UG Syllabus For 3rd Semester Four Year Degree Program

(Provisional: subject to confirmation by the concerned department)

DEGREE PROGRAM IN COMPUTER SCIENCE AND ENGINEERING

Semester-III							
S.No	**Sub Code**	**Subject Name**	**L**	**T**	**P**	**Hrs.**	**Credits**
1	AM-511	Higher Engineering Mathematics	3	0	0	3	3
2	MC-511	Human Values and Professional Ethics	1	0	0	1	0
3	CS-511	Operating System	3	0	2	5	4
4	CS-512	Digital Circuit and Logic Design	3	0	2	5	4
5	CS-513	Data structures and Algorithms	3	0	4	7	5
6	CS-514	Database Management System	3	0	4	7	5
		Total	16	0	12	28	21

DEGREE PROGRAM IN CHEMICAL ENGINEERING

Semester-III							
S.No	**Sub Code**	**Subject Name**	**L**	**T**	**P**	**Hrs.**	**Credits**
1	AM-511	Higher Engineering Mathematics	3	0	0	3	3
2	CY-511	Industrial Chemistry	3	0	2	5	4
3	PH-511	Material Science	3	0	2	5	4
4	CH-511	Chemical Process Calculations	3	2	0	5	4
5	CH-512	Chemical Engineering Thermodynamics	3	2	2	7	5
6	CH-513	Chemical Technology-I	3	0	2	5	4
		Total	18	4	8	30	24

DEGREE PROGRAM IN ELECTRONICS AND COMMUNICATION ENGINEERING

Semester-III							
S No	**Sub Code**	**Subject Name**	**L**	**T**	**P**	**Hrs.**	**Credits**
1.	AM-511	Higher Engineering Mathematics	3	0	0	3	3
2.	MC-511	Human Values and Professional Ethics	1	0	0	1	0
3.	EC-511	Network Analysis & Synthesis	3	2	0	5	4
4.	EC-512	Analog Communication	3	2	2	7	5
5.	EC-513	Digital Electronics	3	2	2	7	5
6.	EC-514	Analog Electronics Circuits	3	2	2	7	5
		Total	16	8	6	30	22

DEGREE PROGRAM IN ELECTRICAL ENGINEERING

Semester-III							
S.No	**Sub Code**	**Subject Name**	**L**	**T**	**P**	**Hrs.**	**Credits**
1	AM-511	Higher Engineering Mathematics	3	0	0	3	3
2	MC-511	Human Values and Professional Ethics	1	0	0	1	0
3	EE-511	Network Analysis & Synthesis	3	2	2	7	5
4	EE-512	Electrical Machines(DC machines and Transformers)	3	2	2	7	5
5	EE-513	Electrical and Electronic Measurement and Instrumentation	4	0	0	4	4
6	EE-514	Transmission and Distriution of Electrical Power	3	2	0	5	4
7	EE-515	Simulation Lab	0	0	2	2	1
		Total	17	6	6	29	22

DEGREE PROGRAM INFOOD TECHNOLOGY

Semester-III							
S.No	**Sub Code**	**Subject Name**	**L**	**T**	**P**	**Hrs.**	**Credits**
1	AM-511	Higher Engineering Mathematics	3	0	0	3	3
2	CY-511	Industrial Chemistry	3	0	2	5	4
3	PH-511	Material Science	3	0	2	5	4
4	FT-511	Food Biochemistry and Nutrition	3	0	2	5	4
5	FT-512	Heat and Mass Transfer	3	0	2	5	4
6	FT-513	Unit Operations	3	0	2	5	4
		Total	18	0	10	28	23

DEGREE PROGRAM IN INSTRIUMENTATION AND CONTROL ENGINEERING

Semester-III							
S.No	**Sub Code**	**Subject Name**	**L**	**T**	**P**	**Hrs.**	**Credits**
1	AM-511	Higher Engineering Mathematics	3	0	0	3	3
2	MC-511	Human Values and Professional Ethics	1	0	0	1	0
3	IE-511	Digital Electronics	3	0	2	5	4
4	IE-512	Linear Integrated Circuits	3	0	2	5	4
5	IE-513	Signals and Systems	3	2	0	5	4
6	IE-514	Electrical Machines	3	2	2	7	5
7	IE-515	Circuit Theory	3	0	0	3	3
		Total	19	4	6	29	23

DEGREE PROGRAM IN MECHANICAL ENGINEERING (MANUFACTURING)

Semester-III							
S.No	**Sub Code**	**Subject Name**	**L**	**T**	**P**	**Hrs.**	**Credits**
1	AM-511	Higher Engineering Mathematics	3	0	0	3	3
2	CY-511	Industrial Chemistry	3	0	2	5	4
3	PH-511	Material Science	3	0	2	5	4
4	ME-511	Applied Thermodynamics	3	0	2	5	4
5	ME-512	Manufacturing Processes	3	0	2	5	4
6	ME-513	Fluid Mechanics	3	2	2	7	5
		Total	18	2	10	30	24

DEGREE PROGRAM IN MECHANICAL ENGINEERING (WELDING)

Semester-III							
S.No	**Sub Code**	**Subject Name**	**L**	**T**	**P**	**Hrs.**	**Credits**
1	AM-511	Higher Engineering Mathematics	3	0	0	3	3
2	CY-511	Industrial Chemistry	3	0	2	5	4
3	PH-511	Material Science	3	0	2	5	4
4	ME-511	Applied Thermodynamics	3	0	2	5	4
5	ME-512	Manufacturing Processes	3	0	2	5	4
6	ME-513	Fluid Mechanics	3	2	2	7	5
		Total	18	2	10	30	24

Title of the course : Higher Engineering Mathematics
Subject Code : AM - 511
Weekly load : 3 Hrs. LTP 3-0-0
Credit : 3 (Lecture 3; Tutorial 0; Practical 0)

Unit	Course outlines	Lecture(s)
Unit-1	**Laplace transforms** Laplace transforms of elementary functions. Properties of Laplace transform. Transform of derivatives and integrals. Evaluation of integrals by Laplace transforms. Inverse Laplace transforms. Convolution theorem. Solution of ordinary differential equations. Unit step function and unit impulse function. Engineering applications.	7
	Fourier series Fourier series. Change of interval. Even and odd functions. Half-range series.	5
	Partial derivatives and expansions Functions of two or more variables. Partial derivatives. Homogenous functions. Euler's Theorem. Total derivative. Derivative of an implicit function. Tangent and normal to a surface. Change of variables. Jacobians. Taylor's and Maclaurin's series expansions for a function of two variables.	9
Unit-2	**Complex Functions** Limit of a complex function. Differentiation. Analyticity. Cauchy-Riemann equations. Harmonic functions. Conformal mapping. Some special transformations- translation, inversion and rotation. Bilinear transformation.	7
	Multiple integral Double integral. Change of order of integration. Triple integral. Change of variables. Applications to area and volume. Beta and Gamma functions.	8
	Vector Calculus Differentiation of a variable vector. Scalar and vector point functions. Vector operator - Del. Gradient, curl and divergence - their physical interpretation and applications. Directional derivative. Line, surface and volume integrals. Theorems of Green (in plane), Gauss and Stoke (without proof) - their verification and applications.	9

Total=45

Recommended Books:

1. R.K. Jain & S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishers.
2. G.B. Thomas & R.L. Finney, Calculus: Analytical Geometry, Addison Wesley.
3. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern.
4. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill.

Title of the course : Industrial Chemistry
Subject Code : CY-511
Weekly load : 5 LTP 3-0-2
Credit : 4(Lecture 3; Practical 1)

Unit	Course outlines	Lecture(s)
Unit-1	**Water and its treatment** Water and its Treatment: Introduction, Hardness and its determination, Degree of Hardness, Treatment and Purification of water for domestic and Industrial purposes- Sedimentation, Filtration, Sterilization, Break point chlorination, Ozonization ,Water for Steam Making: Sludge and scale formation and Caustic embrittlement. Methods of boiler water treatment Lime-Soda process (hot and cold lime soda process), Permutit or Zeolite process, Deionization or Demineralization, Desalination of Brackish Water. Numerical Problems	**12**
	Corrosion Direct chemical corrosion and electrochemical corrosion and their Mechanism, Types of corrosion, Concentration cell corrosion, atmospheric corrosion, Passivity, Pitting corrosion, factors influencing corrosion, Polarization, over potential and its significance, Factors affecting corrosion, protection from corrosion by metallic coatings, electroplating, electroless plating and cathodic protection, Chemical conversion coatings and organic coatings- Paints, enamels.	**07**
	Phase Rule and Distribution law Definitions (phase,component, degree of freedom, phase equilibrium),gibbs phase rule,One component System (water system, Carbon dioxide system,sulphur system), Two component system(Pb-Ag System, KI-water system, Sodium sulphate water system) ,Nernst distribution law, Applications of distribution law: solvent extraction.	**07**
	Polymers Polymerization, types of Polymerization reaction and mechanism of polymerization, molecular weight determination-Viscometry, light scattering methods. Study of some commercially important polymers (PVA, FLUON, PC, Kevlar, ABS polymer, phenolic & amino resins, epoxy resins and polyurethanes), Engineering applications of polymeric materials,Conductive polymers.	**07**
Unit-2	**Spectroscopic Techniques for Analysis** Introduction, interaction of EMR radiation and matter , atomic and molecular spectroscopy, Absorption laws Atomic absorption spectroscopy: Basic principles, instrumentation, interferences, typical applications. Atomic emission spectroscopy: Basic principle, instrumentation and applications. UV-VIS and IR Spectroscopy-Introduction, theory, instrumentation, applications of UV & IR spectroscopy (including finger print region in IR)	**12**

Total=45

Recommended Books:

1. P. C. Jain & M. Jain, Engineering Chemistry, Dhanpat Rai Publishing Company, New Delhi, 2005.
2. B.R. Puri, L.R. Sharma, M.S. Pathania, Principles of Physical Chemistry, Vishal Publishing Company, 2008.
3. F.W. Billmayer. Textbook of Polymer Science. 3rd Edn, Wiley. N.Y. 1991.
4. C. N. Banwell & E.M. McCash, Fundamentals of Molecular Spectroscopy, 4th Edn, Tata Mc Graw-Hill Edition, 1995.
5. S. S. Dara, S. S. Umare, A Text Book of Engineering Chemistry, S. Chand Publishing, 2011.

6. J. D. Lee, Concise Inorganic Chemistry, 5th Edn., Chapman and Hall, London, 1996.
7. Engineering Chemistry by B. Sivasankar, Tata Mcgraw Hill
8. Engineering Chemistry by A. Mallick, Viva Books, 2008.
9. Organic Chemistry by J. Clayden, Nick Greeves, S. Warren, Oxford Press 2012.
10. Levine, Physical Chemistry, 5/e (7th reprint), Tata McGraw Hill, 2006.
11. Inorganic Chemistry, Principle, structure and reactivity, J.E. Huheey, E.A. Keitler, R.L. Keita, O.K. Medhi, Pearson Education, 4th Ed.
12. Chemistry, J.E. Mcmerry and R.C. Fay, 5th Ed., Pearson Education, 2008

List of Experiments (CY-511/CY-521)

1.) Determination of Total Hardness of water (tap, lake, pond, river) using standard EDTA solution and Eriochrome Black Tea (EBT) indicator.
2.) Determination of Available Chlorine in treated and untreated water titrimetrically.
3.) Determination of Available Chlorine in Bleaching Powder titrimetrically
4.) Analysis of water samples by BOD and COD.
5.) Estimation of Iron in water.
6.) Investigation of rusting of iron in different condition of rusting of iron.
7.) Investigation of the effect of metal coupling on rusting of iron.
8.) Study of phase rule of one component system
9.) Study of phase rule of two component system
10.) To determine the partition coefficient or distribution coefficient of iodine between CCl_4 and H_2O
11.) Preparation of Nylon 66
12.) Preparation of Polymers (Polystyrene)
13.) Preparation of urea –formahaldehyde resin
14.) Preparation of phenol–formahaldehyde resin (Bakellite)
15.) To determine the molecular weight of a polymer (polystyrene) by using viscometric method.
16.) Identification of functional group by FT-IR spectroscopy
17.) Determination of concentration of an unknown sample of UV spectroscopy.
18.) To determine λ max (wavelength of maximum absorption) of a solution of KMnO4 using a spectrometer.

