Semester VI (Third year]
Branch/Course Civil Engineering

Course Code	Course Name	L	T	P	Credits	TH/PR	ESE	IA
101601	Constitution of India/Essence of Indian Knowledge Traditional	3	0	0	0	TH	0	0
101602	Construction Engineering & Management	2	1	0	3	TH	70	30
101603	Design of Steel Structure	3	0	0	3	TH	70	30
101604	Engineering Economics, Estimation & Costing	2	0	0	2	TH	70	30
101605	Environmental Engineering-II	3	0	0	3	TH	70	30
101606	Geotechnical Engineering -II	3	0	0	3	TH	70	30
100604	MOOCs / SWAYAM / NPTEL Courses - 2	2	0	0	2	TH	70	30
1016xx	Program Elective- I	3	0	0	3	TH	70	30
101604P	Engineering Economics, Estimation & Costing	0	0	2	1	PR	30	20
101607P	Industrial Visit	0	0	2	1	PR	30	20

Semester VI (Third year]
Branch/Course Mechanical Engineering

Course Code	Course Name	L	T	P	Credits	TH/PR	ESE	IA
102605	Automation in Manufacturing	3	0	0	3	TH	70	30
102601	Design of Machine Elements	3	1	0	4	TH	70	30
102602	Dynamics of Machinery	3	0	0	3	TH	70	30
100603	Graduate Employability Skills and Competitive Courses (GATE, IES, etc.)	3	0	0	0	TH	0	0
102603	Manufacturing Technology	3	0	0	3	TH	70	30
102604	Open Elective- I	3	0	0	3	TH	70	30
1026xx	Program Elective- I	3	0	0	3	TH	70	30
1026xx	Program Elective- II	3	0	0	3	TH	70	30
102601P	Design of Machine Elements	0	0	2	1	PR	30	20
102602P	Dynamics of Machinery	0	0	3	1.5	PR	30	20
102603P	Manufacturing Technology	0	0	3	1.5	PR	30	20
102605P	Automation in Manufacturing	0	0	3	1.5	PR	30	20

Semester VI (Third year]
Branch/Course Electrical Engineering

Paper Code	Paper Name	L	T	P	Credits	TH/ PR	ESE	IA
100606	Digital Signal Processing	3	0	0	3	TH	70	30
100609	Electronics Design Laboratory	1	0	0	1	TH	70	30
100607	Introduction to VLSI Design	3	0	0	3	TH	70	30
100604	MOOCs / SWAYAM / NPTEL Courses - 2	2	0	0	2	TH	70	30
103601	Power Systems – II (Operation and Control)	3	0	0	3	TH	70	30
100608	Professional Skill Development	3	0	0	3	TH	70	30
1036xx	Program Elective - III	3	0	0	3	TH	70	30
1036xx	Program Elective- II	3	0	0	3	TH	70	30
100605	Workshop/heads on Training/Soft Skill	3	0	0	0	TH	0	0
100606P	Digital Signal Processing	0	0	2	1	PR	30	20
100609P	Electronics Design Laboratory	0	0	4	2	PR	30	20
100607P	Introduction to VLSI Design	0	0	2	1	PR	30	20
103601P	Power Systems – II (Operation and Control)	0	0	2	1	PR	30	20

Semester VI (Third year]
Branch/Course Electronics & Communication Engineering

Paper Code	Paper Name	L	T	P	Credits	TH/ PR	ESE	IA
100601	Biology for Engineers	2	1	0	3	TH	70	30
104601	Computer Organization and Architecture	3	0	0	3	TH	70	30
104602	Digital Communication	3	1	0	4	TH	70	30
104603	Disaster Management	3	0	0	0	TH	0	0
104604	Electronics Instruments and Measurement	3	1	0	4	TH	70	30
100604	MOOCs / SWAYAM / NPTEL Courses - 2	2	0	0	2	TH	70	30
1046xx	Program Elective- I	3	0	0	3	TH	70	30
100605	Workshop/heads on Training/Soft Skill	3	0	0	0	TH	0	0
104602P	Digital Communication	0	0	2	1	PR	30	20
104604P	Electronics Instruments and Measurement	0	0	2	1	PR	30	20

Semester VI (Third year]
Branch/Course Computer Science & Engineering

Paper Code	Paper Title	L	T	P	Credits	branch	TH/PR	ESE	IA
105601	Compiler Design	3	0	0	3	105	TH	70	30
100602	Computer Networks	3	0	0	3	105	TH	70	30
100603	Graduate Employability Skills and Competitive Courses (GATE, IES, etc.)	3	0	0	0	105	TH	0	0
105602	Machine Learning	3	1	0	4	105	TH	70	30
100604	MOOCs / SWAYAM / NPTEL Courses - 2	2	0	0	2	105	TH	70	30
1056xx	Program Elective- I	3	0	0	3	105	TH	70	30
1056xx	Program Elective- II	3	0	0	3	105	TH	70	30
105601P	Compiler Design	0	0	4	2	105	PR	30	20
100602P	Computer Networks	0	0	4	2	105	PR	30	20
1006xx	Professional Elective Lab-I	0	0	2	1	105	PR	70	30

Semester VI (Third year]
Branch/Course Information Technology

Paper Code	Paper Title	L	T	P	Credits	TH/ PR	ESE	IA
100602	Computer Networks	3	0	0	3	TH	70	30
100603	Graduate Employability Skills and Competitive Courses (GATE, IES, etc.)	3	0	0	0	TH	0	0
100604	MOOCs / SWAYAM / NPTEL Courses - 2	2	0	0	2	TH	70	30
1066xx	Program Elective- I	3	0	0	3	TH	70	30
1066xx	Program Elective- II	3	0	0	3	TH	70	30
106601	Software Engineering	3	0	0	3	TH	70	30
100602P	Computer Networks	0	0	4	2	PR	30	20
106601P	Software Engineering	0	0	4	2	PR	30	20
1066xx	Professional Elective Lab-I	0	0	2	1	PR	70	30

Semester VI (Third year]
Branch/Course Leather Technology

Paper Code	Paper Title	L	T	P	Credits	TH/PR	ESE	IA
100601	Biology for Engineers	2	1	0	3	TH	70	30
107601	Chemical Engineering -III	3	0	0	3	TH	70	30
107602	Finance and accounting (Humanities)	3	0	0	3	TH	70	30
100603	Graduate Employability Skills and Competitive Courses (GATE, IES, etc.)	3	0	0	0	TH	0	0
107603	Induction Program	3	0	0	0	TH	0	0
107604	Leather finishing materials and Auxiliaries	3	0	0	3	TH	70	30
100604	MOOCs / SWAYAM / NPTEL Courses - 2	2	0	0	2	TH	70	30
107605	Practices of Leather manufacturing -II	3	0	0	3	TH	70	30
107606	Principles of material testing	3	0	0	3	TH	70	30
107605P	Practices of Leather manufacturing -II	0	0	2	1	PR	30	20
107606P	Principles of material testing	0	0	3	1.5	PR	30	20

Semester VI (Third year]
Branch/Course Electrical Electronics Engineering

Paper Code	Paper Title	L	T	P	Credits	TH/PR	ESE	IA
100606	Digital Signal Processing	3	0	0	3	TH	70	30
100609	Electronics Design Laboratory	1	0	0	1	TH	70	30
100603	Graduate Employability Skills and Competitive Courses (GATE, IES, etc.)	3	0	0	0	TH	0	0
100607	Introduction to VLSI Design	3	0	0	3	TH	70	30
110601	Measurements and Instrumentation	3	0	0	3	TH	70	30
100608	Professional Skill Development	3	0	0	3	TH	70	30
1106xx	Program Elective- I	3	0	0	3	TH	70	30
1106xx	Program Elective- II	3	0	0	3	TH	70	30
100606P	Digital Signal Processing	0	0	2	1	PR	30	20
103601P	Electronics Design Laboratory	0	0	4	2	PR	30	20
100607P	Introduction to VLSI Design	0	0	2	1	PR	30	20
110601P	Measurements and Instrumentation	0	0	2	1	PR	30	20

Semester VI (Third year]
Branch/Course Civil Engineering

PCC-CE308	**Construction Engineering & Management**	**2L:1T:0P**	**3 credits**

Module 1: Basics of Construction- Unique features of construction, construction projects- types and features, phases of a project, agencies involved and their methods of execution;

Module 2: Construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT- Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.

Module 3: Construction Methods basics: Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs; conventional framed structure with blockwork walls; Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges.

Module 4: Construction Equipment basics: Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities

Module 5: Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow, sources of funds; Histograms and S-Curves. Earned Value; Resource Scheduling- Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and leveling. Common Good Practices in Construction

Module 6: Project Monitoring & Control- Supervision, record keeping, periodic progress reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures. Basics of Modern Project

management systems such as Lean Construction; Use of Building Information Modelling (BIM) in project management; Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.

Module 7: Contracts Management basics: Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given, Contract Duration and Price. Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods.

Module 8: Construction Costs: Make-up of construction costs; Classification of costs, timecost trade-off in construction projects, compression and decompression.

Text/Reference Books:

1. Varghese, P.C., "Building Construction", Prentice Hall India, 2007.
2. National Building Code, Bureau of Indian Standards, New Delhi, 2017.
3. Chudley, R., Construction Technology, ELBS Publishers, 2007.
4. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015
7. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

S. No	Module (No of Lectures in brackets)	Tutorials
1	Basics of Construction (2)	
2	Construction Planning (6)	Develop a WBD structure for the construction of one storeyed building; Develop a bar chart for the construction of this building, including finishing activities, assuming reasonable activity durations.
3	Construction Methods basics (6)	Develop a CPM chart for a 5 span bridge on open foundations. Develop a comparative table for a 10-storeyed building constructed by at least three different methods, listing their pros and cons.

