per theory syllabus.

Text Books/References

1. Surface Mining Technology– S. K. Das;Geeta Book Stores.
2. Elements of Mining Technology–D.J. Deshmukh; Vidyasewa Prakashan.
3. Mine, Pumps, Haulage & Winding– S. Ghatak; Coalfield Publishers, Asansol.
4. Conveying machines; Part I & II – A. Spivakovsky, V. Dyachkov; Mir Publishers, Moscow.
5. Recent Development of Heavy earth Moving machineries – A. De, Lovely Prakashan.
6. Moving the Earth – Nicholes.
7. On and with the Earth – J. Singh.
8. Drilling Technology Handbook– C. P. Chugh.

MI 478 (c) (OE) TUNNELING ENGINEERING

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of the course, the student will be able to:

Understand various methods of tunneling, use of latest numerical techniques for tunnel design, stability analysis and ground control measures with various steel support and rock reinforcement, maintenance of tunnels, provision of facilities such as ventilation, illumination etc in tunnels.

Unit-I

Introduction to tunneling; geological concept of tunneling. Influence of geological aspects on design & construction of tunnels.

Unit-II

Tunnelling Methods: Conventional and special Drill & blast roadway drivage machines, tunnel boring machines (TBM).

Unit-III

Stresses and displacements associated with excavating tunnels, Ground control or treatment in tunneling and drivages. Design of Supports of Tunnels; Steel supports, rock enforcements, new Australian tunneling methods (NATM).

Unit-IV

Design of Tunnels: Rock conditions, RMR, Q-system, RSR, rock mass behavior, stress strain behavior and stress analysis of tunnels. Maintenance: Dewatering, ventilation and illumination drivages tunnels. Numerical techniques: Introductory use of FLAC, PLAXIS etc

Practical: As per theory

Text Books/References

1. Richards E. Bullock – Tunnelling and Underground Construction Techniques.
2. Stack Barbara – Hand Book of Mining and Tunnelling Machinery, John Wiley & Sons.
3. R.V. Proctor – Rock Tunneling with Steel Supports.
4. J. Johnsen – Modern Trends in Tunneling and Blast Design.

ME478(a) (OE)
ENTREPRENEURSHIP AND INDUSTRIAL MANAGEMENT

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcomes: Upon completion of this course the students will be familiar with:

CO1: Selection and development of a small or medium business idea

CO2: Make and Implement project proposals and reports to hunt for venture capital etc.

CO3: Market competition and innovation in products and processes.

CO4: Develop managerial skills to achieve goals, & Plan and implement projects applying management techniques.

CO5: Understand social responsibility as a modern management concept.

Unit-I

Entrepreneurship: Definition and Meaning; Characteristics of Entrepreneurship / Traits of an Entrepreneur; Functions of Entrepreneurship - Job Creation, Innovation, Inspiration, Economic Development; Types of Entrepreneurship, Entrepreneurship and Intrapreneurship, Entrepreneurship Strategy

The Business Plan: Creating and Starting the Venture: The Marketing Plan, The Financial Plan, Sources of Capital; Legal Issues for the Entrepreneur: Patents, Trademarks, Copyrights, Trade Secrets, Licensing, Product Safety and Liability, Insurance; Contracts, Advertising, Supply Chain Management, Retail & FDI

Proposals & risks: Project Report Preparation (Feasibility, Cost Estimation, CVP Analysis, Detailed Project Report, Concept of Risk and decision making, Risk Management-SWOT etc

Unit-II

Entrepreneurship and Innovation: The Innovation Concept, Importance of Innovation for Entrepreneurship, Source of Innovation for Opportunities, The Innovation Process, Product life cycle, new product development process, mortality curve, Creativity and innovation in product modification/ development

Entrepreneurship and Economic Development: Role of Entrepreneurship in Modern Economy, Managers Vs Entrepreneurship**:** Characteristic of Managers, Characteristic of Entrepreneurs, Similarities and differences between Managers and Entrepreneurs

Unit-III

Industry, Commerce and Business: Types of ownership in the organization- Definition, characteristics, Merits & Demerits; Single ownership, Partnership, Cooperative Organizations, Joint Stock Companies, Government owned, Differences between Management and Administration, Leadership Models.