(Any twelve to be performed)

Title of the course **:Material Science**
Subject Code **: PH-511/PH-521/PH-611**
Weekly load : 5 LTP 3-0-2
Credit : 4 (Lecture 3; Practical 1)

Unit	Course outlines	Lecture(s)
Unit-1	**Elements of crystallography** A brief Introduction to material science, Space lattices, Unit cell, primitive cell, Bravais lattice, Atomic packing factor, Miller Indices, directions and planes in crystal lattice (cubic and hexagonal only), distribution of atoms in lattice planes (in cubic crystal only), Important structures (NaCl, CsCl, Diamond and ZnS), structure determination; X-ray diffraction, Neutron and electron diffraction	08
	Imperfections in crystals Point imperfections, Frenkel, and Schottky defects and their equilibrium concentration determination, Color centres, types of color centres, generation of color centres, Edge and screw dislocation, Burger vector, Surface defects	05
	Band theory of solids Free electron theory, Concept of energy bands, Bloch theorem, Electron in a periodic field of crystal (The Kronig – Penny Model) distinction between metal, semiconductor and insulator, effective mass of an electron, Hall effect.	06
	Nano-materials Fundamentals of nonmaterial's and nanotechnology, nano particles, properties of nonmaterial's, synthesis and characterisation, applications of nonmaterials.	05
Unit-2	**Dielectric materials** Introduction of dielectric materials, Polarization, Different types of polarization, Electronic, ionic, orientational and space charge polarization, polarizability, Clausius-Mossotti relation, temperature and frequency dependence of polarizability, dielectric breakdown, measurement of dielectric properties, Dielectric constant, Dielectric loss, ferroelectric and piezoelectric materials, examples of materials and their applications.	08
	Magnetic materials Terminology and classification of engineering materials, Type of magnetism (dia, para, ferro, ferri and anti ferromagnetisms), Theory of para, dia and ferromagnetic materials, magnetic anisotropy and magnetrostriction, magnetic domains, hard and soft magnetic materials, ferrites and their applications	08
	Superconductivity Introduction, type I & type II superconductors, Meissner's effect, isotope effect, effects of magnetic field, London's equations, penetration depth, specific heat, BCS theory (electron-lattice-electron interaction, Cooper-pair, coherence length, energy gap), high temperature superconductors, applications of superconductivity.	08

Total=48

Recommended Books:

1. Raghvan :Materials Science
2. Srinivasan & Srivastava :Science of Engineering Materials
3. Callister JR Materials Science and Engg.: An Introduction
4. Askeland & Phule :The Science and Engineering of Materia

List of Experiments (PH-511/PH-521/PH-611)

1. To prepare a metallic sample and measure the grain size using the metallurgical microscope.
2. To study the creep nature in metallic wires at room temperature.

3. To find the mobility and carrier concentration in a semiconductor sample using Hall Effect experiment.
4. To study the B-H curves of different materials using B-H curve tracer.
5. To determine the Stefan's constant using Stefan's constant kit.
6. To find the resistivity of a given semiconductor material using four probe method.
7. To find the Curie temperature of the given ferrite material.
8. To find the Curie temperature of the given ferroelectric material.
9. To calculate the dielectric constant of the given dielectric material.
10. To find the capacitance and permittivity of the given material.

Title of the course : **Human values and professional ethics**
Subject Code : **MC-511/ MC-521**
Weekly load : 01 Hr Lecture LTP 1-0-0
Credit : 0

Unit	Course Description	Lecture(s)
Unit 1	**Values and Self Development** Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non moral valuation, Standards and principles, Value judgments. Importance of cultivation of values, Sense of duty, Devotion, Self reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline.	04
	Personality and Behavior Development Soul and scientific attitude, God and scientific attitude, Positive thinking, Integrity and discipline, Punctuality, Love and kindness, Avoiding fault finding, Free from anger, Dignity of labor, Universal brotherhood and religious tolerance, True friendship, Happiness vs. suffering love for truth, Aware of self destructive habits, Association and cooperation, Doing best, Saving nature.	04
Unit 2	**Character and Competence** Science vs. God, Holy books vs. blind faith, Self management and good health, Science of reincarnation, Equality, Nonviolence, Humility, Role of women, All religions and same message, Mind your mind, Self control, Honesty, Studying effectively.	03
	Human Rights Jurisprudence of human rights nature and definition, Universal protection of human rights, Regional protection of human rights, National level protection of human rights, Human rights and vulnerable groups.	02
	Competence in professional ethics Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems	03

Total=16

Recommended Books:

1. S.K.Chakraborty, Values and Ethics for Organizations Theory and Practice; Oxford University Press, New Delhi,2001.
2. S.K. Kapoor, Human rights under International Law and Indian Law; Prentice Hall of India, New Delhi, 2002.
3. D.D. Basu, Indian Constitution; Oxford University Press, New Delhi, 2002.
4. W.K. Frankena, Ethics; Prentice Hall of India, New Delhi, 1990.
5. R. R. Gaur, R. Sangal, G. P. Bagaria, A Foundation Course in Value Education. 2009,
6. M Govindrajran, S Natrajan, V.S. Senthil Kumar, Engineering Ethics(including
7. Values); Eastern Economy Edition, Prentice Hall of India Ltd.

Title of course : APPLIED THERMODYNAMICS
Subject code : ME-511
Weekly load : 5 LTP- 302
Credit : -4(Lecture-3, Practical-1)

Unit	Course Description	Lectures(s)
Unit-1	**Internal Combustion Engines** Introduction to I.C. Engines and their classification, Engine components, Nomenclature, Comparison of S.I. & C.I. engine, Working principles of 2-stroke and 4-stroke engine, Comparison of 2-stroke and 4-stroke engine, Gas power cycle, Introduction of different cycles, Carnot cycle, Otto, Diesel cycle, Dual cycle. Analysis of Otto cycle, Diesel cycle & Dual cycles.	**7**
	Combustion in S.I. Engine Introduction, Combustion in S.I. engine, Flame front propagation, Factor influencing flame speed, pre-ignition, abnormal combustion, Phenomena of knock in S.I. engine, Effect of engine variables on knocking.	**7**
	Combustion in C.I. Engine Stages of Combustion in C.I. engine, Factors affecting delay period, Phenomena of knocking in C.I. engine, Comparison of knocking in S.I. & C.I. engine	**6**
	Steam Engines Parts of steam engine and their function, Working of steam engine, Indicator diagram (Theoretical & actual), Diagram factor, IHP, BHP, Mechanical efficiency, Compounding of steam engines.	**4**
	Steam Nozzles and Steam Turbines Introduction to nozzles & types, Equation of continuity, Steady flow energy equation, Momentum equation, Nozzle efficiency, Calculation of nozzle area in adiabatic and frictionless flow, Mass flow rate through nozzle. Steam Turbines: Rankine's cycle, Principle of operation of steam turbine, Types of steam turbines, Simple impulse turbine, Compounding of impulse turbine, impulse reaction turbine, Reaction turbine, Velocity diagram of impulse turbine, effect of blade friction on velocity diagram, Blade or diagram efficiency, gross stage efficiency.	
	Gas Turbines Simple open cycle gas turbine, Actual Brayton's cycle, Rate & work ratio, Open cycle gas turbine with regeneration, Open gas turbine cycle with reheat, Open gas turbine with inter cooler, Comparison between closed cycle gas turbine & open cycle gas turbine, advantages & disadvantages of gas turbine over steam turbine, application of gas turbine.	**7**
	Jet Propulsion Introduction to turbojet engine, Thrust power propulsive efficiency, Thermal efficiency relations, Advantages & disadvantages of jet propulsion over other system, Operation of rocket engine using solid, Liquid propellant.	**4**
	Compressors Types of compressors, Reciprocating, centrifugal, screw comp. etc., Work done in single & multi cylinder compressor, Inter-cooling, Principle of minimum work for multi compressor, Efficiency.	**5**

Total-48

Recommended Books

I.C. Engine	Mathur & Sharma	Dhanpat Rai & Sons
Thermodynamics	P.K.Nag	TMH

Thermodynamics (Vol. I-III)	R.Yadav	CPH
Heat Engineering	V.P.Vasandhani	Khanna Pubilsher
Thermal Engineering	P.L.Ballaney	Khanna Pubilsher
Engineering Thermodynamics	O.P.Single	TMH

List of Experiments (ME-511)

1. Constructional details and working of 2-stroke petrol engine.
2 Constructional details and working of 4-stroke petrol engine.
3. Constructional details and working of 4-sytokr diesel engine.
4. To find the performance of a diesel engine (B.H.P, thermal efficiency, fuel consumption, air consumption.)
5. Make a heat balance sheet of 4-stroke single cylinder diesel engine.
6. Morse test on 4-stroke 4 cylinder petrol engine.
7. To Analyses the exhaust gases of a vehicle with the help of a exhaust gas analyses.
8. To find out the flash point and fire point of kerosene.
9. Constructional details and working of steam engine.
10. Constructional details and working of turbojet engine.

Title of course : MANUFACTURING PROCESSES
Subject Code : ME-512
Weekly load : 05 LTP 3-0-2
Credit : 04

Unit	Course Description	Lecture(s)
Unit 1	**Cutting Tools** Types of cutting tools, cutting tool materials and their properties, illustration of different cutting tools, design and manufacturing of a single point cutting tool, a twist drill and milling cutters.	**8**
	Press Working Types of presses, press working operations; shearing, blanking, piercing, coining, swaging, embossing and upsetting. Types of dies, punches. punch holders & strip Layout	**8**
	Metal Finishing and Coating Purpose of grinding, surface grinding, cylindrical grinding, centre-less grinding, specifications of grinding wheel, super finishing, introduction to Honing, Lapping Polishing, Buffing and super-finishing. Metal Spraying. Metal Coating; galvanizing, electro-plating and anodizing.	**8**
Unit 2	**Powder Metallurgy** Principle. Methods of making powder from metal. Processes involved; Compacting, Sintering and finishing operations. Advantages and Disadvantages of powder metallurgy	**6**
	Thread Manufacturing Introduction, types of threads, threads making techniques, thread cutting on a lathe, threads finishing.	**8**
	Gears and Gear Manufacturing Gear nomenclature, types of gears and their applications, gear manufacturing methods, gear cutting on a milling machine, gear hobbing, gear shaping and gear finishing	**10**

Total = 48

Recommended Books

Title	*Author(s)*	*Publisher*
Manufacturing Science	Malik & Ghosh	EWP
Production Engineering Science	Pandey & Singh	Standard Publishers
Metal cutting Theory	A.Bhattacharya	Central Book publishers

List of Experiments (ME-512)

1. Study of different types of single point cutting tools and different operations performed with these tools. Practice facing, knurling and
2. Study types of threads and threads cutting process using a lathe. Practice thread cutting operations on a lathe.
3. Study of a twist drill, counter boring tool, counter sinking tool, and a spot facer. Practice the application of these cutting tools.
4. Study of different types of milling cutters used and different operations performed using these tools.
5. Study the use of indexing head on a milling machine. Practice gear milling operations for the making of a spur gear.