4	Construction Equipment Basics (3)	Develop a Gantt Chart for the construction of a two storeyed precast framed structure, including open foundations, along with list of equipment resources, assuming reasonable quantities and productivities. Develop a bar chart for concreting 1500 sq.m. of a 15cm. thick slab using various equipment for production to placing of concrete at 3m height above ground level; show all equipment resources required, along with a site layout.
5	Planning and Organizing Construction Site and Resources (4)	For the construction of a typical 3 storeyed, framed structure with 400 sq.m. area per floor develop the histograms for the various resources required, showing all intermediate calculations; also, draw S-curves for concrete placing and blockwork done over the period.
6	Project Monitoring and Control (4)	Write a 500-word note on the advantages of Lean Construction method over conventional project management systems. Write a 500-word note on the Safety and Health precautions you would take for a typical 3 storeyed building with 400 sq. m. plinth area.
7	Contract Management basics (3)	Assuming a 4 month delay in a construction contract of 24 months duration, form 3 groups for arguing the case for or against levying penalty on the contractor; Group A to formulate the contract conditions, Group B to act as Client and Group C to act as the Contractor. One person to act as Arbitrator/ Judge.
8	Construction Costs (2)	Refer to a Standard Schedule of Rates of any PWD (available on the Net), develop the approximate cost of a 3 storey, 400 sqm plinth area building.
	Total: 30 Lectures	15 Tutorials

PCC-CE309	Engineering Economics, Estimation & Costing	2L:0T:2P	3 credits

Module 1:Basic Principles and Methodology of Economics. Demand/Supply – elasticity – Government Policies and Application. Theory of the Firm and Market Structure. Basic Macro-economic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes (3 lectures)

Module 2: Public Sector Economics –Welfare, Externalities, Labour Market. Components of Monetary and Financial System, Central Bank –Monetary Aggregates; Commercial Banks & their functions; Capital and Debt Markets. Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve. (2 lectures)

Module 3: Elements of Business/Managerial Economics and forms of organizations. Cost & Cost Control –Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money (present and future worth of cash flows). Business Forecasting – Elementary techniques. Statements – Cash flow, Financial. Case Study Method. (3 lectures)

Module 4: Indian economy - Brief overview of post-independence period – plans. Post reform Growth, Structure of productive activity. Issues of Inclusion – Sectors, States/Regions, Groups of people (M/F), Urbanization. Employment–Informal, Organized,

Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors. (2 lectures)

Module 5: Estimation / Measurements for various items- Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. Use of Computers in quantity surveying (7 lectures)

Module 6: Specifications-Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures. (3 lectures)

Module 7: Rate analysis-Purpose, importance and necessity of the same, factors affecting, task work, daily output from different equipment/ productivity. (3 lectures)

Module 8: Tender- Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, extra work and Changes, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc. Preparing Bids- Bid Price buildup: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management (6 lectures)

Module 9: Introduction to Acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights. (1 lecture)

Term Work Assignments may include:

1. Deriving an approximate estimate for a multistoried building by approximate methods.
2. Detailed estimate for the following with the required material survey for the same.
    a. Ground plus three storied RCC Framed structure building with blockwork walls
    b. bridge with minimum 2 spans
    c. factory building
    d. road work
    e. cross drainage work
    f. Ground plus three storied building with load-bearing walls g Cost of finishes, MEP works for (f) above
3. Preparation of valuation report in standard Government form.
4. Assignments on rate analysis, specifications and simple estimates.
5. Detailed estimate of minor structure.
6. Preparation of Bar bending schedule.

Text/Reference Books:

1. Mankiw Gregory N. (2002), Principles of Economics, Thompson Asia
2. V. Mote, S. Paul, G. Gupta(2004), Managerial Economics, Tata McGraw Hill
3. Misra, S.K. and Puri (2009), Indian Economy, Himalaya
4. Pareek Saroj (2003), Textbook of Business Economics, Sunrise Publishers
5. M Chakravarty, Estimating, Costing Specifications & Valuation
6. Joy P K, Handbook of Construction Management, Macmillan 7. B.S. Patil, Building & Engineering Contracts 8. Relevant Indian Standard Specifications.
9. World Bank Approved Contract Documents.
10. FIDIC Contract Conditions.
11. Acts Related to Minimum Wages, Workmen's Compensation, Contract, and Arbitration

12. Typical PWD Rate Analysis documents.
13. UBS Publishers & Distributors, Estimating and Costing in Civil Engineering: Theory and Practice including Specification and Valuations,2016
14. Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016

PCC-CE303	Design Of Steel Structure	3L:0T:0P	3 credits

Module 1: Introduction: Steel structures, material properties, Limit states and design philosophies; analysis and design methods, Loads, partial safety factors and load combinations, analysis of roof for wind loads. Codes and standards. Section Classification: Plastic, compact, semi-compact, and slender sections.

Module 2: Connections: Structural fasteners - Rivets, bolts and welds, strength under combined stresses, Bolted and Welded Connections - Simple and Eccentric and Column bases.I

Module 3: Tension members: Design based on net section including shear lag effects and block shear, lug angles. Compression members:

Module 4: Design for flexural and flexural-torsional buckling, Effective length factor: Sway and Non-sway frames, Local buckling, Built-up columns - Battens and lacings. Laterally Supported and Unsupported Beams:

Module 5: Design strength using shear-moment interaction; Built-up beams, Shear buckling strength, Plate girders and design of stiffeners, Lateral torsional buckling, Effect of restraints and effective length.

Module 6: Beam-Columns: Effect of axial load on flexure behaviour, P-M interaction and moment amplification, Flexural torsional buckling and Bi-axial bending.

Text/Reference Books:

1. McCormac, J.C., Nelson, J.K. Jr., Structural Steel Design. 3rd edition. Prentice Hall, N.J., 2003.
2. Galambos, T.V., Lin, F.J., Johnston, B.G., Basic Steel Design with LRFD, Prentice Hall, 1996
3. Segui, W. T., LRFD Steel Design, 2nd Ed., PWS Publishing, Boston.
4. Salmon, C.G. and Johnson, J.E., Steel Structures: Design and Behavior, 3rd Edition, Harper & Row, Publishers, New York, 1990.
5. Related Codes of Practice of BIS
6. NBC, National Building Code, BIS (2017).
7. ASCE, Minimum Design Loads for Buildings and Other Structures, ASCE 7-02, American Society of Civil Engineers, Virginia, 2002.
8. Subramanian, N. (2010). Steel Structures: Design and Practice, Oxford University Press.
9. Duggal, S.K. (2014). Limit State Design of Steel Structures, McGraw Hill.

PCC-CE304	Geotechnical Engineering -II	3L:0T:0P	3 credits

Module 1: Consolidation of Soil - Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's theory of consolidation, final settlement of soil deposits, computation of consolidation settlement and secondary consolidation.

On completion of this module, the student must be able to:

- Understand the basic mechanism of consolidation of soil;
- Determine various consolidation parameters of soil through laboratory test; Evaluate ground settlements against time.

Module 2: Shear Strength - Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, test behaviour of UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength parameters unconfined compression test, vane shear test On completion of this module, the student must be able to:

- Determine graphically and analytically the stress state in any plane of the soil mass; Perform various shear strength tests and appreciate the different field conditions which they simulate;
- Understand the significance of shear strength parameters in various geotechnical analyses;
- Evaluate the stiffness of soil using shear strength parameters

Module 3: Stability of Slopes - Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, wedge failure Swedish circle method, friction circle method, stability numbers and charts. On completion of this module, the student must be able to:

- Differentiate various modes of slope failure;
- Evaluate factor of safety of infinite slopes based on different ground conditions; Understand various methods for computation of factor of safety for finite slopes.

Module 4: Soil Exploration- Introduction, methods of site exploration and soil investigation, methods of boring, soil samplers, sampling procedures, trail pits, borings, penetrometer tests, analysis of borehole logs, geophysical and advance soil exploration methods.

On completion of this module, the student must be able to:

- Specify a strategy for site investigation to identify the soil deposits and determine the depth and spatial extent within the ground;
- Understand various site investigation techniques and their in-situ applications; Prepare a soil investigation report based on borehole log data and various in-situ tests like SPT, CPT, etc.

Module 5 Application of soil mechanics to determine earth pressures, analysis of retaining walls, cuts & excavations and sheet piles, stability of slopes, instrumentation.

Text/Reference Books:

1. Soil Mechanics by Craig R.F., Chapman & Hall
2. Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ
4. Principles of Geotechnical Engineering, by Braja M. Das, Cengage Learning
5. Principles of Foundation Engineering, by Braja M. Das, Cengage Learning
6. Essentials of Soil Mechanics and Foundations: Basic Geotechnics by David F. McCarthy
7. Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph B. Peck, and Gholamreza Mesri.
8. Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering (Civil and Environmental Engineering) by V.N.S. Murthy

PCC-CE306	Environmental Engineering-II	3L:0T:0P	3 credits

Module 1: Sewage- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water- Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes.

Module2: Solid waste management-Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes, Effects of solid waste on environment: effects on air, soil, water surface and ground health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle. Disposal methods- Integrated solid waste management. Hazardous waste: Types and nature of hazardous waste as per the HW Schedules of regulating authorities.

Module 3: Government authorities and their roles in water supply, sewerage disposal. Solid waste management and monitoring/control of environmental pollution.

Practical Work: List of Experiments

1. Physical Characterization of water: Turbidity, Electrical Conductivity, pH
2. Analysis of solids content of water: Dissolved, Settleable, suspended, total, volatile, inorganic etc.
3. Alkalinity and acidity, Hardness: total hardness, calcium and magnesium hardness
4. Analysis of ions: copper, chloride and sulfate
5. Optimum coagulant dose
6. Chemical Oxygen Demand (COD)
7. Dissolved Oxygen (D.O) and Biochemical Oxygen Demand (BOD)
8. Break point Chlorination
9. Bacteriological quality measurement: MPN,
10. Ambient Air quality monitoring (TSP, RSPM, SOx, NOx)
11. Ambient noise measurement

Text/Reference Books:

1. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
2. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
3. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw Hill International Editions, New York 1985.
4. MetCalf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.
5. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
6. Plumbing Engineering. Theory, Design and Practice, S.M. Patil, 1999
7. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
8. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

Semester VI (Third year]
Branch/Course Mechanical Engineering

PCC-ME 306	Dynamics of Machinery	3L:0T:3P	4.5 Credits

Objectives:

1. To equip the student with fundamental knowledge of dynamics of machines so that student can appreciate problems of dynamic force balance, transmissibility of forces, isolation of systems, vibrations.
2. Develop knowledge of analytical and graphical methods for calculating balancing of reciprocating masses.
3. Develop understanding of vibrations and its significance on engineering design.
4. Develop understanding of dynamic balancing, flywheel analysis, gyroscopic forces and moments.