Industry Size & Current schemes: Micro, Small, Medium- Industry; Registration Process, Current Promotional Schemes for new Enterprise

Unit-IV

Function of Management: Planning- Types of Planning - Strategic Plan, Tactical Plan and Operation Plan; Organizing- Definition and Meaning, Types of Organizing; Staffing- Definition and Meaning, Types of Staffing – Internal & External, The Basic Steps in the Staffing Process; Directing (Leading)- Definition and Meaning; Controlling**-** Definition and Meaning, Relationship between Planning and Controlling.

Social Responsibility: Social Obligation, Social Responsiveness and Social Responsibility, Managerial Ethics

Practical: As per theory

Text Books/References

1. Entrepreneurship Development and Management, A. K. Singh, Jain Book Agency (JBA) publishes, New Delhi.
2. Small Scale Industries and Entrepreneurship, Vasant Desai, Himalaya 2008.
3. Industrial Engineering and Management, O.P.Khanna, Dhanpat Rai and Sons, Delhi.
4. Industrial Management and Entrepreneurship, V. K. Sharma, Scientific Publishers, New Delhi.
5. Entrepreneurship, Roy Rajeev, Oxford Latest Edition.

ME478(b) (OE) BIO-ENERGY SYSTEMS DESIGN

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcomes: Upon completion of this course the students will be familiar with:

CO1: Classifybioenergy fuels and their conversion technologies.

CO2: Describe the knowledge for operation of biomass gasifier, biomass pyrolysis and biogas plant.

CO3: Design system for biomass gasification, pyrolysis and biogas production.

CO4: Demonstrateproduction of biodiesel and bioethanol, and their application power generation and transportation.

CO5: Demonstrate socio-economic aspects and cost-economics analysis of biomass conversion technologies.

Unit – I

Introduction: Introduction to bio-energy from, classification of biomass as fuel – Agro based, Forest, residue. Bio-energy systems/Conversion devices – Incinerators, gasifiers, digestors.Design objectives for sustainable bio-energy systems.Bio-mass bricketing machine.

Biomass conversion processes: Thermo chemical conversion, Direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion.

Unit – II

Bio-mass Combustion: Basics of combustion, Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit – III

Bio-mass Gasification: Working principle, Gasifiers – Fixed bed system – Downdraft and updraft gasifiers,Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Bio-mass Pyrolysis: Pyrolysis – types, slow, fast; Manufacture of charcoal: methods -yields and application; Manufacture of pyrolytic oils and gases, yields and applications.

Unit – IV

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status, Design and constructional features; Biomass resources and their classification for biogas.

Review of mechanical Design: Materials of Construction, corrosion damage, testing and inspection.

System modelling: Basics and its mathematical model, Use of Software in system design. Economicsanalysis of bio-energy systems.

Practical: As per theory

Text books/ References

1. PrabirBasu, Biomass Gasification, Pyrolysis and Torrefaction: Practical Design and Theory, Academic Press, Elsevier, 2018.
2. John Rezaiyan, Nicholas P. Cheremisinoff, Gasification Technologies, Taylor & Francis, 2005.
3. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
4. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
5. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
6. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

ME478(c) (OE) ENERGY CONSERVATION AND MANAGEMENT

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcomes: Upon completion of this course the students will be familiar with:

CO1: To understand the basic knowledge ofdifferent terms & principles of energyconservation,audit and management.

CO2: To understand efficient heat utilization, saving andrecovery in different thermal system.

CO3: To prepare energy audit report fordifferent energy conservation instances.

CO4: To Evaluate the energy saving &conservation in different mechanical utilities.

Unit - I

Energy Scenario: Commercial and Non-Commercial Energy, Primary Energy Resources, Commercial Energy Production, Final Energy Consumption, Energy Needs of Growing Economy, Long Term Energy Scenario, Energy Pricing, Energy Sector Reforms, Energy and Environment: Air Pollution, Climate Change, Energy Security, Energy Conservation and its Importance, Energy Strategy for the Future, Energy Conservation Act-2001 and its Features.