Note: Two exercises have to be done on each above mentioned experiments.

Title of the course **:Fluid Mechanics**
Subject Code **: ME-513**
Weekly load : 7 LTP 3-2-2
Credit :5

Unit	Course Description	Lecture(s)
Unit 1	**Fundamental concepts** Definition of fluid, distinction between solid and fluid, fluid properties: viscosity, surface tension, capillarity, vapour pressure; types of fluid	**02**
	Fluid statics Control volume, forces on fluid element, fundamental equation of fluid statics, pressure and devices for its measurement, centre of pressure, buoyancy, centre of buoyancy, metacentre, metacentric height, hydrostatic thrust on submerged bodies	**04**
	Kinematics of fluid Scalar and vector fields, flow field and methods of describing fluid motion, classification of fluid flow, motion of fluid particle along a curved path, velocity and acceleration of fluid particle, rate of discharge, continuity equation in differential form in different co-ordinate systems, velocity potential, rotation, circulation, vorticity, stream lines, path lines, streak lines, stream function, flow net, conservation of momentum- equation of motion and momentum theorem	**06**
	Dynamics of fluid flow Fluid dynamics, control volume and control surface, energy and its different form used in fluid mechanics, Euler's equation of motion, Bernoulli's theorem, application of Bernoulli's theorem, Euler's equation along a streamline, Application of Bernoulli's theorem.	**04**
	Viscous incompressible flow General viscosity law, Navier –Stokes equations, exact solutions of Navier – Stokes equations as applied in parallel flow in a straight channel, Couette flow and Hagen Poiseuille flow, kinetic energy correction factor, momentum correction factor, theory of hydrodynamic lubrication	**05**

Unit 2	**Dimensional Analysis and Model Similitude** Systems of dimensions, Dimensional homogeneity and its applications. Dimensional analysis, Rayleigh's method, Buckingham's π-theorem, model similitude, Dimensionless numbers and their significance, distorted model.	**06**
	Boundary Layer Theory Description of boundary layer, boundary layer parameters, Prandtl's boundary layer equations, Blasius solution for laminar boundary layer flows. Von-Karman momentum integral equation, Laminar boundary layer, laminar – turbulent transition, turbulent boundary layer flow, boundary layer separation, Prandtl's mixing length hypothesis, fully developed turbulent flow in a pipe	**04**
	Flow through pipes Concept of friction factor in a pipe flow, variation of friction factor, flow potential and flow resistance, flow through pipes jointed together either in series or in parallel or in combination of both of them, losses in pipe bends and pipe fittings, flow through orifice	**04**
	Flow with a free surface Flow in open channels, flow over a weir and notch, flow in a closed circular conduits only partly full, hydraulic jump	**05**
	Compressible flow Thermodynamic relations of perfect gases, speed of sound, pressure field due to a moving source, basic equations for one dimensional flow, stagnation and sonic properties, normal shocks	

Total=48

Recommended Books:

1. White, Fluid Mechanics, ,McGraw Hill
2. Munson , Fundamentals of Fluid Mechanics, John Wiley & Sons
3. Cenegal, Fluid Mechanics, McGraw Hill
4. Modi & Seth, Fluid Mechanics & Fluid Machines, Standard Publishers
5. D. S. Kumar, Fluid Mechanics & Fluid Machinery, Kataria & Sons
6. A.K Jain, Fluid Mechanics, Khanna Publishers
7. Om & Biswas, Fluid Mechanics & Fluid Machines, Tata McGraw-Hill.
8. J. Lal, Fluid Mechanics, Metropolitan.

List of Experiments (ME-513)

1. Determination of Viscosity of a Liquid by Redwood viscometer.
2. Verification of Bernoulli's Theorem.
3. To determine Coefficient of Discharge of Venturimeter.
4. To determine Coefficient of Discharge of orifice meter.
5. To determine Coefficient of Discharge of Weir.
6. Pressure measurement using Bourdons Tube Pressure Gauge.
7. To determine C_c,C_v,C_d for Vena-Contracta.
8. Computation of Reynolds Number for different types of flow.
9. Computation of losses in Pipe bends/Fittings/Geometrical changes.
10. To determine coefficient of friction in a pipe flow.

Title of the course : **Operating System**
Subject Code : **CS-511**
Weekly load : 3 LTP 3-0-2
Credit : 4

Unit	Course outlines	Lecture(s)
Unit-1	**Basic Concept of Operating System** Evolution of operating system, Operating System classifications, Fundamental of operating system functions, Multiprogramming, Multiprocessing, Time-sharing systems and real time systems. Software layers & virtual machine.	06
	Process Mangement Process Overview, process states, multiprogramming, levels of scheduler and CPU scheduling algorithms, multiple-processor scheduling, Threads, Process Scheduling objects and techniques.	06
	Interprocess Communication Concurrent processes - The Critical Section & Mutual Exclusion problem - Algorithms - Semaphores, Critical Region, Conditional Critical Region, Monitors, Messages - Examples in Contemporary OS - Classical Process Co-ordination Problems	06
	Memory Management Memory Hierarchy, Static and Dynamic Memory Allocation, Overview of Swapping, Multiple Partitions Contiguous and Non-Contiguous Memory Allocation, Concepts of Paging, Segmentation.	06
Unit-2	**Virtual Memory** Virtual Memory Concepts - Demand paging - Performance - Fragmentation & Compaction. Page replacement and Allocation algorithms -Memory Protection - System Calls – Linux/Windows Virtual Memory Techniques.	08
	File Mangemen File concepts, Access methods, Directory structure, File protection, File System structure, Allocation methods, Secondary storage management - Disk structure, Disk scheduling, Disk management, Swap-space management, Disk reliability.	08
	Deadlock Introduction, Analysis of conditions, Prevention & avoidance, Detection & recovery.	08
		Total=48

Recommended Books:

1. Silberschatz A & Galvin, Operating System Concepts, John Wiley & Sons
2. W. Stallings, Operating Systems: Internals and Design Principles, Pearson Pub.
3. Andrew S Tanenbaum, Operating Systems - Design and Implementation, PHI
4. Crawley, Operating Systems - An Object oriented Approach, McGraw Hill

List of Experiments

1. WAP to implement following CPU scheduling algorithms:
    - FCFS, SJF, Priority,Round Robin
2. WAP to implement MVT and MFT.
3. WAP to implement Bankers algorithm for deadlock avoidance.
4. WAP to implement Bankers algorithm for deadlock prevention.
5. WAP to implement following page replacement algorithms:
    - FIFO, LRU
6. WAP to implement paging technique of memory management.

Title of the course : **Digital Circuits and Logic Design**
Subject Code : **CS-512**
Weekly load : 5 LTP 3-0-2
Credit : 4

Unit	Course outlines	Lecture(s)
Unit-1	Introduction to the concept of Digital Electronics, Number systems, binary number system, octal number system, hexadecimal number system, signed and unsigned numbers, Arithmetic using Different Number Systems; Representation of Binary Number in Sign-Magnitude, Sign 1's & 2's Complement Notation; Rules for Addition and Subtraction with Complement.	07
	BCD, EBCDIC, ASCII, Extended ASCII, Gray and other Codes.	05
	Simplification of Boolean Function using Boolean theorems; Canonical and Standard Forms(SOP and POS) for Boolean Functions; Objectives of the Minimization Procedures; Karnaugh Map Method; Don't Care Conditions; Quine-Mccluskey Tabulation Method; Concept of Prime Implicates. Realization of Boolean Functions Using Only NAND and NOR Gates.	07
	Half & Full Adder; Half & Full Subtractor; Parity Generator and Checker; Code Converters; Carry look ahead generator; Binary Multiplier; Majority Circuits, Magnitude Comparator.	05
Unit-2	Binary Parallel; BCD Adder; Encoder, Priority Encoder, Decoder; Multiplexer and De-multiplexer Circuits; Implementation of Boolean Functions Using Decoder and Multiplexer; ALU; BCD to 7-Segment Decoder; Common Anode & Cathode 7-Segment Displays; PLA and PAL	07
	Basic Concepts of Sequential Circuits; Cross Coupled SR Flip-Flop Using NAND or NOR Gates; D-Type and Toggle Flip-Flops JK Flip-Flop & race Condition; Clocked Flip-Flops; Truth Tables & Excitation Tables for Flip-Flops; Edge & Level Triggering; Master Slave Configuration; Edge triggered D flip-flop; Elimination of Switch Bounce Using Flip-Flops; Flip-Flops With Preset & Clear.	07
	Sequential circuit; state table and state diagram; Design procedure; Basic Concepts of Counters and Registers; Shift Left and Right Register; Registers With Parallel Load; SIPO and PISO	06
	Up Down and Mod-N ripple counters; Design of Synchronous Counter Using State Diagrams and Table; BCD Counters; Modulo-N Counter; Up Down Counter; Ring counter; Johnson Counter, Sequence Generators	04
		Total=48

Recommended Books:

1. Morris Mano: "Digital Logic and Computer Design", PHI.
2. Bartee Thomas: "Digital Computer Fundamentals", McGraw-Hill.
3. Richard Sandige: "Modern Digital Design", McGraw-Hill.
4. Taub and Schilling: "Digital Integrated Electronics", McGraw-Hill.
5. Fletcher W.I.: "Engineering Approach to Digital Design", PHI.
6. Malvino & Leech: "Digital Principles & Applications", TMH.
7. J. F. Wakerly: "Digital design: principles and practice package", Pearson Edu.

List of Experiments CS-512

1. Study of Logic gates- AND,OR,NOT,NAND,NOR,XOR.
2. To simplify the given expression and to realize it using Basic gates and Universal gates.
3. Design and realization of Half adder/Substractor using NAND gates.
4. Design and realization of Full adder using Logic gates.
5. Realization of R-S Flip-flop.

6. Realization of J-K Flip-flop.
7. To design and set up the following circuit
    a. 4:1 Multiplexer (MUX) using only NAND gates.
    b. 1:4 Demultiplexer(DE-MUX) using only NAND gates.