Contents:

Module: 1

Force analysis of mechanism: Dynamics of plane motion of a rigid body, dynamically equivalent two mass system, correction torque, forced in mechanism and machines. **(Lectures 3)**

Module: 2

Turning moment diagram: Fluctuations of crankshaft speed and energy in a direct acting engine mechanism, flywheels. **(Lectures 5)**

Module: 3

Cams: Classification of cams and followers, types of follower and retardation, cam profile and generation of concentric and offset radial cam profiles by graphical method. Cams with specified contours tangent cam with roller follower, circular arc cam with flat follower. **(Lectures 8)**

Module: 4

Analysis of gyroscopic motion : Principle of gyroscope, gyroscopic couple and gyroscopic reaction couple, Gyroscopic effects on the movement of ships, aeroplanes, two wheeled and four wheeled vehicles, gyrostabilizers. **(Lectures 6)**

Module: 5

Effects of inertia of reciprocating masses on engine frame: Unbalanced primary and secondary forces and couples, balancing of primary and secondary forces, partial balancing of locomotives,

balancing of multicylinder in line and radial engines, direct and reverse cranks methods for balancing of radial engines. **(Lecture 8)**

Module: 6

Mechanical vibrations : Basic concepts degree of freedom, types of damping and viscous damping; natural free, damped free and damped forced vibrations of a single degree of freedom spring mass system, reciprocating and rotating unbalance, vibration isolation and transmissibility, whirling of shaft, elementary treatment of two degree of freedom systems torsional vibrations of single rotor and two rotor systems, transverse vibration of simply supported beam energy method, Rayleigh's and Dankerley method. **(Lecture 12)**

Course outcomes:

Upon successful completion of this course the student should be able to:

1. Analyze stabilization of sea vehicles, aircrafts and automobile vehicles.
2. Compute frictional losses, torque transmission of mechanical systems.
3. Analyze dynamic force analysis of slider crank mechanism and design of flywheel.
4. Understand how to determine the natural frequencies of continuous systems starting from the general equation of displacement.
5. Understand balancing of reciprocating and rotary masses.

Text/References Books:

1. Theory of Machines / S.S Ratan/ Mc. Graw Hill Publ.
2. Mechanism and machine theory by Ashok G. Ambedkar, PHI Publications.
3. Mechanism and Machine Theory / JS Rao and RV Dukkipati / New Age.
4. Theory of Machines / Shiegly / MGH
5. Theory of Machines / Thomas Bevan / CBS Publishers
6. Theory of machines / Khurmi / S.Chand.

Laboratory:

Minimum of 10 Experiment need to be performed

1. To study various types of Links, Pairs, Chain and Mechanism
2. To study inversion of Four Bar Mechanism
3. To study velocity diagram for Slider Crank Mechanism.
4. To study various kinds of belts drives.
5. To study and find coefficient of friction between belt and pulley.
6. To study various types of Cam and Follower arrangement.
7. To plot follower displacement Vs cam rotation graph for various cam follower arrangement.

8. To study Different types of Gears.
9. To study Different types of Gear Trains.
11. To Perform Experiment on Watt, Porter, Proell and Hartnell Governors and prepare Performance Characteristic Curves also analyze Stability & Sensitivity
12. To study gyroscopic effects through models.
13. To determine gyroscopic couple on Motorized Gyroscope.
14. To perform the experiment of Balancing of rotating parts and find the unbalanced couple and forces.
15. To study Dynamically Equivalent System.
16. Determine the moment of inertial of connecting rod by compound pendulum method and trifler suspension pendulum.
17. To study the various types of dynamometers.
18. To find out critical speed experimentally and to compare the Whirling Speed of a shaft with theoretical values

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PCC-ME 307	Manufacturing Technology	3L:0T:3P	4.5 Credits

Objectives:

(i) To provide knowledge on machines and related tools for manufacturing various components.
(ii) To understand the relationship between process and system in manufacturing domain.
(iii) To identify the techniques for the quality assurance of the products and the optimality of the process in terms of resources and time management.

Course Contents:

Module:1

Tooling for conventional and non-conventional machining processes: Mould and die design, Press tools, Cutting tools; Holding tools: Jigs and fixtures, principles, applications and design; press tools – configuration, design of die and punch; principles of forging die design. **(Lectures 10)**

Module:2

Metrology: Dimensions, forms and surface measurements, Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; Metrology in tool wear and part quality including surface integrity, alignment and testing methods; tolerance analysis in manufacturing and assembly. Process metrology for emerging machining processes such as microscale machining, Inspection and workpiece quality. **(Lectures 10)**

Module:3

Assembly practices: Manufacturing and assembly, process planning, selective assembly, Material handling and devices. **(Lectures 6)**

Module:4

Unconventional Machining Processes: Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultrasonic Machining, principles and process parameters. Electrical Discharge Machining, principle and processes parameters, MRR, surface finish, tool wear, Dielectric, power and control circuits, wire EDM; Electro-chemical machining (ECM), etchant & maskant, process parameters, MRR and surface finish. Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining **(Lectures 14)**

Course Outcomes:

Upon completion of this course, students will be able to the tooling needed for manufacturing, the dimensional accuracy and tolerances of products, assembly of different components and the application of optimization methods in manufacturing.

Text Books:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)-PearsonIndia, 2014.
2. Taha H. A., Operations Research, 6th Edition, Prentice Hall of India, 2003.
3. Shenoy G.V. and Shrivastava U.K., Operations Research for Management, Wiley Eastern, 1994.

Laboratory:

1. Measurement of angle using Sine Center / Sine bar / bevel protractor
2. Measurement of alignment using Autocollimator / Roller set
3. Measurement of cutting tool forces using
    a. Lathe tool Dynamometer
    b. Drill tool Dynamometer.
4. Measurement of Screw Threads Parameters using Two wire or Three-wire method.
5. Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator
6. Measurement of gear tooth profile using gear tooth Vernier/Gear tooth micrometer
7. Calibration of Micrometer using slip gauges
8. Measurement using Optical Flats

PCC-ME 308	Design of Machine Elements	3L:1T:2P	5 Credits

Objectives:

This course seeks to provide an introduction to the design of machine elements commonly encountered in mechanical engineering practice, through 1. A strong background in mechanics of materials based failure criteria underpinning the safety-critical design of machine components 2. An understanding of the origins, nature and applicability of empirical design principles, based on safety considerations 3. An overview of codes, standards and design guidelines for different elements 4. An appreciation of parameter optimization and design iteration 5. An appreciation of the relationships between component level design and overall machine system design and performance

Course Contents:

Module: 1

Introduction to design: Steps in design process, design factors, practical considerations in design, selection of materials, strength of mechanical elements, impact load, shock load, fatigue loading, effects of surface, size, temperature and stress concentration, consideration of creep and thermal stress in design. (**Lectures8**)

Module: 2

Design of shafts: stresses in shafts, design of static loads, combined stresses, reversed bending and steady loads, design of shafts based on deflection and strength, critical speed of shafts. Analysis and design of sliding and rolling contact bearings, (**Lectures10**)

Module: 3

Riveted joint: Stresses in riveted joint, design of riveted joints with central and eccentric loads, boiler and tank joints, structural joints.

Bolt Joints: Stresses in bolt joint, design of bolt joints with central and eccentric loads.

Welded joints: types of welded joints, stresses, design of welded joints subjected to axial, torsional and bending loads, welds subjected to fluctuating loads**.** **(Lectures8**)

Module: 4

Design of Clutches: Friction clutches, uniform wear and uniform pressure assumptions, centrifugal clutches.

Brakes: Design of internal expansion elements, assumptions, design of external contraction elements, band type brakes. (**Lectures6**)

Module: 5

Design of transmission elements: spur, helical, bevel and worm gears;

Springs: stresses in helical springs, deflection of helical compression and tension springs, springs subjected to fatigue loading, concentric and helical torsion spring, critical frequency of springs, leaf springs, and design of automotive leaf springs. (**Lectures 8**)

Course Outcomes:

Upon completion of this course, students will get an overview of the design methodologies employed for the design of various machine components.

Data books allowed for Examination:

1. Mahadevan & Balaveera Reddy : Design Data Hand Book
2. Dr. Linghaigh & Prof. Narayana Iyengar, Vol.1 & 2 : Design Data Hand Book
3. P.S.G. Tech : Design Data Hand Book

Text Books:

1. Shigley, J.E. and Mischke, C.R., Mechanical Engineering Design, Fifth Edition, McGraw-Hill International; 1989.
2. Deutschman, D., Michels, W.J. and Wilson, C.E., Machine Design Theory and Practice, Macmillan, 1992.
3. Juvinal, R.C., Fundamentals of Machine Component Design, John Wiley, 1994.
4. Spottes, M.F., Design of Machine elements, Prentice-Hall India, 1994.
5. R. L. Norton, Mechanical Design – An Integrated Approach, Prentice Hall, 1998

Laboratory:

1. To study the design procedure of Knuckle & Cotter joint.
2. Design of shafts subjected to torsion, bending moment and combined bending and torsion.
3. Design of flat and square key
4. Design and drawing of riveted joints
5. Design and drawing of screw jack
6. Journal Bearing Test Rig

PCC-ME421	Automation in manufacturing	3L:0T:3P	4.5 credits

Objectives:

1. To understand the importance of automation in the of field machine tool based manufacturing
2. To get the knowledge of various elements of manufacturing automation – CAD/CAM, sensors, pneumatics, hydraulics and CNC
3. To understand the basics of product design and the role of manufacturing automation

Course Contents:

Module: 1

Introduction: Why automation, Current trends, CAD, CAM, CIM; Rigid automation: Part handling, Machine tools. Flexible automation: Computer control of Machine Tools and Machining Centers, NC and NC part programming, CNC-Adaptive Control, Automated Material handling. Assembly, Flexible fixturing. **(Lectures12)**

Module: 2

Computer Aided Design: Fundamentals of CAD - Hardware in CAD-Computer Graphics Software and Data Base, Geometric modeling for downstream applications and analysis methods; Computer Aided Manufacturing: CNC technology, PLC, Micro-controllers, CNC-Adaptive Control. **(Lectures12)**

Module: 3

Low cost automation: Mechanical & Electro mechanical Systems, Pneumatics and Hydraulics, Illustrative Examples and case studies. **(Lectures8)**

Module: 4

Introduction to Modeling and Simulation: Product design, process route modeling, Optimization techniques, Case studies & industrial applications. **(Lectures8)**

Course Outcomes:

Upon completion of this course, the students will get a comprehensive picture of computer based automation of manufacturing operations

Text Books:

1. Mikell P. Groover, Automation, Production Systems, and Computer-integrated Manufacturing, prenticeHall
2. Serope Kalpakjian and Steven R. Schmid, Manufacturing – Engineering and Technology,7th edition, Pearson
3. YoramKoren, Computer control of manufacturing system, 1stedition
4. Ibrahim Zeid , CAD/CAM : Theory & Practice, 2ndedition.

Practical:

At-least 10 experiment should be performed.