Unit - II

Energy Management & Audit: Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments.

Financial Management: Investment-need, Appraisal and criteria, Financial analysis techniques- Simple pay back period, Return on investment, Net present value, Internal rate of return, Cash flows, Risk and sensitivity analysis; Financing options, Energy performance contracts and role of ESCOs.

Unit - III

Energy Monitoring and Targeting: Defining monitoring & targeting, Elements of monitoring & targeting, Data and information-analysis, Techniques -energy consumption, Production, Cumulative sum of differences (CUSUM).

Global Environmental Concerns: United Nations Framework Convention on Climate Change (UNFCC), Kyoto Protocol, Conference of Parties (COP), Clean Development Mechanism (CDM), Prototype Carbon Fund (PCF), Sustainable Development.

Unit - IV

Energy Efficiency in Thermal Utilities and systems: Boiler efficiency calculation, evaporation ratio and efficiency for coal, oil and gas, Boilers: Types, combustion in boilers, performances evaluation, analysis of losses, Condensate and flash steam recovery system, identifying opportunities for energy savings, Cupola, non-ferrous melting, Induction furnace, performance evaluation of a furnace, hot air generators, Feed water treatment, blow down, energy conservation opportunities, Furnaces: Classification, general fuel economy measures in furnaces, excess air, heat distribution, Soot blowing and soot deposit reduction, reasons for boiler tube failures, start up, shut down and preservation,

Steam System: Properties of steam, assessment of steam distribution losses, steam leakages, steam trapping, Steam utilization, Performance assessment more details, installation, Temperature control, draft control, waste heat recovery. Forging furnace heat balance, Thermic fluid heaters, super critical boilers, Thermo-compressor, steam pipe insulation, condensate pumping, steam dryers

Cogeneration: Definition, need, application, advantages, classification, saving potentials. Heat balance, steam turbine efficiency, tri-generation, micro turbine. Heat Exchangers: Types, networking, pinch analysis, multiple effect evaporators, condensers, distillation column, etc. Waste Heat Recovery: Classification, advantages and applications, commercially viable waste heat recovery devices, saving potential. Insulation and Refractories: Insulation-types and application, economic thickness of insulation, heat savings and application criteria, Refractory-types, selection and application of refractories, heat loss. Cold insulation. Heating, ventilation, air conditioning (HVAC) and Refrigeration System: Factors affecting Refrigeration and Air conditioning system performance and savings Opportunities. Vapor absorption refrigeration system: Working principle, types and comparison with vapor compression system and saving potential, heat pumps and their applications, section on ventilation system, ice bank system, and performance assessment of window and split room air conditioners, Star labeled pumps, cold storage refrigeration, and humidification system.

Practical: As per theory

Text Books/References:

1. Energy Conservation Guidebook, Dale R Patrick, Stephen W Fardo, 2nd Edition, CRC Press.
2. Handbook of Energy Audits, Albert Thumann, 6th Edition, The Fairmont Press.
3. Bureau of Energy Efficiency Reference book: No.1, 2, 3 4.
4. Energy Management Handbook, W.C. Turner, John Wiley and Sons, A Wiley Interscience publication.
5. Carbon Capture and Sequestration: Integrating Technology, Monitoring, and Regulation dited byE J Wilson and D Gerard, Blackwell Publishing.
6. Heating and Cooling of Buildings - Design for Efficiency, J. Krieder and A. Rabl, McGraw Hill Publication, 1994.

EE 478(a) (OE) Knowledge Based System

Cr. Hrs. 3 (3+0 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcome :

CO1: Know-how of Artificial neural networks.

CO2: Proficiency in learning techniques of artificial neural networks.

CO3: Know-how of fuzzy control techniques.

CO4: Capability to Adaptive Fuzzy control design.

Unit I

Artificial Neural Networks: Neural Networks- an overview, Introduction to Artificial Neural Networks (ANN), Historical Development of Neural Networks, Biological Neural Networks, Comparison Between Artificial and Biological Neural Network. Basic Building Blocks of ANN: Network Architecture, , Activation Function.