Title of the course : Data Structures and Algorithms
Subject Code : CS-513
Weekly load : 3 LTP 3-0-4
Credit : 5

Unit	Course outlines	Lecture(s)
Unit-1	**Introduction** Basic concepts and notations; Data structures and Data Structure operations; Mathematical Notation and Functions; Algorithmic complexity and time-space trade off.	04
	Recursion Recursion; types of recursion; Examples of recursion – the exponential power of a number, Fibonacci numbers, the greatest common divisor, Towers of Hanoi.	06
	Arrays Introduction; One-dimensional array – storage, Traversing, Insertion, Deletion, Searching; Multidimensional arrays – Two-dimensional arrays, General multidimensional arrays. String processing and Manipulation	07
	Linked List Introduction; Basic concepts of linked list – Memory representation, Building a linked list, Traversing, Insertion, Deletion, Searching; Double linked list; Merging two lists; Header linked list; Circular linked list.	07
Unit-2	**Stacks & Queues** Stack, Representation of stack, Implementation of stack; Polish Notation; Queues; Implementation of queues; Circular queues; Double ended queue; Priority Queues	06
	Trees Binary trees; Complete Binary trees; Extended binary tree; Representation of Binary tree; Insertion and deletion from the Binary Tree. Tree Traversals using in-order, pre-order and post-orders ; Representation of Binary Tree; Application of Binary tree; search tree; Heap tree, Balanced Binary tree; B-trees.	08
	Graphs Basic concepts & definitions; Representation of Graph; Adjacency list; Adjacency Matrix, Path Matrix, Graph Traversal; Shortest Path Algorithms.	05
	Sorting & Searching Linear search; Binary search; Bubble sort; Insertion sort; Quick sort; Selection sort; Merge sort; Heap sort; Selection sort, Hashing Techniques.	05
		Total=48

Recommended Books:

1. Lipschutz,Schaum Series, Data Structures ,TMH
2. A.M. Tanenbaum, Data Structures using C and C++, Pearson education.
3. Trembley Sorenson, Introduction to Data Structures with applications, TMH.
4. Harowitz & Sahni, Data Structures,Galgotia Publications

List of Experiments CS-513

1) WAP to generate Fibonacci Series using recursion.
2) Write a function that interchanges the first element with last element, second element with second last element and so on.
3) WAP to multiply two Matrices.
4) Write a Function that removes all duplicate elements from an Array.
5) WAP that insert an element in beginning of Linear Link List.
6) WAP that delete an element from the beginning of the Linear Link List.
7) WAP that delete an element from the end of the Linear Link List.
8) WAP that delete an element after a given element of the given Linear Link List.
9) WAP that reverse the element of the Linear Link List.
10) WAP that concatenate two Linear Linked List.
11) WAP to remove the Top element of Stack.
12) WAP to insert (or push) an element at the Top of Stack.
13) WAP to insert an element at the end of queue.
14) WAP to remove the first element of the queue.
15) WAP to illustrate the implementation of Binary Search Tree.
16) WAP to sort an array of integer in Ascending Order using Bubble Sort.
17) WAP to sort an array of integer in Ascending Order using Insertion Sort.
18) WAP to sort an array of integer in Ascending Order using Quick Sort.
19) WAP to search an element using Linear Search Method.
20) WAP to search an element using Binary Search Method.

Title of the course **Database Management System**
Subject Code **: CS-514**
Weekly load : 3 LTP 3-0-4
Credit : 5

Unit	Course outlines	Lecture(s)
Unit-1	**Introduction** Data, data processing requirement, desirable characteristics of an ideal data processing system, traditional file based system, its drawback, concept of data dependency, Def of database, database management system.	04
	Database concept 3-schema architecture, database terminology, benefits of DBMS, Database development process - conceptual data modeling, logical database design, physical database design, database implementation, database maintenance.	06
	Database Analysis Conceptual data modeling using E-R data model -entities, attributes, relationships, generalization, specialization, specifying constraints. 5 – 6 practical problems based on E-R data model.	06
	Database Design Logical database design and relational data model: Introduction to relational database theory: *def* of relation, relational model operators, relational model integrity rules, Normalization- 1NF, 2NF, 3NF, 4NF, BCNF & practical problems based on these forms. Denormalization	08
Unit-2	**Database Implementation** Introduction to SQL, DDL aspect of SQL, DML aspect of SQL – update, insert, delete & various form of SELECT- simple, using special operators, aggregate functions, group by clause, sub query, joins, co-related sub query, union clause.	08

	Query optimization Introduction, Overview of optimization process, expression transformation, database statistics, A divide and conquer strategy.	06
	Transaction processing Transaction concept, transaction state, Implementation of atomicity and durability, concurrent execution, Serializability, recoverability, Implementation of isolation, transaction definition in SQL.	04
	Overview of backup and recovery process Failure classification, Storage structure, recovery and atomicity, log based recover , shadow paging, recovery with concurrent transaction, buffer management, failure with loss of non- volatile storage, advance recovery techniques.	06

Total=48

Recommended Books:

1. A Silberschatz, H. F. Korth, and S Sudarshan, Database System Concepts, TMH.
2. McFadden, F.Hoffer, M. B Modern database management, Prescott.
3. C.J Date, An Introduction to Database Systems, Addison, Wesley.
4. Raghu Ramakrishnan and Gehrke,Database Management System, McGraw-Hill.
5. Margaret.H.Dunham , Data Mining. Introductory and advanced topics, Pearson.

List of Experiments(CS-514)

1. Introduction to various constraints such as Primary key, secondary key, Super key, etc.
2. To implement Data Definition Commands (create, drop).
3. To implement Data Manipulation Commands (insert, delete, update, select)
4. To implement Data Control Commands (Commit, revoke, rollback, connect, execute)
5. Create Table, SQL for Insertion, Deletion, Update and Retrieval using aggregating functions.
6. Write Programs in PL/SQL, Understanding the concept of Cursors.
7. Write Program for Join, Union & intersection etc.
8. Creating Views, Writing Assertions, and Triggers.
9. Creating Forms, Reports etc.
10. WAP in PL/SQL for adding two numbers.
11. WAP in PL/SQL for reversing the number. For example the number is 12345 and reverse number will be 54321)
12. WAP in PL/SQL to find the number is even or odd.
13. WAP in PL/SQL to count numbers from 1 to 100

Title of the course : Chemical Process Calculations
Subject Code : CH-511
Weekly load : 3 LTP 3-2-0
Credit : 4

Unit	Course outlines	Lecture(s)
Unit-1	**Introduction and Techniques of problem solving** Concept about unit operations and unit processes, Types of problems in chemical engineering, various steps in techniques of problem solving, barriers to problem solving, comparison between problem solving habits of novice and an expert.	02
	Basic Chemical Calculations Units and conversion, Concentration calculations for solutions, Raoult's Law for ideal solutions, Ideal Gas Law, Equations of state for real gases, Dalton's Law for gaseous mixtures.	05
	Psychrometry Humidification operations, psychrometric chart for air water system, psychrometric operations calculations for air – water and other systems, Humidity charts & their uses.	03
	Material Balance Process flow sheet, material balance without chemical reactions and with chemical reactions. Recycle, bypass and purge operations with and without chemical reactions. Degree of freedom analysis. Applications of material balance to various chemical plant operations.	14
Unit-2	**Energy Balance** Heat Capacity, Heat capacity of gases at constant pressure and constant volume, Heat capacity for gaseous mixtures, and specific heat of liquid mixtures. Latent heats, Heat of formation, Heat of combustions and heat of reaction, theoretical flame temperature and their calculations. Energy balances over various basic unit operations.	12
	Applications of material and energy balance Applications of material and energy balance to the evaporators, distillation, reactors and other industrial processes (steady state operations). Basic calculations using chemical flow sheet simulator	12

Total=48

Recommended Books:

1. Hougen & Watson, Chemical Process Principle, Asia Publishers
2. Bhat & Vora, Stoichiometry, Tata McGraw Hill
3. Himmelblau, Basic Principles and Calculations in Chemical Engg., Prentice Hall (I) Ltd.
4. Felder, Elementary Process Calculations, Wiley Eastern

Title of the course : **Chemical Engineering Thermodynamics**
Subject Code : **CH-512**
Weekly load : 3 LTP 3-2-2
Credit : 5

Unit	Course outlines	Lecture(s)
Unit-1	**Introduction** Introduction and scope of chemical engg. thermodynamics, concept of system and surroundings, classification of thermodynamic processes, concept of temperature and Zeroth law of thermodynamics, thermodynamic properties	03
	Laws of Thermodynamics General statement of first law of Thermodynamics, first law of thermodynamics for cyclic process, non-flow and flow process, concept of enthalpy and calculations. Second law of thermodynamics : statement, concept of entropy, Carnot's cycle and Carnot's engine, third law of thermodynamics	05
	Volumetric Properties of Fluids and Heat Effects P-V-T behaviour of pure fluids, ideal gas law, equations of state for real gases, compressibility charts, heat effects accompanying chemical reactions	04
	Thermodynamic properties of pure fluids Classification, work function, free energy, relationships among thermodynamic properties : Maxwell's equations and their uses, Clapeyron equation, Method of Jacobian and thermodynamic properties, Fugacity, Activity, Departure functions, Thermodynamic diagrams.	05
	Properties of solutions Properties of homogeneous mixtures; partial molar properties, chemical potential & its applications, Fugacity in solutions, Henry's law, excess properties & their applications, activity and Activity coefficients in solutions, Gibb's Duhem equation, properties changes of mixing, heat effects of mixing process.	07
Unit-2	**Phase equilibria** Criteria for Phase equilibria, Phase equilibria in single component and multi-component systems, Phase rule for non-reacting systems, Duhem's theorem, Vapour liquid equilibria in ideal and non-ideal solutions at low and moderate pressures, Azeotrope calculations, Consistency test for VLE data, VLE for high pressure systems, Flash vaporization, Calculation of activity coefficients for solutions. VLE for partially miscible and immiscible solutions.	08
	Refrigeration and Liquifaction Review of various cycles of refrigeration & liquefaction cycles (single stage), refrigeration and liquefaction cycles (multiple stage).	04
	Chemical Reaction Equilibria Criteria for chemical reaction equilibria, calculation of equilibrium constant and Gibb's free energy change, effects of various parameters on equilibium constant and equilibrium compositions, liquid phase and heterogeneous reaction equilibria, phase rule for reacting system.	07
	Applications of thermodynamics Applications of thermodynamics to various operations, thermodynamic analysis of distillation, evaporation and condensation processes, minimum work of separation and thermodynamic efficiency of separation.	05

Total=48

Recommended Books :

1. Smith & Van Ness, Introduction to Chemical Engineering Thermodynamics, Tata McGraw Hill
2. Kyle, Chemical & Engineering Process Thermodynamics, Prentice Hall Ltd.
3. Narayanan, K.V., Chemical Engg. Thermodynamics, Prentice Hall Ltd.
4. Rao, YVC, Chemical Engineering Thermodynamics, University Press.

List of Experiments (CN512)

1. To verify Zeroth law of thermodynamics.
2. To verify First law of thermodynamics.
3. To study the use of a pH probe and determine acid equilibrium constant from pH measurement.
4. To determine the solubility and solubility product of a slightly soluble salt.
5. To determine the specific heat of copper metal.
6. To determine the specific heat of a liquid substance by using method of mixing.
7. Determining the value for the molar heat of fusion for water.
8. Calculation of the calorimeter constant and measurement of enthalpy of neutralization of a strong acid with a strong base.
9. To verify Boyle's law.
10. To verify Charle's law.
11. To study vapor compression cycle of refrigeration and find C.O.P of the cycle.
12. To find dry bulb & wet bulb temperature of ambient air.
13. Joule-Thomson experiment to find Joule Thomson Coefficient.
14. To find the vapor pressure of a liquid substance at a given temperature.
15. To develop VLE data for a binary solution.
16. To study the effect of temperature on equilibrium constant for a reversible reaction.

Title of the course : **Chemical Technology - I**
Subject Code : **CH-513**
Weekly load : 3 LTP 3-0-2
Credit : 4

Unit	Course outlines	Lecture(s)
Unit-1	**Sulphuric acid** Properties of sulphuric acid, Manufacturing with flow chart by DCDA process, uses.	05
	Hydrochloric acid Manufacturing process with flow chart and its uses.	05
	Phosphoric acid Details of manufacturing process with flow chart and its uses.	05
	Chlor alkali industries Manufacturing of soda ash with flow chart and uses. Working of Diaphragm, Mercury and Membrane cells.	09
Unit-2	**Cement** Portland cement production. (details of manufacturing process with flow chart)	06
	Alumina Manufacturing process with flow chart and uses.	07
	Fertilizers Major components of fertilizers and their significance, Triple superphosphate, Wet process, Urea, Ammonium nitrate (details of manufacturing process with flow chart)	11

Total=48

Recommended Books:

1. M. Gopala Rao, Marshall Sitting, Outlines of Chemical Technology, East West Press
2. George T. Austin, Shreves's Chemical Process Industries, McGraw Hill

List of Experiments (CH-513)

1. To find the NPK value of given fertilizer.
2. To find out the components of cement.
3. To find the saponification value of vegetable oil.
4. To find the iodine value of given oil.
5. To perform the Ultimate Analysis of a salt.
6. To perform the Proximate Analysis of a Coal.