1. Case study on automated system of any industry.
2. Practice programming on manual part program.

3. Practice programming on APT.
4. Demonstration on robot.
5. Performance on robot.
6. Demonstration on CNC lathe.
7. Performance on CNC lathe.
8. Performance and simulation with CNC lathe software.
9. Demonstration on CNC milling.
10. Performance on CNC milling.
11. Performance and simulation with CNC milling software.
12. Case study on computer aided process planning
13. Case study on part coding and group technology
14. Case study on computer aided quality control
15. Case study on flexible manufacturing system

Semester VI (Third year]
Branch/Course Electrical Engineering

PCC-EE23	Power Systems – II	3L:0T:0P	3 credits

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Use numerical methods to analyse a power system in steady state.
- Understand stability constraints in a synchronous grid.
- Understand methods to control the voltage, frequency and power flow.
- Understand the monitoring and control of a power system.
- Understand the basics of power system economics.

Module 1: Power Flow Analysis (7 hours)

Review of the structure of a Power System and its components. Analysis of Power Flows: Formation of Bus Admittance Matrix. Real and reactive power balance equations at a node. Load and Generator Specifications. Application of numerical methods for solution of non-linear algebraic equations – Gauss Seidel and Newton-Raphson methods for the solution of the power flow equations. Computational Issues in Large-scale Power Systems.

Module 2: Stability Constraints in synchronous grids (8 hours)

Swing Equations of a synchronous machine connected to an infinite bus. Power angle curve. Description of the phenomena of loss of synchronism in a single-machine infinite bus system following a disturbance like a three—phase fault. Analysis using numerical integration of swing equations (using methods like Forward Euler, Runge-Kutta 4^{th} order methods), as well as the Equal Area Criterion. Impact of stability constraintson Power System Operation. Effect of generation rescheduling and series compensation of transmission lines on stability.

Module 3: Control of Frequency and Voltage (7 hours)

Turbines and Speed-Governors, Frequency dependence of loads, Droop Control and Power Sharing. Automatic Generation Control. Generation and absorption of reactive power by various components of a Power System. Excitation System Control in synchronous generators, Automatic Voltage Regulators. Shunt Compensators, Static VAR compensators and STATCOMs. Tap Changing Transformers.

Power flow control using embedded dc links, phase shifters and

Module 4: Monitoring and Control (6 hours)

Overview of Energy Control Centre Functions: SCADA systems. Phasor Measurement Units and Wide-Area Measurement Systems. State-estimation. System Security Assessment. Normal, Alert, Emergency, Extremis states of a Power System. Contingency Analysis. Preventive Control and Emergency Control.

Module 5: Fault Analysis and Protection Systems (10 hours)

Method of Symmetrical Components (positive, negative and zero sequences). Balanced and Unbalanced Faults. Representation of generators, lines and transformers in sequence networks. Computation of Fault Currents. Neutral Grounding.

Text/References:

1. J. Grainger and W. D. Stevenson, “Power System Analysis”, McGraw Hill Education,1994.
2. O. I. Elgerd, “Electric Energy Systems Theory”, McGraw Hill Education,1995.
3. A. R. Bergen and V. Vittal, “Power System Analysis”, Pearson Education Inc.,1999.
4. D. P. Kothari and I. J. Nagrath, “Modern Power System Analysis”, McGraw Hill Education,2003.
5. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, “Electric Power Systems”, Wiley, 2012.

PCC-EE24: Power Systems-II Laboratory (0:0:2 – 1 credit)

Hands-on and computational experiments related to the course contents of EE20. This should include programmingofnumericalmethodsforsolutionofthepowerflowproblemandstabilityanalysis.Visit to load dispatch centre is suggested.

PCC-EE25	Electronics Design Laboratory	1L:0T:4P	3 credits

Course Outcomes:

At the end of the course, students will demonstrate the ability to

- Understand the practical issues related to practical implementation of applications using electronic circuits.
- Choose appropriate components, software and hardware platforms.
- Design a Printed Circuit Board, get it made and populate/solder it with components.
- Work as a team with other students to implement an application.

Basicconceptsonmeasurements;Noiseinelectronicsystems;Sensorsandsignalconditioningcircuits; Introduction to electronic instrumentation and PC based data acquisition; Electronic system design, Analog system design, Interfacing of analog and digital systems, Embedded systems, Electronic system design employing microcontrollers, CPLDs, and FPGAs, PCB design and layout; System assembly considerations. Group projects involving electronic hardware (Analog, Digital, mixed signal) leading to implementation of an application.

Text/Reference Books

1. A. S. Sedra and K. C. Smith, “Microelectronic circuits”, Oxford University Press, 2007.
2. P. Horowitz and W. Hill, “The Art of Electronics”, Cambridge University Press, 1997.
3. H. W. Ott, “Noise Reduction Techniques in Electronic Systems”, Wiley, 1989.
4. W.C. Bosshart, “Printed Circuit Boards: Design and Technology”, Tata McGraw Hill, 1983.
5. G.L. Ginsberg, “Printed Circuit Design”, McGraw Hill, 1991.

HSMC 501	Professional Skill Development	3L:0T: 0P	3 credits
Pre-requisites	HSMC 301		

Objectives of the course:

1. To learn various interpersonal skills
2. To help in developing various professionals skills.
3. To cover the facets of verbal and non-verbal languages, public speech, reading gestures and body languages, preparing for group discussion and enhancing presentations skills.
4. To enable learners to speak fluently and flawlessly in all kinds of communicative Contexts with speakers of all nationalities.

Detail contents:

Module 1 **Lecture 10 hrs.**

Communication skills: Public speaking, Group discussion, Gestures and body language & professional presentation skills

Module 2 **Lecture 10 hrs.**

Interpersonal skills: Group dynamics, Negotiation skills, Leadership, Emotional intelligence

Module 3 **Lecture 10 hrs.**

Employability and Corporate Skills: Time management and effective planning, Stress management, People skills, Team work, development of leadership qualities, Decision making and Negotiation skills, Positive attitude, Self-motivation, Professional ethics, Business etiquettes, balancing board room.

Module 4 **Lecture 10 hrs.**

Business writing skills, Resume Writing. Interview Skills, Technical Presentation, Guest Lecture, Professional Ethics, Project Management, Entrepreneurship.

Suggested reference books:

1. "Personality Development and Soft Skills", Barun Mitra, Oxford University Press.
2. "Managing Soft Skills for Personality Development", B.N. Ghosh, McGraw Hill.
3. "Communication Skills and Soft Skills: An Integrated Approach", E. Suresh Kumar, Pearson
4. "Communication to Win", Richard Denny, Kogan Page India Pvt. Ltd.

Course outcomes

1. Student can able to write their resume and can prepare for presentation, group discussion and interview.
2. Student can develop interpersonal skills like negotiation and leadership skills.
3. Students can develop Employability and Corporate Skills with proper time management and stress management.

Students learn to practice the professional ethics, project management and Entrepreneurship.

Semester VI (Third year]
Branch/Course Electronics & Communication Engineering

EC115 Digital Communication 3L: 1T: 0P 3 Credits

Contents **Hours**

1 Introduction: Block Diagram of Digital Communication System, Advantages of Digital communication system over Analog communication systems, Sampling theorem, Signal reconstruction in time domain, Practical and Flat Top Sampling, Sampling of Band-pass Signal, Aliasing Problem, Uniform and Non-uniform quantization. Signal to Quantization ratio of Quantized Signal. 7 Hrs.

2 Baseband Transmission: Line Coding and its properties, Various types of PCM waveforms. Attributes of PCM waveforms, Mary Pulse Modulation waveforms, Differential Pulse Code Modulation, Multiplexing of PCM signals, Delta modulation, Idling noise and slope overload, Adaptive Delta Modulation, Adaptive DPCM, Comparison of PCM and DM 9 Hrs.

3 Baseband Detection: Error performance degradation in communication systems, Eb/NO parameter, Matched filter and its derivation, Inter-Symbol Interference (ISI), Nyquist criterion for zero ISI and raised cosine spectrum, Correlation detector : Decision threshold and Error probability for Binary, Unipolar (on-off) signalling 7 Hrs.

4 Band-pass Modulation and Demodulation: Types of digital modulation, Waveforms for Amplitude, Frequency and Phase Shift Keying, Method of generation and detection of coherent and non-coherent binary ASK, FSK and PSK, Differential phase shift keying, Quadrature modulation techniques, M- ary FSK, Minimum Shift Keying (MSK), Probability of error and comparison of various digital modulation techniques 9 Hrs.

5 Error: A base band signal receiver, Probability of error, The Optimum filter, Matched Filter, Probability of error in Matched filter, Coherent reception, Coherent reception of ASK, PSK and FSK, Non-Coherent reception of ASK, FSK, PSK and QPSK, Calculation of bit error probability of BPSK and BFSK, Error probability for QPSK 6 Hrs.

6 Multiple Access Techniques: Time division multiplexing, Frequency division multiplexing, Code division multiplexing, Introduction to upcoming techniques of transmission 2 Hrs.

Sl. No. Name of Authors / Books /Publishers

1. "Communication Systems", Simon Haykin, Wiley publication, 4th Edition, 2004
2. "Digital Communication Fundamentals and Applications", Bernard Sklar, Pearson Education India, 2nd Edition, 2009

3. "Modern Electronic Communication", Miller Gary M, Prentice-Hall, 6th Edition, 1999
4. "Digital Communications", John Proakis, Tata Mc Graw Hill, 5th Edition, 2007
5. "Electronic Communication Systems, Fundamentals Through Advanced", Wayne Tomsi, Pearson Education, 4th Edition, 2001

Digital Communication Lab are according to the theory mentioned above. 0L: 0T: 2P 1 Credit

EC116Electronics Instruments and Measurements 3L: 1T: 0P 3 Credits

Contents Hours

1 Introduction to Standards of Measurement, Errors and their evaluation. Calibration, Accuracy, Precision Sensitivity, Resolution, Noise, etc. 3 Hrs.

2 Measurements of voltage, current, power and energy: Moving iron, moving coil, thermal, Induction and Rectifier type.

Measurements of power factor and frequency: Dynamometer and moving iron single and three phase power factor meters, Resonance, moving coil and moving iron frequency meters.

Range extension of voltmeter, ammeter, Wattmeter and Energy meter: Voltmeter multipliers, Ammeter shunt, Current and Potential Transformers 10 Hrs.

3 Galvanometer: D' Arsonval, Vibration and Ballistic galvanometers 5 Hrs.

4 Bridges: D.C. bridges: Kelvin double bridge, Wheatstone bridge and Carey-Foster bridge; A.C. bridges: Maxwell Bridge, Hay and Owen bridges, Anderson Bridge, Wien Bridge, Schering Bridge and Heaviside-Campbell Bridge 7 Hrs.

5 Potentiometer's Principle, Standardization and application: D.C. Potentiometers: Crompton and Vernier potentiometers, A.C. Potentiometers: Coordinate type and Polar type 5 Hrs.