Unit II

Fundamental Models of Artificial Neural Networks: Introduction, McCulloch-Pitts Neuron Model. Learning Rules: Hebbian Learning Rule, Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square (LMS) Rule), Back Propagation Rule.

Unit III

Fuzzy Logic: Fuzzy logic concepts and application areas, classical and fuzzy Sets, fuzzy relation and membership functions, fuzzification and defuzzification methods, fuzzy rule base system.

Unit IV

Neural Network and Fuzzy Logic application in load forecasting, fault detection, economic load dispatch, voltage and reactive power control, load flow and electric drive control.

Text Books/References

1. S N Sivanandanm, S Sumathi and S N Deepa. Introduction to Neural Networks Using MATLAB- Tata McGraw- Hill Publishing Company Limited.
2. J.M. Zurada. Introduction of artificial neural systems - Jaico Publication House.
3. D. Driankov, H. Hellendoorn and M Rein frank. An introduction to fuzzy control - Narosa Publication House, 2nd reprint.

EE 478 (b) (OE) Advanced Power Converters

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcome :

CO1: Competency in Single-Switch Isolated Converters design**.**

CO2: Proficiency in Dynamic Analysis of DC-DC Converters

CO3: Know-how of resonant converter.

CO4: Know-how of Multilevel Converters**.**

Unit I

Single-Switch Isolated Converters: Requirement for isolation in the switch-mode converters, Forward and flyback converters, Push-Pull Converters Power circuit and steady-state analysis,.

Unit II

Dynamic Analysis of DC-DC Converters: Formulation of dynamic equation of buck and boost converters, averaged circuit models, linearization technique, small-signal model and converter transfer functions.

Unit III

Resonant Converters: Classification of Resonant converters-Basic resonant circuits- Series resonant circuit-parallel resonant circuits-Resonant switches. Concept of Zero voltage switching.

Unit IV

Multilevel Converters: Basic concept, classifications, working principle, applications.

Text Books/References

1. Switched Mode Power Conversion, Course Notes, CCE, IISc, 2004.
2. Issa Batarseh, 'Power Electronic Circuits', John Wiley, 2004.
3. Philip T Krein,' Elements of Power Electronics ',Oxford Press.
4. Fundamentals of Power Electronics – Robert Erickson and Dragon Maksivimovic,
5. Springer Publications. Power Electronics–IssaBatarseh- John Wiely
6. Elements of Power Electronics- Philip T.Krein – Oxford University Press.

EE 478(c) (OE)
Power Electronics in Renewable Energy Systems

Cr. Hrs. 3 (3+0 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcome :

CO1: Learning of Basics Renewable Energy Systems.

CO2: Proficiency in Dynamic modelling of Power Electronics converter.

CO3: Know-how of power electronics in Wind Power Plants.

CO4: Know-how of power electronics in Solar PV.

Unit I

Basics Renewable Energy Systems: Modern power electronics technology for the integration of renewable energy sources. challenges for grid integration,energy needs of India and energy consumption patterns, worldwide potentials of these sources.

Unit II

Power electronics converters: Various topologies of power electronics converters (PECs), power electronics converters (PEC) classifications, Dynamic modelling of Power Electronics converter

Unit III

Power electronics in Wind Power Plants: Grid interconnection requirements for wind farms, integration issues, operational issues, grid integration issues in India, wind power integration standards, super grid strategy, Applications of PEC in wind power plants, Modern PEC in wind power plants.

Unit IV

Solar Photo Voltaic (PV) Technology: Solar cell characteristics, parameters of solar cell and its equivalent circuit, PV Module and arrays, perturb and observe maximum power point tracking (MPPT) technique, components of PV system, design of a standalone PV system. Solar constant, solar radiation at the earth's surface, solar radiation geometry, solar radiation measurements, estimation of average solar radiation. Solar Thermal Systems: Types of collectors, collection systems and efficiency.

Text Books/References

1. Wind power plants and projects developments, Joshua Earnest and T Wizelius, PHI, New Delhi, 2011.
2. Handbook of renewable energy technology, World Scientific, Siongapore, 2011.