Title of the course : **Network Analysis & Synthesis**
Subject Code : **EC-511**
Weekly load : 5 LTP 3-2-0
Credit : 4

Unit	Course outlines	Lecture(s)
Unit-1	**Basic of Circuit Analysis** Basic two terminal circuit elements, Linear time invariant passive elements (resistor, capacitor and inductor), Ideal voltage and current source,Energy concepts in two terminal element.	04
	Network Theorems Introduction, Kirchoff's Law, Nodal and Mesh analysis, Super Position Theorem, Reciprocity Theorem, Thevenin Theorem, Norton Theorem, Millman's Theorem, Maximum Power Transfer Theorem, Substitution Theorem, Compensation Theorem, Tellegne's Theorem (for both AC and DC excitations).	10
	Resonance Introduction, Series resonance, Parallel resonance,	05
	Magnetically Coupled Circuits Concept of mutual inductance and coupling coefficient, magnetically coupled circuits, magnetically coupled circuits, Simple series and parallel circuits, Dot convention, Ideal Transformer.	05
Unit-2	**Two Port Networks** Introduction to single and two port networks, Parameters of two port networks, z, y, h and A, B, C, D parameters, Relationship among different parameters, Series and parallel connections of two-port networks.	07
	Network Functions Review of Laplace transform, Network functions for one-port networks and two-port networks, Procedure for finding network functions for two-port networks, Poles and zeros of network functions, Restrictions on locations of poles and zeros in driving point functions and transfer functions.	04
	Network Synthesis Positive real functions, Synthesis of dissipative networks, Foster and Cauer form realization.	06
	Attenuator And Filters Introduction, Concept of Neper and decibel ,Types of attenuators: t-type, pi-type, L-type, ladder type, balanced type,Filter fundamentals, Pass and stop band, Behavior of characteristic impedance, Constant K-low and high pass filters.	07

Total=48

Recommended Books:

1. D-Roy Choudhary, Networks and Systems; Wiley Eastern.
2. Abhijit Chakrabarti, Circuit Theory : Analysis and Synthesis; Dhanpat Rai Publications.
3. Umesh Sinha, Network Analysis; Satya Prakashan.
4. Van Valkenburg, Network and Analysis; PHI.

Title of the course : **Analog Communication**
Subject Code : **EC-512**
Weekly load : 7 LTP 3-2-2
Credit : 5

Unit	Course outlines	Lecture(s)
Unit-1	**Analog Modulation Techniques** Introduction to modulation, Need of modulation, Theory of amplitude modulation, Frequency spectrum of AM wave, AM power calculations, AM modulation with a complex wave, Concepts of angle modulation, Theory of frequency modulation, Mathematical analysis of FM, Spectra of FM signals, Narrow band FM, Wide band FM, Phase modulation, Phase modulation obtained from frequency modulation, Comparison of AM, FM and PM.	05
	AM Transmission Basic principle of AM generation, Square law modulation, Low level and high level modulation, Grid modulated class-C amplifier circuit (Vander Bijl modulation), Plate modulated class-C amplifier circuit, Suppressed carrier AM generation (Balanced modulator) Diode ring modulator, Product modulator.	06
	FM Transmission FM generation methods, Generation of FM by direct method, Basic reactance modulator, Varactor diode modulator, Indirect generation of FM by Armstrong method, Frequency stabilized AFC transmitter system, Pre-emphasis circuit, Stereophonic FM transmitter system.	05
	SSB Transmission Introduction, Advantages of SSB Transmission, Generation of SSB, Filter method, Phase Shift Method, Hilbert Transform, Representing SSB Signals in terms of Hilbert Transforms, SSB modulator Using a Hilbert Transform , Third Method, Forms of amplitude modulation, Pilot carrier system, Independent Sideband system (ISB), Vestigial sideband system (VSB).	06
Unit-2	**AM Reception** Tuned radio frequency (TRF) receiver, Superheterodyne receiver, AM receiver characteristics. RF amplifier, Image frequency rejection, Choice of intermediate frequency, Frequency conversion and mixer circuits, Tracking and alignment, IF Amplifier, AM detector, practical diode detector with AGC, Distortion in diode detectors, Double hetrodyne receiver, Coherent AM detection, AM receiver using a phase locked loop (PLL).	06
	FM Reception Introduction, Block diagram of FM receiver, Amplitude limiter, De-emphasis circuit, Basic principle of FM detection, slope detector, Balanced stop detector, Foster-Seely phase discriminator, Ratio detector, FM detector using PLL, Zero crossing detector as a frequency demodulator, Stereo FM receiver.	05
	SSB Reception SSB product demodulator, Balanced modulator as SSB demodulator, SSB envelop detection receiver, Pilot carrier SSB receiver, SSB double hetrodyne receiver, ISB receiver, Modern communication receiver.	05
	Analog Pulse Modulation Techniques Introduction, Pulse Amplitude Modulation (PAM), Natural PAM, Flat-top	05

	PAM, Sampling Theorem, Frequency Spectra for PAM, PAM Time Multiplexing, Pulse Time Modulation (PTM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), Pulse Code Modulation, Generation and detection of PAM, PWM, PPM and PCM.	
	Noise Introduction, External noise, Internal noise, Resistor noise, Multiple resistor noise sources, Shot noise, Transit time noise, Noise in reactive circuits, Noise Temperature, Noise bandwidth, Effective input noise temperature, Noise figure, Noise figure calculations, Noise in analog modulated systems, SNR calculation for AM and FM.	05

Total=48

Recommended Books:

1. Kennedy, G., Electronic Communication Systems, McGraw-Hill (2008) 4th ed.
2. Taub, H., Principles of Communication Systems, McGraw-Hill (2008) 3rd ed.
3. Haykin, S., Communication Systems, John Willey (2009) 4th ed.
4. Wayne Tomasi, Electronic Communication Systems, Pearson(2011), 5th ed.

List of Experiments :(EC-613)

Experiments based upon hardware using communication kits and simulation with the help of simulation packages.

Hardware

1. To measure the modulation index of AM signals using the sine wave method and trapezoidal method .
2. To setup the circuit of AM modulator using transistor.
3. To setup the circuit of envelop detector for AM demodulation.
4. To setup the DSB/ SC AM signal and its demodulation using product Detector Circuit.
5. To setup the generation and detection of FM signals.
6. To setup the sampling process and time division multiplexing.
7. To setup the pulse amplitude modulation and demodulation circuits.
8. To setup the pulse width modulation and demodulation circuits.
9. To setup the pulse code modulation and demodulation circuits.
10. To setup the voltages and waveforms of various stages of super-heterodyne receiver.

Software

1. To measure the modulation index of AM signals using the sine wave method and trapezoidal method on MULTISIM software.
2. To observe the frequency spectrum and measure the bandwidth of AM signal on MULTISIM software
3. To setup the circuit of AM modulator using transistor on MULTISIM software.
4. To setup the circuit of envelop detector for AM demodulation on MULTISIM software.
5. To setup the circuit of DSB/SC AM using product modulator on MULTISIM software.
6. To observe the frequency spectrum and measure the bandwidth of FM signal on MULTISIM software.
7. To setup the circuit of pulse amplitude modulation on MULTISIM software.
8. To setup the circuit of pulse width modulation on MULTISIM software.
9. To setup the circuit of pulse position modulation on MULTISIM software.
10. To implement the analog modulation circuits using MATLAB.

Title of the course : Digital Electronics
Subject Code : EC-513
Weekly load :7 LTP 3-2-2
Credit : 5

Unit	Course outlines	Lecture(s)
Unit-1	**.Number Systems And Boolean Algebra** Review of Number systems, Radix conversion, Complements 9's &10's, Subtraction using 1's & 2's complements, Binary codes, Error detecting and Correcting codes, Theorems of Boolean algebra, Canonical forms, Logic gates.	08
	Digital Logic Families Introduction to bipolar Logic families: RTL, DCTL, DTL, TTL, ECL, I 2 L and MOS Logic families: NMOS, PMOS, CMOS, Details of TTL logic family - Totem pole, open collector outputs, TTL subfamilies, Comparison of different logic families.	08
	Combinational Logic Representation of logic functions, Simplification using Karnaugh map,Tabulation method, Implementation of combinational logic using standard logic gates, Multiplexers and Demultiplexers, Encoders and Decoders, Code Converters, Adders, Subtractors, Parity Checker and Magnitude Comparator.	08
Unit-2	**Sequential Logic Concepts And Components** Flip flops - SR, JK, D and T flip flops – Level triggering and edge triggering, Excitation tables - Counters - Asynchronous and synchronous type Modulo counters, design with state equation state diagram, Shift registers, type of registers, circuit diagrams, timing wave form and operations, Introduction to finite state machines	08
	D/A And A/D Converters Weighted resistor type D/A Converter, Binary ladder D/A converter,Steady state accuracy test, D/A accuracy and resolution, Parallel A/D Converter, counter type A/D converter, Successive approximation A/D converter, Single and Dual slope A/D converter, A/D accuracy and resolution.	08
	Semiconductor Memories: Memory organization, Classification, and characteristics of memories,Sequential memories, ROMs, R/W memories, Content Addressable memories, Charged-Coupled Device memory, PLA, PAL and Gate Array. Magnetic core memories.	08

Total=48

Recommended Books:

1. Malvino and Leach "*Digital principles and Applications*" Tata McGraw Hill.
2. Jain R P "*Modern Digital Electronics*", Tata McGraw-Hill, Third Edition, (2003)
3. Mano M Morris, "*Digital Design*" Pearson Education, Third Edition, (2002)
4. Flecther "An Engineering Approach to Digital Design", Prentice Hall of India, New Delhi.
5. Tocci Ronald J "Digital Systems-Principles and Applications" Prentice Hall of India, New Delhi.

List of experiments (EC-513)

1. Verification of the truth tables of TTL gates, e.g., 7400, 7402, 7404, 7408, 7432, 7486.
2. Verify the NAND and NOR gates as universal logic gates.
    a) Verification of the truth table of the Multiplexer 74150.
    b) Verification of the truth table of the De-Multiplexer 74154.
3. Design and verification of the truth tables of Half and Full adder circuits.
4. Design and verification of the truth tables of Half and Full subtractor circuits.
5. Design and test of an S-R flip-flop using NOR/NAND gates.

a) Verify the truth table of a J-K flip-flop (7476)
b) Verify the truth table of a D flip-flop (7474)

6. Operate the counters 7490, 7493 and 74194. Verify the frequency division at each stage and with a low frequency clock (say 1 Hz) display the count on LEDs.
7. Verify the truth table of decoder driver 7447/7448. Hence operate a 7 segment LED display through a counter using a low frequency clock.
8. Repeat the above with the BCD to Decimal decoder 7442 and an array of LEDs
9. Design and test D/A converter using R-2R Ladder Network
10. Design and test of A/D converter.

