PDPM

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN & MANUFACTURING JABALPUR

UG Course Curriculum
and
Courses of Study

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY DESIGN & MANUFACTURING JABALPUR

CURRICULUM

Semester I (27 Hours/week) **Credits: 24**

NS 101	Mathematics for Continuous Domain (3 L + 1T)	4
NS 102	Engineering Physics I (2L + 1T)	3
IT 101	Fundamentals of Computing (2L + 3 Hrs Lab)	4
DS 101	Engineering Graphics (2L + Lab 3 Hrs)	4
ES 101	Fundamentals of Electrical Engineering (3L + 1T)	4
HS 101	Effective Communication (2L + 1T)	3
IT 102	IT Workshop I (3 hrs Lab)	2

Semester II (27 Hrs/week) **23**

NS 103	Mathematics for Continuous & Discrete Domain (3L +1T)	4
NS 104	Engineering Physics II (2 L + 1T + 2 Hours Lab)	4
ES 102	Data Structures and Algorithms (3L+1T)	4
ES 103	Materials Design and Processing (3L + 2 Hours Lab)	4
ES 104	Engineering Literacy (1L + 3 Hrs Lab)	3
HS 102	Culture & Human Values (1L + 1 GD)	2
IT 103	IT Workshop II (3 Hours Lab)	2

Semester III (27 Hours/Week) **26**

NS 205	Mathematics for Discrete Domain (3L + 1T)	4
ES 205	Fundamentals of Electronics (3L + 1T)	4
ES 206	Computer Graphics, Simulation & Visualization (3L)	4
MN 201	Fundamentals of Manufacturing Processes (3L)	4
MN 202	Manufacturing Processes Workshop (3 Hrs Lab)	2
Professional Course I: (3L + 1T)		4
ME 201	Thermodynamics [ME]	
CS 201	Fundamentals of Computer Systems [CSE & ECE]	
ES 207	Electronics Lab (3 Hrs Lab)	2
IT 204	IT Workshop III (3 Hrs Lab)	2

Semester IV (26 Hours/week) **26**

DS 202	Engineering Design (3L + 1T)	4
ES 208	Mechanical Drives and Devices (2L + 2 Hrs Lab)	4
ES 209	Signals, Systems and Networks (3L + 1T)	4
HS 203	Arts and Aesthetics (2L + 2 Hours Lab)	4
Professional Course II: (3L)		4
ME 202	Solid Mechanics [ME]	
CS 202	Principles of Operating Systems [ECE, CSE]	
Professional Course III: (3L + 1T)		4
ME 203	Kinematics & Dynamics of Mechanical Systems [ME]	
EC 201	Digital Electronics & Microprocessor Technology [ECE, CSE]	
IT 205	IT Workshop IV (3Hrs Lab)	2

Semester V (25 Hours/week) **24**

ES 310	Sensing: Methods, Devices and Applications (2L + 3 Hrs Lab)	4
MS 301	Management: Concepts and Techniques (3L)	4
HS 304	Professional Ethics (1L)	2
Professional Course IV: (3L + 1T)		4
ME 304	Fluid Mechanics & Heat Transfer [ME]	
EC 302	Principles of Communications [ECE]	
CS 303	Object-Oriented Design and Analysis [CSE]	
Professional Course V: (3L)		4
ME 305	Design of Mechanical Components [ME]	
EC 303	Fundamentals of Electromagnetic Theory [ECE]	
CS 304	Design and Analysis of Algorithms [CSE]	
ME 306/EC 304/CS 305	Professional (ME/EC/CSE) Lab I (3 Hours)	2
DS 303	Project I (Design Project) (6 Hours Lab)	4

Semester VI (25 Hours/week) **24**

ES 311	Control Systems: Theory, Software and Hardware (2L)	2
ES 312	Mechatronics & Robotics (3L + 2 Hours Lab)	4
Core Elective I: (3L)		4
NS …	Numerical Methods / Computer Vision & Image Processing / Probability & Statistics/… Communication Systems Engineering …….	
Professional Course VI: (3L)		4
ME 307	Computer Aided Design [ME]	
EC 305	Digital Signal Processing [ECE]	
CS 306	Language Theory[CSE](3L)	
Professional Course VII: (3L)		4
ME 308	Energy Conversion Devices [ME]	
EC 306	Microprocessors and Interfacing [ECE]	
CS 307	Database Design and Management [CSE]	
ME 309/EC 307/CS 308	Professional (ME/EC/CSE) Lab II (3 Hours)	2
MN 303	Project II (Fabrication Project) (6 Hours Lab)	4