6 Magnetic measurements: Measurement of magnetic flux by ballistic galvanometer and fluxmeter, Determination of B-H curve and hysteresis loop, Separation of iron loss into hysteresis and eddy current losses, Measurement of iron loss and its separation on Lloyad-Fisher squares 5 Hrs.

7 Digital measurements: Digital voltmeter and multimeter Universal counter and its uses for measurements of frequency, ratio of two frequencies, Time period and Pulse width. 5 Hrs.

Name of Authors / Books /Publishers

1 "Measurement System, Application and Design", E O Doeblin, TMH
2 "Course in Electrical and Electronic Measurement and Instrumentation", A K Sawhney, Dhanpat Rai and Sons
3 "Electronic Measurements and Instrumentation", Rajendra Prasad, Khanna Publishers
4 "Basic Electrical Measurements", M.B. Stout, Prentice Hall

Electronic Instruments and Measurement Lab are according to the theory mentioned above.

0L: 0T: 2P 1 Credit

EC117Computer Organization and Architecture 3L: 0T: 0P 3 Credits

Contents Hours

1 Introduction: Computer Arithmetic, Instruction sets, Introduction to computer organization, CPU Design. Micro programmed Control: Control Memory, Address sequencing, Micro programming, sequencing and execution of microinstructions. 10 Hrs.

2 Memory system: Hierarchical memory structure, Cache memories, Set Associative memory, Virtual Memory, Paging, Segmentation, Input-Output Inter- face, Asynchronous Data Transfer, Programmed I/O, Interrupts, Direct Memory Access 8 Hrs.

3 Input-Output Organization: Basic Input/Output Structure of Computers, serial and parallel communications, Asynchronous Data Communication, Programmed I/O, Interrupt Driven I/O, Interrupt Controller, DMA, Device Drivers, Buses. 10 Hrs.

4 Introduction to Parallel Processing: Evolution of computer systems (RISC vs. CISC), Parallelism in uniprocessor systems, Architectural classification schemes. 5 Hrs.

5 Principles of Pipelining and Vector processing: Pipeline strategy, Pipeline performance, Controls and Data paths, Overlapped parallelism, Principles of designing pipelined processors, Vector processing requirements 7 Hrs.

Name of Authors / Books /Publishers

1 Computer system architecture by M. Morris Mano
2 Computer Architecture and parallel processing by Kai Hwang, Briggs, McGraw
3 Hill
4 Computer Architecture by Carter, Tata McGraw Hill.
5 Computer System Organization and Architecture by John D. Carpinelli, Pearson Education

BSC109	Biology for Engineers	3L:0T:0P	3 credits

[3 credit course; 2 (one hour) lectures and one (one hour) tutorial per week. Only lecture hours are shown]

Module 1. (2 hours)- Introduction
Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

Module 2. (3 hours)- Classification
Purpose: To convey that classification per se is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S. cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus

Module 3. (4 hours)-Genetics
Purpose: To convey that "Genetics is to biology what Newton's laws are to Physical Sciences"

Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

Module 4. (4 hours)-Biomolecules
Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine

Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

Module 5. (4 Hours). Enzymes
Purpose: To convey that without catalysis life would not have existed on earth

Enzymology: How to monitor enzyme catalyzed reactions. How does an enzyme catalyzereactions. Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

Module 6. (4 hours)- Information Transfer
Purpose: The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

Module 7. (5 hours). Macromolecular analysis
Purpose: How to analyses biological processes at the reductionistic level

Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Module 8. (4 hours)- Metabolism

Purpose: The fundamental principles of energy transactions are the same in physical and biological world.

Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of K_{eq} and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to $CO_2 + H_2O$ (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge

Module 9. (3 hours)- Microbiology
Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

Module 10: Plant Physiology covering, Transpiration; Mineral nutrition (3 Lectures)

Module 10B: Ecology covering, Ecosystems- Components, types, flow of matter and energy in an ecosystem; Community ecology- Characteristics, frequency, life forms, and biological spectrum; Ecosystem structure- Biotic and a-biotic factors, food chain, food web, ecological pyramids; (3 Lectures)

References:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

Semester VI (Third year]
Branch/Course Computer Science & Engineering

PCC CS 601	**Compiler Design**	**3L:0T: 4P**	**5 Credits**
Pre-requisites	**Formal Language & Automata Theory**		

Objectives of the course

- To understand and list the different stages in the process of compilation.
- Identify different methods of lexical analysis
- Design top-down and bottom-up parsers
- Identify synthesized and inherited attributes
- Develop syntax directed translation schemes
- Develop algorithms to generate code for a target machine
- To study the underlying theories in designing of a compiler
- The study especially consider the imperative languages

Detailed contents

Module 1 **Lecture: 6 hrs.**

Introduction: Phases of compilation and overview.

Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, from regular expressions to finite automata, scanner generator (lex, flex).

Module 2 **Lecture: 9 hrs.**

Syntax Analysis (Parser): Context-free languages and grammars, push-down automata, LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc, bison).

Module 3 **Lecture: 10 hrs.**

Semantic Analysis: Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree.

Symbol Table: Its structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and scope.

Module 4 **Lecture: 10 hrs.**

Intermediate Code Generation: Translation of different language features, different types of intermediate forms.

Code Improvement (optimization) Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc.

Architecture dependent code improvement: instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation.

Module 5 **Lecture: 5 hrs.**

Advanced topics: Type systems, data abstraction, compilation of Object Oriented features and non-imperative programming languages.

Suggested Books:

1. Compilers Principles Techniques And Tools by Alfred V. Aho, Ravi Sethi, Jeffery D. Ullman. Pearson Education.

Suggested Reference Book

1. Compiler Design by Santanu Chattopadhyay. PHI
2. Modern Compiler Design by Dick Grune, E. Bal. Ceriel, J. H. Jacobs, and Koen G. Langendoen, Viley Dreamtech.

Course Outcomes

After the completion of course, students can able to able to:

1. Develop the lexical analyser for a given grammar specification.
2. Design top-down and bottom-up parsers for a given parser specification
3. Develop syntax directed translation schemes
4. Develop algorithms to generate code for a target machine

PCC CS 601P	**Compiler Design Lab**

Hands-on experiments related to the course contents of PCC CS 601.

PCC CS 602	**Computer Networks**	**3L:0T: 4P**	**5 Credits**
Pre-requisites	**PCC CS 402 & PCC CS 403**		

Objectives of the course

- To develop an understanding of modern network architectures from a design and performance perspective.
- To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
- To provide an opportunity to do network programming
- To provide a WLAN measurement ideas.

Detailed contents

Module 1 **Lecture 8 hrs.**

Data communication Components: Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

Module 2 **Lecture 8 hrs.**

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA

Module 3 **Lecture 8 hrs.**

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping - ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

Module 4 **Lecture 8 hrs.**

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

Module 5 **Lecture 8 hrs.**

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography.

Suggested books

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw- Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.

Suggested reference books

1. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
2. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
3. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

Course Outcomes

After the completion of course, students can able to able to:

1. Explain the functions of the different layer of the OSI Protocol.
2. Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) and can able to describe the function of each block.
3. Program for a given problem related TCP/IP protocol.
4. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

PCC CS 602P	**Computer Networks Lab**

Hands-on experiments related to the course contents of PCC CS 602.

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PCC CS 603	Machine Learning	3L: 1T:0 P	4 Credits

Objectives of the course

- To learn the concept of how to learn patterns and concept from data.
- Design and analyze various machine learning algorithms and their applications in recent trends.
- Evaluate the various factors of machine learning to measure the performance.
- Understand basic of machine learning's application in recent trend of technology.

Detailed contents

Module 1 **Lecture 8 hrs.**

Introduction: Basic definitions, Linear Algebra, Statistical learning theory, types of learning, hypothesis space and Inductive bias, evaluation and cross validation, Optimization.

Module 2 **Lecture 8 hrs.**

Statistical Decision Theory, Bayesian Learning (ML, MAP, Bayes estimates, Conjugate priors), Linear Regression, Ridge Regression, Lasso, Principal Component Analysis, Partial Least Squares

Module 3 **Lecture 8 hrs.**

Linear Classification, Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Perceptron, Support Vector Machines + Kernels, Artificial Neural Networks + Back Propagation, Decision Trees, Bayes Optimal Classifier, Naive Bayes.

Module 4 **Lecture 8 hrs.**

Hypothesis testing, Ensemble Methods, Bagging Adaboost Gradient Boosting, Clustering, K-means, K-medoids, Density-based Hierarchical, Spectral.

Module 5 **Lecture 8 hrs.**

Expectation Maximization, GMMs, Learning theory Intro to Reinforcement Learning, Bayesian Networks.

Suggested books:

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997
2. Introduction to Machine Learning Edition 2, by Ethem Alpaydin

Suggested Reference Books:

1. J. Shavlik and T. Dietterich (Ed), Readings in Machine Learning, Morgan Kaufmann, 1990.
2. P. Langley, Elements of Machine Learning, Morgan Kaufmann, 1995.
3. Understanding Machine Learning. Shai Shalev-Shwartz and Shai Ben-David. Cambridge University Press. 2017. [SS-2017]
4. The Elements of Statistical Learning. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Second Edition. 2009. [TH-2009]

Semester VI (Third year]
Branch/Course Information Technology

PCC-IT602	**Computer Networks**	**3L:0T: 4P**	**5 Credits**
Pre-requisites	**PCC-CS - 402 PCC-CS - 403**		

Objectives of the course

- To develop an understanding of modern network architectures from a design and performance perspective.
- To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
- To provide an opportunity to do network programming
- To provide a WLAN measurement ideas.

Module 1: **Lecture 8**

Data communication Components: Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

Module 2: **Lecture 8**

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols -

Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA

Module 3: **Lecture 8**

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

Module 4: **Lecture 8**

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

Module 5: **Lecture 8**

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography.

Suggested books

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw- Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.

Suggested reference books

1. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
2. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
3. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

Course Outcomes

1. Explain the functions of the different layer of the OSI Protocol.
2. Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.
3. For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component
4. For a given problem related TCP/IP protocol developed the network programming.
5. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

PCC- IT601	Software Engineering	3L:0T:4P	5 Credits
Pre-requisites	PCC – CS402		

Module I **Lectures: 8**

Introduction: What is Software Engineering and its history, software crisis, Evolution of a Programming System Product, Characteristics of Software, Brooks' No Silver Bullet, and Software Myths, Software Development Life Cycles: Software Development Process, The Code-and-Fix model, The Waterfall model, The Evolutionary Model, The Incremental Implementation, Prototyping, The Spiral Model, Software Reuse, Critical Comparisons of SDLC models, An Introduction to Non-Traditional Software Development Process: Rational Unified Process, Rapid Application Development, Agile Development Process.