* Experimentation work to be supported by simulated results

Title of the course : Analog Electronics Circuits
Subject Code : EC-514
Weekly load :7 LTP 3-2-2
Credit : 5

Unit	Course outlines	Lecture(s)
Unit-1	**Introduction** Transistor biasing, stability factors, thermal runaway, JFET, MOSFET characteristics, principle of operation, FET as amplifier.	06
	Hybrid parameters and multistage amplifiers h- parameters, h- parameter equivalent circuits, analysis of CE, CC and CB configurations, BJT amplifiers, frequency response of R-C coupled amplifier, cascaded amplifier, transformer and direct coupled amplifiers,	06
	Transistor At High Frequencies Hybrid PI model and high frequency analysis of transistor amplifiers, gain-bandwidth product, Miller's theorem, common source and common drain amplifiers at high frequencies, frequency response, distortions and noise in amplifiers.	06
	Feedback Amplifiers Classification of amplifier, feedback concept, advantages and disadvantages of negative feedback, current-series, current-shunt, voltage-series, voltage-shunt feedback amplifier.	06
Unit-2	**Oscillators** Criteria for oscillation, description of circuits and working of tuned oscillator, Collpits, Hartley, R-C phase shift, L-C, crystal oscillators.	05
	Power Amplifiers analysis of class-A and class-B power amplifiers, push-pull amplifier, complementary symmetry push-pull amplifier, harmonic distortion, power dissipation and heat sink, conversion efficiency.	07
	Tuned Amplifiers Tuned voltage and power amplifiers, classification, single ended power amplifier, doubled tunned circuits.	06
	Wave shaping circuits Multivibrators, astable, monostable, bistable multivibrators, Schmitt trigger, design of these circuits using transistors.	06
		Total=48

Recommended Books:

1. Millman and Halkias, Integrated electronics-Analog and Digital circuits and Systems**;** Tata McGraw Hill.
2. J.B. Gupta, Electronics Devices and Circuits; Katson Publishers.
3. Millman and Taub, Pulse, Digital and Switching Waveforms; Tata McGraw Hill.

List of Experiments (EC-514)

1. To plot frequency response characteristics of a RC Single stage..
2. To determine the voltage gain of a two stage RC coupled amplifiers.
3. To plot frequency response characteristics of Transformer coupled amplifier.
4. To plot frequency response of a tuned voltage amplifier and to calculate its resonant frequency.
5. To find voltage gain of an emitter follower and find its operating point.
6. To verify the Wein Bridge Oscillator
7. To verify the Phase Shift Oscillator.
8. To verify the high frequency response of transistor.
9. To verify the diode as a biased and unbiased clipper.
10. To verify the Astable and Bistable Multivibrator using Transistors.
11. To observe the low frequency response of transistor.
12. To verify the inverting and non-inverting amplifier using feedback.
13. To verify the frequency response of audio amplifier.

*Compare the results of each aim of experiment with ORCAD spice simulation.

Title of the course : **Network Analysis and Synthesis**
Subject Code : **EE-511**
Weekly load : 7 LTP-3 2 2
Credit : 5

Unit	Course Outlines	Lectures
Unit-1	**Circuits Concepts** Circuits Elements, Independent and dependent sources, signals and wave forms; periodic and singularity voltages, step, ramp, impulse, Doublet. Loop currents and loop equations, node voltage and node equations, Network Theorems, Superposition, Thevenin's, Norton's, Maximum Power Transfer, Reciprocity. Fourier transforms and series, Laplace transform, its properties and applications, Concept of one port, two-port networks, characteristics and parameters	12 Hrs
	Time and Frequency Domain Analysis Representation of basic circuits in terms of generalised freq. & their response, Laplace transform of shifted functions, transient & steady response, Time domain behaviors from poles and zeros, Convolution Theorem.	12 Hrs
Unit-2	**Filters Synthesis** Classification of filters, characteristics impedance and propagation constant of pure reactive network, Ladder network, T section, IT section, terminating half section. Pass bands and stop bands. Design of constant-K, m-derived filters.	12 Hrs
	Network Synthesis Composite filters, Network functions, Impedance & Admittance function, Transfer functions, Relationship between transfer and impulse response, poles and zeros and restrictions, Network function for two terminal pair network, Sinusoidal network in terms of poles & zeros. Real liability condition for impedance synthesis of RL & RC circuits, Network synthesis techniques for 2-terminal network, Foster and Cauer forms	12 Hrs

Recommended Books-

1.Temes& LaPatra – Introduction to circuit Synthesis & Design, McGraw Hill.
2. V. Valkenberg – Modern Network Synthesis, PHI.
3. Weinberg – Network Analysis & Synthesis, McGraw Hill.
4. Peikari – Fundamentals of Network Analysis & Synthesis, Wiley.
5. V. Atre-- Network Theory and Filter design, TMH.

List of Experiments (EE-511)

1Verification of principle of superposition with dc and ac sources
2 Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits
3 Verification of Tellegin's theorem for two networks of the same topology
4 Determination of transient response of current in RL and RC circuits with step voltage input
5 Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases
6 Determination of frequency response of current in RLC circuit with sinusoidal ac input
7 Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters
8 Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values
9 Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests
Write Demo for the following (in Ms-Power point)
10 Verification of parameter properties in inter-connected two port networks : series, parallel and cascade also study loading effect in cascade
11 Determination of frequency response of a Twin – T notch filter

Title of the course : Electrical Machine (DC Machines & Transformers)
Subject Code : EE-512
Weekly load : 7 LTP-3 2 2
Credit **:** 5

Unit	Course Outlines	Lectures
Unit-1	**Transformers** Effect of saturation on exciting current and in-rush current phenomenon. Parallel operation of single phase transformers.	8
	Auto transformers Principle of operation, equivalent circuit and phasor diagrams, comparison with two winding transformer.	08
	Three-phase transformers Different types of winding connections, Voltage and current ratios, Parallel operation of three phase transformers. Three winding transformer's equivalent circuit, off-load and on-load tap changing transformer, Scott connections. Testing of transformers.	08
Unit-2	**D.c. Generator** Working principle , construction of DC Machines, Armature windings, single and double layer winding diagrams, E.M.F. and torque equations, armature reaction, effect of brush shift, compensating winding, commutation, causes of bad commutation, methods of improving commutation, methods of excitation of d.c. generators and their characteristics.	12
	D.c. Motor Working principle characteristics, starting of shunt and series motor, starters, speed control methods: field and armature control. Braking: plugging, dynamic and regenerative braking, Testing: Swinburn's test, Hopkinson test, Field test. Estimation of losses and efficiency.	12

Recommended Books-

1. Bimbhra P.S., *Electrical Machinery, Khanna Publishers*
2. Fitzgerald A.E., Kingsley C. and Umans S.D., *Electric Machinery*, 6th Edition, McGraw Hill
3. Langsdorff E.H., *Principles of D.C. machines*, McGraw Hill
4. Nagrath I.J. and Kothari D.P., *Electrical Machines*, 4th Edition, Tata McGraw Hill,
5. Say M G, *Alternating Current Machines*, 5th edition, Sir Isaac Pitman & Sons Ltd.

List of Experiments (EE-512)

1.To Load test on a single phase transformer.
2. To perform Open circuit and short circuit tests on a single phase transformer and hence find equivalent circuit, voltage regulation and efficiency.
3. To find the efficiency and voltage regulation of single phase transformer under different loading conditions.
4. To perform parallel operation of two single phase transformers.
5. To study the various connections of three phase transformer.
6. To perform Scott connections on three phase transformer to get two phase supply.
7. To study the constructional details of direct current (DC) machine and to draw sketches of different components.
8. To measure armature and field resistance of direct current (DC) shunt generator and to obtain its open circuit characteristics.
9. To obtain load characteristics of direct current (DC) shunt/series /compound generator.
10. To draw speed-torque characteristics of direct current (DC) shunt/series /compound generator.
11. To study direct current (DC) motor starters.
12. To perform Swinburne's test (no load test) to determine losses of direct current (DC) shunt motor

Title of the course :Electrical and Electronics Measurement and Instrumentation

Title of the course : **Electrical and Electronic Measurement and Instrumentation**
Subject Code **: EE-513**
Weekly load : 4 LTP-4 0 0
Credit **:** 4

Unit	Course Outlines	Lecture(s)
Unit-1	**Introduction** Elements of generalized measurement system, characteristics of instruments, accuracy, precision, sensitivity, range span. Construction and working of CRT, Block diagram of CRO, measurement of voltage and frequency with CRO, basic CRO circuit, measurement of voltage, current, phase, frequency, time period. dual track oscilloscope, specification of a CRO and their significance, front panel controls.	10
	Basic Indicating Instruments Classification of analog, concept of deflecting, controlling and damping torque, control and damping system, construction and principle of moving iron and moving coil instruments, construction of ammeter and voltmeter and extension of their range and Electro dynamometer instruments, Principles of operation PMMC ohm meters and their types.	12
	Measurement of Resistance Potentiometers: Basic principles, types of potentiometers, their functions and applications, Classification of resistance, measurement of low, medium and high resistance, ammeter-voltmeter method, wheat-stone bridge, digital LCR meter for measurement of resistance, insulation tester.	10
Unit-2	**Bridges** Sources and Detectors, General equation for bridge balance, Measurement of R,L,C,M, F etc by Wheatstone,Kelvin, Maxwell, Hay's, Anderson, Owen, Heaviside, Campbell, schering, Wien bridges. Bridge sensitivity. Errors, Wagner Earthing Device.	10
	Magnetic Measurements Flux meter, B-H Curve, Hystersis loop, Permeameters, AC Testing of Magnetic materials, Separation of iron losses, iron loss measurement by Wattmeter and Bridge methods.	10
	Instrument Transformers Theory and construction of current and potential transformers, ratio and phase angle errors and their minimization, Characteristics of CTs. &PTs., Testing of CTS &PTS..	10

Recommended Books-

Electrical and electronic measurement and instrumentation	AK Sawhney	DhanpatRai and Co.
Electrical Measurement	JB Gupta	SK Kataria
Electronic Measurement and Instrumentation	Dr.Rajendra Prasad	S.Chand

Title of the course : Transmission and Distribution of Electrical Power
Subject Code : EE-514
Weekly load : 5 LTP-3 2 0
Credit : 4

Unit	Course Outlines	Lectures
Unit-1	**Introduction** Generation of Electric Power- Brief description of Thermal, hydro nuclear and gas power plants & other non-conventional power plants. Transmission and Distribution Systems- DC 2 –wire and 3 – wire systems, AC single phase, three phase and 4-wire systems, comparison of copper efficiency. Distribution Systems: primary and secondary distribution systems, concentrated & uniformly distributed loads on distributors fed at one and both ends, ring distribution, submains and tapered mains, voltage drop and power loss calculations, voltage regulators	06
	Overhead Transmission Lines Types of Conductors, Line parameters; calculation of inductance and capacitance of single and double circuit transmission lines, three phase lines with stranded and bundle conductors, Generalized ABCD constants and equivalent circuits of short, medium & long lines. Line Performance: regulation and efficiency of short, medium and long lines, Series and shunt compensation, Introduction to FACTS	08
	Overhead Line Insulators Type, string efficiency, voltage distribution in string of suspended insulators, grading ring, preventive maintenance	06
	Mechanical Design of Transmission Lines Different types of tower, sag-tension calculations, sag-template, string charts, vibrations & damaging Corona-corona losses, radio & audio noise, transmission line – communication line interference	08
Unit-2	**Tariffs & Load Curves** Definition & different tariffs for domestic, commercial, industrial application, Different Load and Load duration curves. Curves their significance	10
	Introduction to EHV/HVDC transmission Brief description of both the systems with working & constructional details	10

Recommended Books-

1. Grainger John, J. and Stevenson, Jr. W.D., “Power System Analysis”, McGraw Hill, 1994.
2. Harder Edwin, I., “Fundamentals of Energy Production”, John Wiley and Sons, 1982.
3. Deshpande, M.V., “Elements of Electric Power Station Design”, A.H. Wheeler and Co. Allahabad, 1979.
4. Burke James, J., “Power Distribution Engineering; Fundamentals and Applications” Marcel Dekker 1996.
5. Wadhwa, C.L., “Electric Power Systems”, Second Edition, Wiley Eastern Limited, 1985.
6. Nagrath, I.J. and Kothari, D.P., “Power System Engineering”, Tata McGraw Hill, 1995.