REE 478(OE); RENEWABLE ENERGY TECHNOLOGIES

Cr. Hrs. 3 (2+0 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome:

This course is undertaken to introduce basic aspects of renewable energy supply presenting fundamental characteristics of the resource base (solar, wind energy, bio energy, etc.) and principles of related technical systems (photovoltaic, wind, biomass power generation, etc.). In a further step an economic analysis of supply technologies will be undertaken. Students will learn to acquire a basic understanding of issues related to renewable energy supply systems.

Unit I

Conventional and Alternative Energy Sources: Effect on environment of fossilfuels, nuclear energy and hydroelectric power. Energy consumption pattern & energy resources in India. Renewable energy options, potential and utilization.

Unit II

Solar Energy: Solar thermal and Photovoltaic System for power generation. Flat platecollectors & Focusingcollectors. Solar water and air heaters, solar distillation, solar cooker, drying of materials, application in industries.

Unit III

Wind Energy: Nature and potential, wind mill types, their merits and demerit. Wind farms. Brief description of geothermal energy, ocean thermal energy, tidal and wave energy.

Unit IV

Biomass: Nature and potential, different bio conversion techniques, biogas, biodiesel. Power generation from biomass (gasification &dendro thermal) and fuel cell technology.

Practical

1. To study solar drying system.
2. To study solar water heating system.
3. To study box type solar cooker.
4. To study solar distillation system.
5. To study different biogas plants.
6. To study wind energy conversion systems.
7. To study downdraft biomass gasifier for thermal application.

Suggested Readings

1. G.D. Rai. Non Conventional Energy Sources, 2013, Khanna Publishers.
2. Twidell, J., & Weir, T. (2015). *Renewable energy resources*. Routledge.
3. Basu, Prabir. *Biomass gasification and pyrolysis: practical design and theory*. Academic press, 2010.
4. Rathore N. S., Kurchania A. K., Panwar N. L.;Non Conventional Energy Sources, Himanshu Publications, 2000.

SWE478(OE) AERIAL PHOTOGRAPHY, RS and GIS

Cr. Hrs. 3 (2 +0+ 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of the course, the student will be able to:

Familiarize with aerial photographs and its interpretation. Developing skill of use of various hardware and software in use of satellite data, GPS technology. Development of resource mapping and planning studies using RS and GIS.

Unit I

Aerial photography: Aerial photograph, their classification, map v/s aerial photograph, photogrammetry and its application. Elements of aerial photo interpretation, aerial photo interpretation and its use.

Unit II

Remote sensing: Definition, electromagnetic radiations,Interactions with the Atmosphere,Passive v/s Active Sensing, Characteristics of Images, Satellite and Sensors-Satellite Characteristics, Resolution, Multi-spectral Scanning, Thermal Imaging, Satellite missions, microwave sensing, Image Analysis- Visual interpretation, Digital image processing, image, Enhancement and Classification.

Unit III

GIS: Definition, basic components, data types- spatial, non- spatial, GIS data modeling, vector and raster representation, GIS data base management, GIS data file management.

Unit IV

GIS data input and editing: Data input methods, scanning, digitization, GPS data, data editing, errors and data reduction, Data analysis- format conversion, spatial measurement, overlay analysis and data output.

Practical

1. Study of aerial photographs under mirror stereoscope.
2. Preparation of stereo model of aerial photograph.

3. Land use/cover studies through aerial photograph.
4. Use of optical scanners and digitizers. U
5. Use of GPS in mapping and GIS data input, satellite data product.
6. Familiarization with image processing and GIS software's and their applications.

Suggested Readings

1. K.K. Rampal. (1999) Hand Book of Aerial Photography and Interpretation, Concept Publishing Company, New Delhi.
2. M. A. Reddy (2002) Remote Sensing and Geographical Information Systems, B.S. Publications, Hyderabad.
3. Lillisand and Kiefer (1987) Remote sensing and Image Interpretation, John Weiley and sons.

FMP 478(OE):MACHINERY FOR LAND DEVELOPMENT

Cr. Hrs. 3 (2 +0 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of the course, the student will have the knowledge of different earth moving machineries used for land development operation.