Module II **Lectures: 8**

Requirements: Importance of Requirement Analysis, User Needs, Software Features and Software Requirements, Classes of User Requirements: Enduring and Volatile, Sub phases of Requirement Analysis, Functional and Nonfunctional requirements, Barriers to Eliciting User requirements, The software requirements document and SRS standards, Requirements Engineering, Case Study of SRS for a Real Time System. Tools for Requirements Gathering: Document Flow Chart, Decision Table, Decision Tree, Introduction to nontraditional Requirements.

Module III **Lectures: 8**

Software Design: Goals of good software design, Design strategies and methodologies, Data oriented software design, Structured Design: Structure chart, Coupling, Cohesion, Modular structure, Packaging, Object oriented design, Top-down and bottom-up approach, Design patterns, Structured Analysis: DFD, Data Dictionary, Software Measurement and Metrics: Various Size Oriented Measures: Halstead's software science, Function Point (FP) based measures, Cyclomatic Complexity Measures: Control flow graphs. Development: Selecting a language, Coding guidelines, Writing code, Code documentation.

Module IV **Lectures: 7**

Software Testing: Testing process, Design of test cases, Functional Testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing, Path testing, Data flow and mutation testing, Unit testing, Integration and system testing, Debugging, Alpha & beta testing, testing tools & standards.

Module V **Lectures: 5**

Software Maintenance: Management of maintenance, Maintenance process, Maintenance models, Regression testing, Reverse engineering, Software reengineering, Configuration management, documentation.

Text Book:

1. Software Engineering: A Practitioner's Approach, R. S. Pressman, McGraw Hill
2. Fundamental of Software Engg. By Rajib Mall 4th edition PHI

Reference Book:

1. Zero Defect Software, G. G. Schulmeyer, McGraw-Hill
2. Object Oriented Modeling and Design, J. Rumbaugh, Prentice Hall
3. Software Engineering, K.K. Aggarwal, Yogesh Singh, New Age International Publishers

Semester VI (Third year]
Branch/Course Leather Technology

PCC-LT307	**Chemical Engineering -III**	**3L: 0T:0P**	**3 Credits**

Module I: Mass Transfer and Diffusion (12hours)

Steady-state ordinary molecular diffusion: Fick's law of diffusion; Velocities in mass transfer, Equimolar counter diffusion; unimolecular diffusion, Diffusion coefficients: Diffusivity in gas mixtures, diffusivity in liquid mixtures, Diffusivity in solids, One-dimensional, steady-state, molecular diffusion through stationary media, Models for mass transfer at a fluid-fluid interface: Film theory; Penetration theory; surface-renewal theory; film-penetration theory, Two-film theory and overall mass transfer coefficients

Module 2: Absorption and Stripping (08hours)

Equipment, Gas-liquid equilibrium, Henry's law, Selection of solvent, Absorption in tray column, Graphical and analytical methods, Absorption in packed columns.

Module 3: Adsorption (08hours)

Description of adsorption processes and their application, Types of adsorption, Nature of adsorbents; Adsorption isotherms and adsorption hysteresis; Stagewise and continuous contact adsorption operations, Determination of number of stages, Equipment.

Module 4: Drying (06hours)

Solid-gas equilibrium, Different modes of drying operations, Definitions of moisture contents, Types of batch and continuous dryers, Rate of batch drying, Time of drying, Mechanism of batch drying, Continuous drying,

Module 5: Crystallization (08hours)

Crystal geometry-Crystal-size distribution; Thermodynamic considerations Solubility and material balances, Enthalpy balance; Kinetic and transport considerations Supersaturation, Nucleation, Crystal growth; Equipment for solution crystallization-Circulating, batch crystallizers, Continuous, cooling crystallizers, Continuous, vacuum evaporating crystallizers

Texts/References:

1. Treybal, R.E. "Mass Transfer Operations", 3rd ed. New York: McGraw-Hill, (1980).
2. Seader, J.D. and Henley, E.J., "Separation Process Principles", 2nd ed., Wiley India Pvt. Ltd., New Delhi (2013).
3. Sherwood, T. K., Pigford, R. L. and Wilke, C.R. "Mass Transfer" McGraw Hill (1975).
4. Geankoplis, C.J. "Transport Processes and Separation Process Principles", 4th ed., PHI Learning Private Limited, New Delhi (2012).

PCC-LT308	**Leather finishing materials and Auxiliaries**	**3L: 0T:0P**	**3 Credits**

Module1. Pigments (08hours)

Inorganic and Organic Pigments, Preparation of Pigments, Methods of Preparation of Pigments, Aqueous Pigment Paste, Properties required in Pigments.

Module 2. Principles of Finishing, Finish Formulation and their Application (06hours)

Definition, Aim, Film- Formation mechanism, Properties of films such as transparency, Gloss and resistance to heat, light and solvent, Role is dispersion and stability – Requirement in multiple coat technique- Single coat, Composition and methods of application like spraying, Curtain coating, Roller coating etc., Cationic finishes and their relative merits.

Module 3. **(06hours)**

Chemistry and Preparation of Nitrocellulose, lacquers, lacuuer emulsion, Coloured lacquers, Wax emulsions, Silicone emlsion.

Module4. **(06hours)**

Chemistry and Properties required of Synthetic Polymers, Impregnatin agents, Binders, Chemistry of Polyurethane lacquers.

Module 5. **(06hours)**

Chemistry and Mechanism of Plasticization, Internal and External Plasticizers.

Module 6. **(06hours)**

Definition of Water proofing, Theory of water Proofing, Chemistry &Mechanism involved in water proofing**.**

Module 7. **(06hours)**

Upgradation technologies in finishing. General introduction to addition, condensation, Natural polymer, Caesin, Cellulose

Text/References

1. Acrylics and their uses in leather manufacture. By Rajadesa, S. and Kula Sekhran, S. CLRI 3 Chennai –1956.
2. Chemistry of Tanning Process. By Gustavson, K.H. Academic Press, New York- 1956.
3. The Chemistry and Technology of Leather. By Fred O, Flaherty, Toddy T.W. and Hollar, R. M. Vol – II, Types of tannages, Rober E. Krieger, Publishing Co. New York – 1977.

HSMC 04	FINANCE AND ACCOUNTING	3L:0T:0P	3 Credits

Module 1

Various definitions of Economics: Nature of Economic Problem, Relation between science Engineering. Technology & Economics **(3 lectures)**

Module 2

Meaning of demand, Law of Demand, Elasticity of demand, Practical importance & application of the concept of elasticity of Demand **(5 lectures)**

Module 3

Meaning of Production and factor of Production: Land, labor, Capital, Entrepreneur& Organization –their Characteristics law of variable Proportion. Return to Scale **(5 lectures)**

Module 4

Cost Analysis: Various concepts of cost, Cost function, Short & Long run cost. Concept of Revenue, Break-Even Analysis **(5 lectures)**

Module 5

Meaning of Market: Type of market –Perfect completion, Monopoly, Oligopoly, Monopolistic competition, Main feature of these market), Meaning of Supply and Law of Supply, R ole of Demand & Supply in price in prime determination imperfect t competition **(7 lectures)**

Module 6

Engineering Economy:

(a) Simple and compound interest, Annuities, (b)Basic methods For making economy Studies -(i) Present worth method, (ii) Future worth method (iii)I.R.R method (c) Comparison of alternative –(i) Present worth method, (ii\) Future Worth method (iii) I.R.R method. **(7 Lecture)**

Module 7

Accounting: Meaning Scope and Role of accounting, Accounting concept & Convention. Accounting as information System. Recording of transaction in journal and Ledgers. Trial –Balance, Preparation of final Account. (**9 Lecture)**

Text Book:

1. Modern Micro Economics by Theory -H.L.Ahuja-S.Chand
2. Advance Economic Theory by M .L.Jhingan-Konark Publication
3. Engineering Economics by Degarmo , Sullican & Canada –McMillan
4. Double Entry Book Keeping by T.S.Grewal –S .Chand

Reference Books:

1. Stonier & Hague by A test book of Economic Theory-Pearson
2. Industrial Organisation and Engg. Economics by Banga & Sharma

BSC109	Biology for Engineers	3L:0T:0P	3 credits

[3 credit course; 2 (one hour) lectures and one (one hour) tutorial per week. Only lecture hours are shown]

Module 1. (2 hours)- Introduction
Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

Module 2. (3 hours)- Classification
Purpose: To convey that classification per se is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S. cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus

Module 3. (4 hours)-Genetics
Purpose: To convey that “Genetics is to biology what Newton’s laws are to Physical Sciences”

Mendel’s laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to

genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

Module 4. (4 hours)-Biomolecules
Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine

Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

Module 5. (4 Hours). Enzymes
Purpose: To convey that without catalysis life would not have existed on earth

Enzymology: How to monitor enzyme catalyzed reactions. How does an enzyme catalyzereactions. Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

Module 6. (4 hours)- Information Transfer
Purpose: The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

Module 7. (5 hours). Macromolecular analysis
Purpose: How to analyses biological processes at the reductionistic level

Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Module 8. (4 hours)- Metabolism

Purpose: The fundamental principles of energy transactions are the same in physical and biological world.

Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of K_{eq} and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to $CO_2 + H_2O$ (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge

Module 9. (3 hours)- Microbiology

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

Module 10: Plant Physiology covering, Transpiration; Mineral nutrition (3 Lectures)

Module 10B: Ecology covering, Ecosystems- Components, types, flow of matter and energy in an ecosystem; Community ecology- Characteristics, frequency, life forms, and biological spectrum; Ecosystem structure- Biotic and a-biotic factors, food chain, food web, ecological pyramids; (3 Lectures)

References:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

PCC-LT309	Practices of Leather manufacturing -II	3L: 0T:3P	4.5 Credits

Module1: **(05hours)**

Manufacture of different types of wet blue/wet white from raw Cow/Goat/Sheep/Buffalo hides/skins.

Module 2 **(06hours)**

Modern practices in E.I. tanning, E.I. Kips and their dressing into upper, lining and leather for goods.

Module 3 **(20hours)**

Semi chrome/Full chrome/Chrome retain hunting suede, Safety uppers burnishable upper leathers from cattle hides. Printed and shrunken grain leathers, Chrome tanned Buff uppers, Upholstry and printed leathers. Vegetable and chrome tanned lining leathers.

Module 4 **(05hours)**

Morocco leathers, Chamois leathers, book binding leathers and pleated leathers.

Module 5 **(05hours)**

Upgradation technologies, rectification of defects in hides, selection and grading of leather.