Title of the course : Simulation Lab
Subject Code : EE-515
Weekly load : 2 LTP-0 0 2
Credit : 1

List of Experiments(EE-515)

1. To perform various arithmetic operations in Microsoft Excel and create various types of 2D plots.
2. To create arrays and matrices in MATLAB and perform various arithmetic operations.
3. To write a programme in MATLAB for getting the desired data (largest, smallest, a range etc) from a set.
4. To write a programme in MATLAB for creating various types of 2D plots (single and multiple) from a set of data.
5. To measure and plot the Instantaneous, RMS and average values of current/voltage, power, power factor, crest factor, frequency and various other waveform parameters while simulation of behaviour of basic circuit components supplied from a DC and an AC source in MATLAB.
6. To simulate the steady state and transient behaviour of circuits having a pure resistance or pure inductance or pure capacitance supplied from a DC and an AC source in MATLAB. Plot their source and load current and voltage waveforms and comment on it.
7. To simulate the steady state and transient behaviour of circuits having RL, RC and RLC series combinations fed from a DC and an AC source in MATLAB. Plot their source and load current and voltage waveforms and comment on it.
8. To simulate the steady state and transient behaviour of circuits having RL, RC and RLC parallel combinations fed from a DC and an AC source in MATLAB. Plot their source and load current and voltage waveforms and comment on it.
9. To simulate the steady state and transient behaviour of a diode bridge rectifier (single phase and three phase) in MATLAB for R and RL load. Plot their current/voltage waveforms at source, diodes and load and comment on it.
10. To simulate the steady state and transient behaviour of DC Motors (shunt, series and compound) in MATLAB. Plot various current/voltage waveforms and characteristics and comment on it.
11. To simulate the steady state and transient behaviour of Transformers (single phase/three phase) in MATLAB. Plot various current/voltage waveforms and comment on it.
12. To simulate the steady state and transient behaviour of a single phase center tapped transformer based diode rectifier in MATLAB for R and RL load. Plot their current/voltage waveforms at source, diodes and load and comment on it.
13. To simulate the speed control of DC Motors (shunt, series and compound) in MATLAB using variable AC source and diode bridge rectifier and by armature and field control methods. Plot various current/voltage waveforms and comment on it.
14. To model a multiphase transformer using single phase/three phase Transformers in MATLAB and simulate its steady state and transient behaviour. Plot various current/voltage waveforms and comment on it.
15. Introduction to Labview and examples.

Recommended Books:

Title	Author	Publisher
1. Getting Started with MATLAB	Rudra Pratap	Oxford University Press
2. Mastering MATLAB 7	Hanselman & Littlefield	Prentice Hall
3. Electric Machinery	Fitzgerald, Kingslay and Umans	McGraw Hills

Title of the course : **Food Biochemistry and Nutrition**
Subject Code : **FT-511**
Weekly load : 5 LTP 3-0-2
Credit : 4

Unit	Detailed Contents	Lectures
Unit 1	**Enzymes** Enzymes classification, specificity of enzymes, co-enzymes, co-factors, enzyme inhibitors and activators, Factors effecting enzyme activity, Enzyme kinetics, Line weaver Burk plot, Allosteric enzymes.	10
	Metabolism of carbohydrates and biological oxidation Digestion and absorption, glycolysis, gluconeogenesis, Feeder pathway of glycolysis, disorders of carbohydrate metabolism Kreb's cycle, electron transport chain and oxidative phosphorylation.	11
Unit 2	**Metabolism of lipids** Digestion, absorption and function of lipid, β-oxidation of fatty acids, Pathway of synthesis of fatty acids, Biosynthesis of triacylglycerol.	7
	Metabolism of Proteins Importance of protein, digestion and absorption of proteins, nitrogen balance, Biosynthesis of protein, general catabolism of amino acids, deamination, Transamination, urea cycle, disorders of amino acid metabolism.	7
	Food Nutrition Functions and energy values of foods, basal energy metabolism: BV, NPU, BMR, PER calculations, dietary allowances and standards for different age groups, nutritive value of Indian food, techniques for assessment of human nutritional status. Causes and preventions of malnutrition.	9
		Total=44

Recommended Books:

Author	**Title**	**Publisher**
Lehninger, A.L.; Nelson, D. L. and Cox, M. M	Principals of Biochemistry	CBS
Strayer. L.	Biochemistry	
Handler, P.: Smith E.I.; Stelten, D. W	Principals of Biochemistry	AVI
Sunetra Roday	Food Science & Nutrition	

List of Experiments (**FT-511**)

1. Estimation of total sugars by Dubois method in a given food sample
2. Estimation of glucose
3. Estimation of fructose
4. Estimation of enzymatic activity in a given food sample
5. Estimation of ascorbic acid in a given food sample
6. Estimation of cholesterol content
7. Estimation of protein by Lowry method
8. Estimation of phytic acid
9. Estimation of phosphatase activity in a milk sample
10. Estimation of products of anaerobic fermentation
11. Estimation of nutritive value of given food sample
12. Estimation of calorific value by Bomb calorimeter

Title of the course : Heat and Mass Transfer
Subject Code : FT-512
Weekly load : 5 LTP 3-0-2
Credit : 4

Unit	Detailed Contents	Lectures
Unit 1	**Conduction heat transfer** Modes of heat transfer, Steady state unidirectional heat transfer with and without internal heat generation through slab, cylinder, spheres and composite geometries; insulation and its purposes, critical thickness of insulation for cylinders and spheres, Unsteady state heat transfer in simple geometry; Use of Heisler charts, Gaussian error function to solve transient heat transfer problems.	12
	Convection Heat Transfer Natural and forced convection, dimensional analysis for free and forced convection, dimensionless numbers used in convective heat transfer, important correlations for free and forced convection.	5
	Boiling and condensation Boiling phenomenon, hysteresis in boiling curve, nucleate and forced convection boiling; condensation phenomenon, condensation on vertical surface, outside a tube and inside horizontal tube.	5
Unit 2	**Radiation heat transfer** Characteristics of black, grey and real bodies in relation to thermal radiation, Stefan Boltzmann law; Kirchhoff's law; Wein displacement law, Emissive power for a black body and real body, intensity of radiation, radiation between two bodies.	5
	Heat Exchanger Classification, overall heat transfer coefficient, fouling factors, log-mean temperature difference for parallel and counter flow heat exchangers, effectiveness of parallel and counter flow heat exchanger by NTU method, Design of shell and tube heat exchanger	5
	Mass Transfer Introduction to mass transfer, different modes of mass transfer, Mass flux and molar flux for a binary system, Fick's law of diffusion of mass transfer, Derivation of general diffusion mass transfer equation, Molecular diffusion in gases, liquids and solids having steady state equi-molar counter diffusion and through non diffusing body; Steady state equimolar counter diffusion, convective mass transfer coefficient, natural and forced convective mass transfer, dimensional analysis for free and forced convective mass transfer, important correlations of convective mass transfer; permeability of films and laminates. Unsteady state diffusion in slabs, cylinders and spheres, transient mass transfer in semi infinite medium.	12

Total=44

Recommended books:

	Author	**Title**	**Publisher**
1.	Arora & D'kundwar	A course in Heat and Mass Transfer	Dhanpat Rai &Sons
2.	R.C. Sachdeva	Fundamentals of Engineering Heat & Mass transfer	New Age
3.	D.S. Kumar	Heat and Mass Transfer	Kataria & Sons
4.	R K Rajput	Heat and Mass Transfer	
5.	K A Gavhane	Unit Operations-II	Khanna Pub

List of Experiments (FT-512)

1. To determine thermal conductivity of a material.
2. To find the thermal diffusivity of a food material.
3. To find out the Overall heat transfer co-efficient for a viscous food material assuming negligible internal thermal resistance (lumped heat capacity system).
4. To calculate the surface and centre temperature of a rectangular body loosing heat to the surrounding by use of Heisler and correction factor chart.
5. To calculate the surface and centre temperature of a cylindrical body loosing heat to the surrounding by use of Heisler and correction factor chart.
6. To calculate the surface and centre temperature of a spherical body loosing heat to the surrounding by use of Heisler and correction factor chart.
7. To determine surface heat transfer coefficient for a vertical tube losing heat by free convection.
8. To determine surface heat transfer coefficient for pipe losing heat by forced convection.
9. Determination of overall heat transfer coefficients for unsteady state heating process
10. To determine the value of Stefan Boltzmann constant for radiation heat transfer.
11. To determine LMTD, rate of heat transfer and effectiveness by NTU method for parallel flow heat exchanger.
12. To determine LMTD, rate of heat transfer and effectiveness by NTU method for counter current flow heat exchanger.
13. To determine the moisture diffusivity and activation energy for different geometries of food materials having rectangular/cubical geometry.
14. To determine the moisture diffusivity and activation energy for different geometries of food materials having cylindrical geometry.
15. To determine the moisture diffusivity and activation energy for different geometries of food materials having spherical geometry.
16. To study the behavior of boiling curve.

Title of the course **: Unit Operations**
Subject Code **: FT-513**
Weekly load : 5 **LTP** 3-0-2
Credit : 4 (Lecture 3; Practical 2)

Unit	Detailed Contents	Lectures
Unit 1	**Introduction** Definition and application in food processing.	1
	Size reduction Theory of communition, Ritinger's law, Kick's law, Bond's law and their applications in calculation of energy required in grinding, Crushing efficiency, Size reduction equipment used in food industry.	8
	Sieving Separation based on size, Effectiveness of screens, Types of screens, Factors affecting the sieving process, Fineness modules and particle size distribution	5
	Mixing Theoretical aspects of solid mixing. Mixing index, rate of mixing, Theory of liquid mixing, Equipment for liquid and solid mixing.	6
Unit 2	**Leaching and extraction** Concentration, Gas – Liquid equilibria, Solid – Liquid equilibria, Extraction-Solid Liquid extraction, Liquid-Liquid extraction, stage equilibrium extraction. Super critical fluid extraction, Application-extraction of fatty acid, Essential oils.	8
	Distillation Liquid vapor equilibrium, distillation of binary mixtures, simple distillation, flash distillation, steam distillation. Crystallization-rate of crystallization, crystallization equilibrium.	8
	Filtration Theoretical aspects, Fundamental equation for filtration, Filtration equipment.	8
	Sedimentation and centrifugal separation Theory, Gravitational sedimentation of particles in liquids and gases, Sedimentation equipment. Basic equation, centrifugal clarification, Equipments.	6

Total=50

Recommended books:

1. P. Fellows Food Processing Technology Woodhead Pub
2. R. L. Earle Unit Operations in Food Processing

List of Experiments (FT-513**)**

1. Study of various equipments in Unit Operation Lab
2. Determination of critical speed of ball mill
3. Determination of power requirement of a given grinding equipment
4. Determination of the effect of hammer mill speed and screen size on particle size of the ground material
5. Determination of effectiveness of screen
6. Determination of fineness modulus of a ground sample
7. Effect of mixing time on the mixing index of solid mixing
8. Calculation of power requirement of a mixer
9. Dismantling and Assembly of horizontal filter press
10. Constructional features of rotary drum vacuum filter
11. Determination of factitious thickness of filter medium
12. Dismantling and Assembly of disc bowl centrifuge
13. Effect of speed of centrifuge on the composition and yield of cream
14. Determination of sedimentation rate of a slurry