Unit-I

Land leveling Criteria for land leveling, plane profile and inspection, engineering fundamentals related to earth-moving machinery.

Unit-II

Earth moving and excavation machines classification and application of bulldozers, advantage and disadvantage, straight and angle bulldozers, moving earth with bulldozers and estimation of output of a bulldozer numerical problems.

Land clearing equipments, Power shovel: Construction and operation of power shovel size selection of power shovel factors affecting the output of a power shovel.

Unit-III

Scraper: Types, construction and operation of scrapers, size of the scraper, cycle time production rates of scrapers, numerical problems, load-growth curve and estimation of output of a scraper.

Dragline: Types of dragline, size basic parts and operation of a dragline, output of a dragline, estimation of output, effect of different factors on output, numerical problems.

Clam shell: Basic parts and operation of a clam shell, application, size and output of a clam shell.

Motor grader: Construction and operation of motor grader, application, basic adjustment parameters of major grader, output of motor grader,

Unit-IV

Trenching machines: types, construction and operation of wheel and ladder type trenching machines, selection of suitable equipment for excavating trenches and production rates of trenching machines.

Practical

1. Study of various components of bulldozers
2. Study of various components of Scraper:
3. Study of various components of Dragline
4. Study of various components of Clam shell
5. Study of various components of Scraper: Motor grader
6. Study of various components of Scraper: Trenching machines

Suggested Readings

1. R.L. Peurifoy. Construction, Planning, Equipment and Methods.
2. Mahesh Verma. Construction equipment and its planning and application.
3. Jagman Singh. Heavy construction, planning, equipment and methods.
4. A.M. Michael. Irrigation theory and practices.

PFE 478(OE):PACKAGING MATERIALS AND METHODS

Cr. Hrs. 3 (2 +0+ 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome:

At the end of the course, the student will be able to acquaint with various packaging materials, various aspects of packaging methods and technology.

Unit-I

Factors affecting package material, Packaging, requirement, importance and scope, frame work of packaging strategy, environmental considerations, Packaging systems, types: flexible and rigid; retail and bulk; levels of packaging.

Unit-II

Different types of packaging materials, their key properties and applications, metal cans, plastic packaging, different types of polymers used in packaging and their barrier properties. Manufacture of plastic packaging materials; glass containers, types of glass used in food packaging, manufacture of glass and glass containers, closures for glass containers. Paper and paper board packaging, modification of barrier properties and characteristics of paper/ boards.

Unit-III

Labeling on packages, shrink and cling packaging, vacuum and gas packaging; active packaging, factors affecting the choice of packaging materials, disposal and recycle of packaging waste, printing and labeling; lamination.

Unit-IV

Package testing, testing methods for flexible materials, rigid materials and semi rigid materials; Tests for paper, glass containers, metal containers.

Practical

1. Identification of different types of packaging materials.

2. Determination of tensile / compressive strength of given material/package.
3. Vacuum packaging of agricultural produces.
4. Determination of tearing strength of paper board.
5. Measurement of thickness of packaging materials.
6. To perform grease-resistance test in plastic pouches.
7. Determination of bursting strength of packaging material.
8. Determination of water-vapour transmission rate.
9. Shrink wrapping of various horticultural produce.
10. Testing of chemical resistance of packaging materials.
11. Determination of drop test of food package and visit to relevant industries.

Suggested Readings

1. Coles R., McDowell D. and Kirwan, M.J. 2003. Food Packaging Technology, Blackwell Publishing Co.
2. Gosby, N.T. 2001. Food Packaging Materials, Applied Science Publication
3. John, P.J. 2008. A Handbook on Food Packaging, Narendra Publishing House,
4. Mahadevia, M., Gowramma, R.V. 2007. Food Packaging Materials, Tata McGraw Hill
5. Robertson, G. L. 2001. Food Packaging and Shelf life: A Practical Guide,Narendra Publishing House.
6. Robertson, G. L. 2005. Food Packaging: Principles and Practice, Second Edition, Taylor and Francis Pub.

Notes