Text/References

1. Introduction to the Principles of Leather Manufacture. By – S. S. Dutta, 4th Edition, ILTA, Kolkata
2. Theory & Practice of Leather Manufacture. By – K. T. Sarkar, Macmillan India Press, Chennai.

Semester VI (Third year]
Branch/Course Electrical Electronics Engineering

PEC-EEE23	Digital Signal Processing	3L:0T:0P	3 credits

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Represent signals mathematically in continuous and discrete-time, and in the frequency domain.
- Analyse discrete-time systems using z-transform.
- Understand the Discrete-Fourier Transform (DFT) and the FFT algorithms.
- Design digital filters for various applications.
- Apply digital signal processing for the analysis of real-life signals.

Module 1: Discrete-time signals and systems (6 hours)

Discrete time signals and systems: Sequences; representation of signals on orthogonal basis; Representation of discrete systems using difference equations, Sampling and reconstruction of signals - aliasing; Sampling theorem and Nyquist rate.

Module 2: Z-transform (6 hours)

z-Transform, Region of Convergence, Analysis of Linear Shift Invariant systems using z-transform, Properties of z-transform for causal signals, Interpretation of stability in z-domain, Inverse z-transforms.

Module 2: Discrete Fourier Transform (10 hours)

Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT, Connvolution of signals, Fast Fourier Transform Algorithm, Parseval's Identity, Implementation of Discrete Time Systems.

Module 3: Designof Digital filters (12 hours)

Design of FIR Digital filters: Window method, Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Low-pass, Band-pass, Band-stop and Highpass filters.

Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to multi-rate signal processing.

Module 4: Applications of Digital Signal Processing (6 hours)

Correlation Functions and Power Spectra, Stationary Processes, Optimal filtering using ARMA Model, Linear Mean-Square Estimation, Wiener Filter.

Text/Reference Books:

1. S. K. Mitra, "Digital Signal Processing: A computer based approach", McGraw Hill, 2011.
2. A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing", Prentice Hall, 1989.
3. J. G. Proakis and D.G. Manolakis, "Digital Signal Processing: Principles, Algorithms And Applications", Prentice Hall, 1997.
4. L. R. Rabiner and B. Gold, "Theory and Application of Digital Signal Processing", Prentice Hall, 1992.
5. J. R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1992.

6. D. J. DeFatta, J. G. Lucas andW. S. Hodgkiss, “Digital Signal Processing”, John Wiley & Sons, 1988.

PCC-EEE24: Digital Signal Processing Laboratory (0:0:2 – 1 credit)

Hands-on/Computer experiments related to the course contents of PCC-EEE23.

PCC-EEE25	**Measurements and Instrumentation**	**3L:0T:0P**	**3 credits**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Design and validate DC and AC bridges.
- Analyze the dynamic response and the calibration of few instruments.
- Learn about various measurement devices, their characteristics, their operation and their limitations.
- Understand statistical data analysis.
- Understand computerized data acquisition.

Lectures/Demonstrations:

1. Concepts relating to Measurements: True value, Accuracy, Precision, Resolution, Drift, Hysteresis, Dead-band, Sensitivity.
2. Errors in Measurements. Basic statistical analysis applied to measurements: Mean, Standard Deviation, Six-sigma estimation, C_p, C_{pk}.
3. Sensors and Transducers for physical parameters: temperature, pressure, torque, flow. Speed and Position Sensors.
4. Current and Voltage Measurements. Shunts, Potential Dividers. Instrument Transformers, Hall Sensors.
5. Measurements of R, L and C.
6. Digital Multi-meter, True RMS meters, Clamp-on meters, Meggers,
7. Digital Storage Oscilloscope.
8. Basic components of bio-medical instruments, bio-electric signals & recording electrodes, transducers, recording and display devices. Patient care and monitoring systems, cardiovascular measurements-blood pressure, blood flow, cardiac output, heart sounds etc.; instrumentation for respiratory and nervous systems, analysis of EEG, ECG, EMG, EOG and action potentials, non- invasive diagnostic measurements - temperature, ultrasonic diagnosis, CAT scan techniques, sensory measurements-motor response.

PCC-EEE26: Measurements and Instrumentation Laboratory (0:0:2 – 1 credit)

List of Experiments

1. Measurement of a batch of resistors and estimating statistical parameters.
2. Measurement of L using a bridge technique as well as LCR meter.
3. Measurement of C using a bridge technique as well as LCR meter.
4. Measurement of Low Resistance using Kelvin's double bridge.
5. Measurement of High resistance and Insulation resistance using Megger.
6. Usage of DSO for steady state periodic waveforms produced by a function generator.
    a. Selection of trigger source and trigger level, selection of time-scale and voltage scale.
    b. Bandwidth of measurement and sampling rate.
7. Download of one-cycle data of a periodic waveform from a DSO and use values to compute the RMS values using a C program.
8. Usage of DSO to capture transients like a step change in R-L-C circuit.
9. Current Measurement using Shunt, CT, and Hall Sensor.

PCC-EEE27	Electronics Design Laboratory	1L:0T:4P	3 credits

Course Outcomes:

At the end of the course, students will demonstrate the ability to

- Understand the practical issues related to practical implementation of applications using electronic circuits.
- Choose appropriate components, software and hardware platforms.
- Design a Printed Circuit Board, get it made and populate/solder it with components.
- Work as a team with other students to implement an application.

Basic concepts on measurements; Noise in electronic systems; Sensors and signal conditioning circuits; Introduction to electronic instrumentation and PC based data acquisition; Electronic system design, Analog system design, Interfacing of analog and digital systems, Embedded systems, Electronic system design employing microcontrollers, CPLDs, and FPGAs, PCB design and layout; System assembly considerations. Group projects involving electronic hardware (Analog, Digital, mixed signal) leading to implementation of an application.

Text/Reference Books

1. A. S. Sedra and K. C. Smith, "Microelectronic circuits", Oxford University Press, 2007.
2. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1997.
3. H.W.Ott, "Noise Reduction Techniques in Electronic Systems", Wiley, 1989.
4. W.C. Bosshart, "Printed Circuit Boards: Design and Technology", Tata McGraw Hill, 1983.
5. G.L. Ginsberg, "Printed Circuit Design", McGraw Hill, 1991.

HSMC 501	Professional Skill Development	3L:0T: 0P	3 credits
Pre-requisites	HSMC 301		

Objectives of the course:

5. To learn various interpersonal skills
6. To help in developing various professionals skills.
7. To cover the facets of verbal and non-verbal languages, public speech, reading gestures and body languages, preparing for group discussion and enhancing presentations skills.
8. To enable learners to speak fluently and flawlessly in all kinds of communicative Contexts with speakers of all nationalities.

Detail contents:

Module 1 **Lecture 10 hrs.**

Communication skills: Public speaking, Group discussion, Gestures and body language & professional presentation skills

Module 2 **Lecture 10 hrs.**

Interpersonal skills: Group dynamics, Negotiation skills, Leadership, Emotional intelligence

Module 3 **Lecture 10 hrs.**

Employability and Corporate Skills: Time management and effective planning, Stress management, People skills, Team work, development of leadership qualities, Decision making and Negotiation skills, Positive attitude, Self-motivation, Professional ethics, Business etiquettes, balancing board room.

Module 4 **Lecture 10 hrs.**

Business writing skills, Resume Writing. Interview Skills, Technical Presentation, Guest Lecture, Professional Ethics, Project Management, Entrepreneurship.

Suggested reference books:

5. "Personality Development and Soft Skills", Barun Mitra, Oxford University Press.
6. "Managing Soft Skills for Personality Development", B.N. Ghosh, McGraw Hill.
7. "Communication Skills and Soft Skills: An Integrated Approach", E. Suresh Kumar, Pearson
8. "Communication to Win", Richard Denny, Kogan Page India Pvt. Ltd.

Course outcomes

4. Student can able to write their resume and can prepare for presentation, group discussion and interview.
5. Student can develop interpersonal skills like negotiation and leadership skills.
6. Students can develop Employability and Corporate Skills with proper time management and stress management.

Students learn to practice the professional ethics, project management and Entrepreneurship.

PCC-EEE21 Introduction to VLSI Design 3L: 0T: 0P 3 credits

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. Understand the mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their inter connect. .
2. Understand the CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects
3. Understand the concepts and techniques of modern integrated circuit design and testing (CMOS VLSI).

Module 1: Introduction MOSFET, threshold voltage, current, Channel length modulation, body bias effect and short channel effects, MOS switch, MOSFET capacitances, MOSFET models for calculation- Transistors and Layout, CMOS layout elements, parasitics, wires and vias-design rules-layout design SPICE simulation of MOSFET I-V characteristics and parameter extraction (10 hours)

Module 2: CMOS inverter, static characteristics, noise margin, effect of process variation, supply scaling, dynamic characteristics, inverter design for a given VTC and speed, effect of input rise time and fall time, static and dynamic power dissipation, energy & power delay product, sizing chain of inverters, latch up effect-Simulation of static and dynamic characteristics, layout, post layout simulation (10 hours)

Module 3: Static CMOS design, Complementary CMOS, static properties, propagation delay, Elmore delay model, power consumption, low power design techniques, logical effort for transistor sizing, ratioed logic, pseudo NMOS inverter, DCVSL, PTL, DPTL & Transmission gate logic, dynamic CMOS design, speed and power considerations, Domino logic and its derivatives, C2MOS, TSPC registers, NORA CMOS – Course project (10 hours)

Module 4: Circuit design considerations of Arithmetic circuits, shifter, CMOS memory design - SRAM and DRAM, BiCMOS logic - static and dynamic behaviour -Delay and power consumption in BiCMOS Logic. (10 hours)

Text / References:

1. David A. Hodges, Horace G. Jackson, and Resve A. Saleh, “Analysis and Design of Digital Integrated Circuits”, McGraw-Hill, Third edition, 2004..
2. R. J. Baker, H. W. Li, and D. E. Boyce, “MOS circuit design, layout, and simulation”, Wiley-IEEE Press, 2007.
3. Sung-Mo Kang & Yusuf Leblebici, “CMOS Digital Integrated Circuits - Analysis & Design”, Tata McGraw Hill, Third edition, 2003.
4. Wayne Wolf, “Modern VLSI design”, Pearson Education, 2003
5. Christopher Saint and Judy Saint, “IC layout basics: A practical guide”, Tata McGraw Hill Professional, 2001.

PCC-EEE22: Introduction to VLSI Design Laboratory (0:0:2 – 1 credit)

Hands-on/Computer experiments related to the course contents of PCC-EEE21

INFORMATION TECHNOLOGY

Data Mining

Module I

Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

Module II

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture Of A Typical Data Mining Systems- Classification Of Data Mining Systems.

Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

Module III

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Module IV

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

Module V

Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

Text Book

1. Jiawei Han, Micheline Kamber and Jian Pei, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011.

Reference Books

1. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.

2. K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.

3. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.

4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

Embedded System

Module I

Embedded Computing: Introduction, Complex systems and Microprocessors, The embedded system design process, Formalization for system design.

Module II

Instruction Sets CPUs: Instruction and preliminaries ARM and SHARC Processors, Programming I/O CPU performance and Power consumption.

Module III

The embedded Computing Platform and program design: Introduction, the CPU bus, Component interfacing, designing with microprocessors, development and debugging.

Module IV

Program Design and Analysis: Introduction program design, Assembly, Linking, Basic compilation techniques, and Analysis optimization of executive time.

Text Book:

1. Wayner Wolf., "Computers as components – Principle of Embedded Computing System Design", Morgan Kaufmann/ Hercourt India Pvt. Ltd.

Reference Books:

1. Raj Kamal - Embedded Systems, TMH, New Delhi 2004.
2. F. Vahid & T. givargis- Embedded system Design, John wiley, India Edition, 2005.

Computer Graphics

Module I **Lectures: 8**

Introduction and Line Generation: Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller. RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software.

Module II **Lectures: 8**

Points and lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generating algorithms, Mid-point circle generating algorithm, and parallel version of these algorithms. Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm. Transformations: Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.

Module III **Lectures: 10**

Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non-rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping

Three Dimensional: 3-D Geometric Primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

Module IV **Lectures: 8**

Curves and Surfaces: Quadric surfaces, Spheres, Ellipsoid, Blobby objects, introductory concepts of Spline, Bspline and Bezier curves and surfaces.

Module V **Lectures: 8**

Hidden Lines and Surfaces: Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

Reference Books:

1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education
2. Foley, Vandam, Feiner, Hughes – "Computer Graphics principle", Pearson Education.
3. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
4. Donald Hearn and M Pauline Baker, "Computer Graphics with OpenGL", Pearson education

Advance Java Programming

Module I

Java Beans and Web Servers: Introduction to Java Beans, Advantage, Properties, BDK, Introduction to EJB, Java Beans API Introduction to Servelets, Lifecycle, JSDK, Servlet API, Servlet Packages: HTTP package, Working with Http request and response, Security Issues. Java Script: Data types, variables, operators, conditional statements, array object, date object, string object, Dynamic Positioning and front end validation, Event Handling

Module II

JSP: Introduction to JSP, JSP processing, JSP Application Design, Tomcat Server, Implicit JSP objects, Conditional Processing, Declaring variables and methods, Error Handling and Debugging, Sharing data between JSP pages- Sharing Session and Application Data.

Module III

Database Connectivity: Database Programming using JDBC, Studying Javax.sql.*package, accessing a database from a JSP page, Application-specific Database Action, Developing Java Beans in a JSP page, introduction to Struts framework.

Module IV

Java Servlet: Brief origin and advantages over CGI, J2EE Servlet 2.x Specification, Writing small Servlet Programs, Deployment Descriptor, Inter Servlet Collaboration, Session: Definition, State on web, Different ways to track sessions,

Module V

J2SE: Concepts and Prerequisites: Data Types, Arrays, Dynamic Arrays, Type Casting, Classes and Objects, Inheritance, Interfaces, Exception Handling, Multi-Threading, J2EE Architecture: J2EE as a framework, Client Server Traditional model, Comparison amongst 2-tier, 3-tier and N-tier architectures, Thin and Thick Clients

Text Books:

1. Elliotte Rusty Harold, " Java Network Programming", O'Reilly publishers,
2. Ed Roman, "Mastering Enterprise Java Beans", John Wiley & Sons Inc.
3. Hortsmann & Cornell, "Core Java 2 Advanced Features, Vol II", Pearson Education,

References:

1. Web reference: http://java.sun.com.
2. Patrick Naughton, "COMPLETE REFERENCE: JAVA2", Tata McGraw-Hill.

Web Technology

Module I

Introduction to web technologies and architectures: Recent Web technologies - A case study on WWW, web 2.0 etc., Client/Server Computing: C/S Computing, Middleware, Fat client VS Fat Servers, N-tiered Software Architecture; Markup-language: Markup Languages and their grammars - SGML, DTD Resources, HTML, CSS, XML, XSL, Query Languages for XML.

Module II

Browser and Apache web server architecture: Web Browser - Browser Architecture, Configuration of Netscape and IE; Web Server Apache Architecture - Web Server Architecture, Server Features, Configuration of Apache Tomcat; Commonly used protocols: HTTP, FTP, SMTP, POP etc.

Module III

Basics of web-programming: Client side scripting – JavaScript, AJAX; Server side programming in PHP/JSP/Servlet; Overview of Java, JAVA Applet; Distributed Object Models - CORBA, DCOM, EJB.

Module IV

E-commerce applications: E-business models, E-commerce and WWW, secure electronic payment protocols, e-commerce payment systems, web based marketing, search engine and directory registration, e-commerce site designing tools etc.

Module V

Web 3.0: Semantic web and supporting technologies.

Text Book:

1. Jeffrey C. Jackson, “Web Technologies: A computer science perspective”, Pearson Education

References:

1. W3schools tutorials, http://www.w3schools.com/

2. Eric T. Freeman, Elisabeth Robson, “Head First JavaScript Programming”, O’Reilly Media

3. L. Beighley, Michael Morrison, “Head First PHP & MySQL”, O-Reilly Media

4. B. Basham, Kathy Sierra, Bert Bates, “Head First Servlets and JSP”, O'Reilly publication.

5. R. M. Riordan, “Head First Ajax”, O’Reilly Media.

Python for Data Science

Module I

Python Basics: Types, Expressions and Variables, String Operations; Python Data Structures - Lists and Tuples, Sets, Dictionaries; Python Programming Fundamentals - Conditions and Branching, Loops, Functions, Objects and Classes; Working with Data in Python - Reading files with open, Writing files with open, Loading data with Pandas, Numpy

Module II

IPython Beyond Normal Python: Shell and Notebook, Help and Documentation in Ipython, Keyboard Shortcuts in the IPython Shell, IPython Magic Commands, Input and Output History, IPython and Shell Commands, Shell-Related Magic Commands, Errors and Debugging, Profiling and Timing Code

Module III

Introduction to NumPy: Understanding Data Types in Python, The Basics of NumPy Arrays, Computation on NumPy Arrays: Universal Functions, Aggregations: Min, Max, and Everything in Between, Computation on Arrays: Broadcasting, Comparisons, Masks, and Boolean Logic, Fancy Indexing, Sorting Arrays, Structured Data: NumPy's Structured Arrays.

Module IV

Data Manipulation with Pandas: Installing and Using Pandas, Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Combining Datasets: Concat and Append, Combining Datasets: Merge and Join, Aggregation and Grouping, Pivot Tables, Vectorized String Operations, Working with Time Series , High-Performance Pandas: eval() and query().

Module V

Visualization with Matplotlib: Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density, Multiple Subplots, Text and Annotation, Three-Dimensional Plotting in Matplotlib, Geographic Data with Basemap, Visualization with Seaborn.

Text Book:

1."Python Data Science Handbook", Jake VanderPlas, O'Reilly Media, Inc., First Edition -2016.

Reference Book:

1. "Mastering Python for Data Science", Samir Madhavan, PACKT Publishing, First Edition – 2015
2. "Data Science from Scratch", Joel Grus, O'Reilly Media, First Edition – 2015.

Responsive Web Design Using PHP & MySQL

Module 1: PHP – Understanding the Preliminaries

Introduction to web &internet ,Introduction to server , Understanding localhost , Starting , PHP syntax and variables , Operators and Expressions , Conditional Branching and Looping Statements , Learning Arrays in PHP

Module 2: PHP - The Core Logics and Techniques

String and Math functions in PHP , Introduction HTML Form Elements and Fields, Accessing PHP, HTTP Data , Query Strings and Hyperlinks , Describing Pre-Defined Variables - Super Global Arrays ,Understanding Functions, Important PHP Functions ,What are the Scope of variables , Usage of Include and require statements

Module 3: PHP – File Handling.

The Plain Repository of Data, Handling files and directories in PHP , Fetching information from files , Uploading and downloading files

Module 4: MySQL Basics (Skip if all ready read in any semester)

Brief History of MySQL , Relational Databases and Popular Databases , Data Manipulation Language (DML) , INSERT , UPDATE , DELETE ,SELECT ; Data Definition Language (DDL) :CREATE , ALTER , DROP ; Sub-Queries, Joins and Unions with , Order By, Like , And & Or, Where , Between ,Joins & Unions , Aggregate Functions and Grouping , Constraints and Normalization , Understanding Primary and Foreign , Understanding Database Normalization , Views and Triggers

Module 5: PHP and MySQL

- The Structured Repository , PHP MySQL Connectivity ,Integrating Web Forms and Database , Using PHP's MySQL Extension , Using PHP's PDO Extension

Module 6: Learn More Advanced Techniques in PHP

Introduction to Object Oriented Programming , Classes and Objects , Abstraction, Encapsulation, Inheritance and Polymorphism , Constructors and Destructors , Overloading, Overriding of functions , Exception Handling , Regular Expressions ,Session Handling , Using Cookies

Module 7: Content Management Systems

Knowing Content Management System, Sample Web Application Development using Word Press, Install Word Press on the MySQL Database, Install, and activate a Theme, Posts, Pages and Menus, Using Widgets and Plugins, Customizing Themes

Module 8: Code Igniter Framework

Introduction to PHP Frameworks , Working with Code Igniter Framework , MVC architecture in Code Igniter ,Routing , Controllers, Views and Models , Helpers and Libraries , Form Validation , Fetching Data using Input Class , Session , Database

Module 9: Payment Gateway, E-mail and Social Media Networks

Integration of payment gateway, Integrating emails to web application, Integrating social media networks to web application

Module 10: FTP Management/Web Hosting

Set up a domain and hosting account, Understanding FTP, Setting up FTP Server (Live) ,Uploading and downloading FTP contents

Text Books

1. Professional PHP 5, Ed Lecky-Thompson , Heow Eide-Goodman , Steven D.
2. Learning PHP: A Gentle Introduction to the Web's Most Popular Language ,David Sklar
3. PHP & MySQL – Novice to Ninja, Tom Butler , Kevin Yank

Reference Books

1. Sams Teach Yourself PHP, MySQL and Apache All in One , Julie C. Meloni
2. CodeIgniter for Rapid PHP Application Development, David Upton
3. WordPress Responsive Theme Design , Dejan Markovic