Title of the course : Digital Electronics
Subject Code : IE-511
Weekly load : 5 LTP-3 0 2
Credit : 4

Unit	Course Outlines	Lecture(s)
Unit-1	**Number System & Codes** Review of number systems, binary number systems, octal number system, hexadecimal number system, signed & unsigned numbers, different types of codes & their conversions, binary operations- addition, subtraction, multiplication, division, 1's & 2's complement of a number.	08
	Combinational Logic Concept of positive & negative logic, introduction to Boolean variables, Logical functions using Karnaugh map & Quine-Macluskey methods, multiplexers, demultiplexers, encoders, decoders, address, subtractors, parity generators, parity checkers, code converter.	08
	Sequential Logic Concepts And Components Flip flops - SR, JK, D and T flip flops - Level triggering and edge triggering, Shift registers, type of registers, circuit diagrams, synchronous & asynchronous Counters, Excitation tables ,design with state equation state diagram counters, up & down counters, ring counters & mod, Counters. Introduction to finite state machines.	10
Unit-2	**Introduction to Vhdl** Overview of digital design with very-high-speed integrated circuits (VHSIC) hardware description language (VHDL), HDL format and Syntax, entity, Data representation in VHDL, Truth table using VHDL, Decision Control structure and Sequential Circuit using VHDL.	08
	Digital Logic Families Introduction, characteristics of digital ICs, resistor transistor logic, integrated injection logic, direct coupled transistor 109lc, diode transistor logic & transistor-transistor logic, emitter coupled logic, MOS logic, and high threshold logic families.	08
	Semiconductor Memories Introduction, memory organization, classification & characteristics of memories, sequential memories, read only memories, read & write memories, content addressable memories, and programmable logic arrays, charged coupled device memory.	08

Recommended Books-

1. Digital Electronics	R. P. Jain	TMH
2.Digital Circuits and Logic Design	Katre	Techmax
3.Digital Electronics & 4.Computer Fundamentals	Albert Paul Malvino	TMH
5.Digital Computer Design	Radhakrishanan & Rajaraman	PHI
6.Digital Computer Fundamentals	Thomas Bartee	TMH
7.Digital Computer Design	Moris Mano	PHI

List of Experiments (IE-511)

1. Verification of the truth tables of TTL gates.
2. Verify the NAND and NOR gates as universal logic gates.
3. Design and verification of the truth tables of Half and Full adder circuits.
4. Design and verification of the truth tables of Half and Full subtractor circuits.
5. Verification of the truth table of the Multiplexer 74150.

6. Verification of the truth table of the De-Multiplexer 74154.
7. Design and test of an S-R flip-flop using NOR/NAND gates.
8. Verify the truth table of a J-K flip-flop (7476)
9. Verify the truth table of a D flip-flop (7474)
10.Operate the counters 7490, 7493.
11. Design of 4 bit shift register(shift right).
12.Design of modulo-4 counter using J K flip flop.

Title of the course : Linear Integrated Circuits
Subject Code : IE-512
Weekly load : 5 LTP-3 0 2
Credit : 4

Unit	Course Outlines	Lecture(s)
Unit-1	**Introduction** The Operational Amplifier, block diagram representation and analysis, Differential amplifier, buffer, level translator and output driver. Block diagram, specifications, ideal op-amp, emitter coupled differential amplifiers, Various Parameters: Input Offset Voltage,Input Bias Current, CMRR,SVRR,Differential Input Resistance, slew rate familiarization with 741, offset null adjustments, measurement of op-amp parameters, frequency response op-amp.	08
	Operational Amplifier Ideal Op-Amp, equivalent circuits, configurations, differential amplifier, inverting amplifier, non inverting amplifier, negative feedback, block diagram representation of feedback configurations, Voltage Series Feedback Amplifier, voltage shunt feedback amplifier, Differential Amplifiers, Voltage Follower.	08
	Op-Amp Linear Applications DC and AC Amplifiers, Summing, Scaling and Averaging Amplifiers, Instrumentation Amplifier, Differential Input and Output Amplifier, V/I converter with grounding and floating load, I/V converter, Integrator and differentiator,	06
	Active Filters Introduction, Butterworth Filter, Higher Order Filters, Band Pass and Band Reject Filters, All Pass filter	06
Unit-2	**Oscillators** Principles, Types, Frequency Stability, Phase Shift, Wein Bridge, Quadrature Oscillators, Square Wave Generator, Triangular Wave Generator, Sawtooth Wave Generator, Voltage Controlled Oscillators.	04
	Comparators Introduction, Basic Comparator, Zero Crossing Detector, Schmit Trigger, Comparator Characteristics, Limitations of Op-Amps as Comparators, Voltage Limiters	04
	Converters High Speed and Precision type Comparators,V/F and F/V Converters, Clippers and Clampers, Peak Detector, Sample and Hold Circuit.	06
	Specialized IC Applications Universal Active Filter, Switched Capacitor Filter,555 Timer, Power Amplifiers, Concept of regulation, 723 voltage regulator, three terminal voltage regulators (positive, negative, variables) applications, commercial voltage regulators ICs, universal active filter, switched capacitor filter, phased locked loop.	08

Recommended Books-

Linear integrated circuits	JAIN & CHAUDHARY	Tata Mcgraw
Op-amp & Linear Integ. Ckts	COUGHLIN	PHI
Integrated Electronics	MILLMAN & HALKIES	Tata Mcgraw
Op-amp & Linear Integ. Ckts	GAEKWAD	PHI

List of Experiments (IE-512)

1. To experimentally study the performance of inverting amplifier-using op-amp.
2. To experimentally study the performance of non-inverting amplifier using op-amp.
3. To experimentally study the performance of differential amplifier using op-amp
4. To demonstrate working of an op-amp as a voltage follower.
5. To demonstrate working of an op-amp as a square wave generator.
6. To demonstrate working of an op-amp as a low pass filter.
7. To demonstrate working of an op-amp as a high pass filter.
8. To demonstrate working of an op-amp as a band pass filter.
9. To demonstrate working of an op-amp as a band rejection filter.
10. To demonstrate the operation of a 555 timer as monostable multivibrator.
11. To demonstrate the operation of a 555 timer as astable multivibrator.
12. To demonstrate working of instrumentation amplifier using 3 op-amp configurations.

Title of the course : Signals and Systems
Subject Code : IE-513
Weekly load : 5 LTP-3 2 0
Credit : 4
Theory:

Unit	Course Outlines	Lecture(s)
Unit-1	**Introduction** Introduction to Signals and Systems, System Properties, Convolution of Signals, Linear Shift Invariant Systems and their Properties.	12
	Inroduction to Transforms Introduction to Transforms, Fourier Series and Fourier Transform, Convergence of Fourier Transform, Properties of Fourier Transform.	12
Unit-2	**Sampling and reconstruction of the signal** Sampling Theorem, Sampling/Reconstruction of Signals, Realistic Sampling, Aliasing, Introduction to Digital Signal Processing, Advantages and disadvantages of digital signal processing over analog signal processing	12
	Laplace and Z-transforms Introduction to Laplace Transform and Z-Transform, Region of Convergence, Properties of Laplace and Z Transform, Inverse Laplace and Z Transforms, Rational System Functions.	12

Recommended Books:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, Signals and Systems, Pearson Education, 2007.
2. Edward W Kamen & Bonnie's Heck, "Fundamentals of Signals and Systems", Pearson Education, 2007.

Title of the course : Electrical Machine
Subject Code : IE-514
Weekly load : 7 LTP-3 2 2
Credit : 5
Theory:

Unit	Course Outlines	Lecture(s)
Unit-1	**D.c. Machine** Construction of D.C. machines – theory of operation of D.C. generator – characteristics of D.C. generators – armature reaction – commutation – principle of operation of D.C. motor – voltage equation – type of D.C. motor and their characteristics – speed control of D.C. motors.	12
	Transformer Theory of ideal transformer – EMF equation – constructional details of shell and core type transformer – test on transformer – equivalent circuit – phasor diagram – regulation and efficiency of a transformer.	12
Unit-2	**Synchronous machine** Principle of alternators – construction details – equation of induced EMF – vector diagram – method of starting of synchronous motor – torque developed by the motor – V curves – speed control.	08
	Induction machines Construction and principle of operation – classification of induction motor – relation between torque and rotor power factor – starting and running condition – condition for maximum torque – comparison between synchronous motor and induction motors – speed control of induction motors.	08
	Special machines Types of single phase motor – double revolving field theory – cross field theory – capacitor start capacitor run motors – shaded pole motor – repulsion type motor – universal motor – hysteresis motor.	08

Recommended Books-

1. Fitzgerald A.E., Kingsly C., Umans S.D., 'Electrical Machinery', McGraw-Hill, Singapore, 1990.
2. Cotton H. 'Advanced Electrical Technology', Sir Isaac Pitman and Sons Ltd., London, 1971.
3. Del Toro V. 'Electrical Engineering Fundamentals', Prentice Hall of India, New Delhi, 1995.
4. Verinott, C.C., 'Fractional and sub-fractional horsepower electric motors', McGraw Hill, Singapore, 1985.
5. Theraja, B.L., 'A Text book of Electrical Technology', Vol.II, S.C.Chand and Co., New Delhi, 1997.

List of Experiments (IE-514)

1. Determination of coupling coefficient.
2. Series and parallel resonance.
3. Power measurement in single phase and three phase circuits.
4. Open circuit characteristics of DC generators.
5. Load characteristic of DC motors.
6. Speed control of DC motors
7. Brake test of DC motors.
8. Regulation of three-phase alternator.
9. Open circuit and short circuits of transformer.
10. Brake test of induction motors.
11. V-curve of synchronous motor.

Title of the course : **Circuit Theory**
Subject Code : **IE-515**
Weekly load : 3 LTP-3 0 0
Credit : 3

Unit	Course Outline	Lecture(s)
Unit-1	**Graph Theory** Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis.	08
	Network Theorems (Applications to ac networks) Super-position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem. Millman's theorem, compensation theorem, Tellegen's theorem.	06
	Network Functions Concept of Complex frequency , Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot, frequency response and Bode plots.	10
Unit-2	**Two Port Networks** Characterization of LTI two port networks ZY, ABCD and h parameters, reciprocity and symmetry. Inter-relationships between the parameters, inter-connections of two port networks, Ladder and Lattice networks. T & Π Representation.	09
	Network Synthesis Positive real function; definition and properties; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.	08
	Filters Image parameters and characteristics impedance, passive and active filter fundamentals, low pass, highpass,band pass, band elimination filters.	07

Recommended Books-

1. M.E. Van Valkenburg," Network Analysis", Prentice Hall of India
2. D.Roy Choudhary,"Networks and Systems" Wiley Eastern Ltd.
3. Donald E. Scott : "An Introduction to Circuit analysis: A System Approach" McGraw Hill Book Company.
4. A.Chakrabarti,"Circuit Theory" Dhanpat Rai & Co.

Reference Books :

5. M.E. Van Valkenburg,"An Introduction to Modern Network Synthesis",Wiley Eastern Ltd.
6. W.H. Hayt & Jack E-Kemmerly, Engineering Circuit analysis" Tata McGraw Hill.
7. Soni, Gupta ,"Circuit Analysis", Dhanpat Rai & Sons.
8. Ram Kalyan, Linear Circuits Oxford University Press.