Semester VII (24 Hours/week) **26**

ES 413 Micro-Nano Science and Technology (3L) 4

Professional Course VIII: (3L) 4

ME 410 Advanced Manufacturing Processes and Technologies [ME]
EC 408 Linear Integrated Circuits [ECE]
CS 409 Compiler Design [CSE] (3L)

Professional Course IX: (3L) 4

ME 415 Computer Integrated Manufacturing [ME]
EC 409 Power Electronics [ECE]
CS 410 Artificial Intelligence [CSE]

Professional Course X: (3L) 4

ME 412 Finite Element Methods [ME]
EC 410 Advanced Electronic Devices [ECE]
CS 411 Computer Networks [CSE]

Professional Elective I (3L) 4
ME … : CFD/ Optimization/ Advanced Materials
EC …: Digital Communication
CS …: Parallel Architecture/ Mobile Computing & Wireless Communication

ME 413 / EC 411 / CS 412 Professional (ME/EC/CSE) Lab III (3 Hrs Lab) 2
PR 401 Advanced Project I (6 Hrs Lab) 4

Semester VIII (21 Hrs/week) **24**

Professional Course XI: (3L) 4

ME 414 Design of Mechanical Systems [ME]
EC 412 VLSI: Design & Testing [ECE]
CS 413 Design and Validation of Software Systems [CSE]

Professional Course XII: (3L) 4

ME 411 Management of Production Systems [ME]
EC 413 Applications of Electromagnetics [ECE]
CS 414 Distributed and Fault Tolerant Systems [CSE]

Professional Elective II (3L) 4
ME …: Rapid Prototyping/ Manufacturing Science/ Vibrations of Mechanical Systems
EC ….: RF and Microwave Engineering……
CS …..: Human Computer Interface……..

Open Elective I (3L) 4
Engineering Economics/ Industrial Psychology/ Industrial Sociology

Open Elective II (3L) 4
Business Models for Manufacturing/ Entrepreneurship & Technology Management/ Personnel Management & Industrial Relations/ ……..

PR 402 Advanced Project II (6 Hrs Lab) 4

Guidelines used for Course Category Classification and Numbering

NS	Natural Science
ES	Engineering Science
IT	Information Technology
DS	Design
MN	Manufacturing
MS	Management Science
HS	Humanities & Social Sciences
CS	Computer Science & Engineering
EC	Electronics & Communications Engineering
ME	Mechanical Engineering
PR	Project

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY DESIGN & MANUFACTURING JABALPUR

UG Courses Contents

Semester I

NS 101 Mathematics for Continuous Domain I [3-1-0-4] ***Prerequisites: #***

Calculus of Functions of One Variable: Real Numbers, Functions, Sequences, Limit and Continuity, Differentiation : review, successive differentiation, chain rule and Libnitz theorem, Rolle's and Mean Value Theorems, Maxima/ Minima, Curve Sketching, Linear and Quadratic Approximations, Error Estimates, Taylor's Theorem, Newton and Picard Methods, The Riemann Integral, Approximate Integration, Natural Logarithm, Exponential Function, Relative Growth Rates, L'Hospital's Rule Geometric Applications of Integrals, Infinite Series, Tests of Convergence, Absolute and Conditional Convergence, Taylor and Maclaurin Series.
Calculus of Functions of Several Variables: Scalar fields, Limit and Continuity, Partial derivatives, Chain rules, Implicit differentiation, web gradient, Directional derivatives, Total differential, Tangent planes and Normals, Maxima, Minima and Saddle Points, Constrained maxima and minima, Double Integrals, Applications to Areas and Volumes, Change of variables.
Vector Calculus: Vector fields, Divergence and Curl, Line Integrals, Green's Theorem, Surface integrals, Divergence Theorem, Stoke's Theorem and Application.

Text Books:

1. Thomas and Finney, Calculus, Ninth Edition, Pearson Education, 1996.
2. Rudin, Walter, Principles of Mathematical Analysis, Third Edition, McGraw Hill, 1976.

NS 102 Engineering Physics I [2-1-0-3] ***Prerequisites: #***

Vector algebra review; Newton's laws, force, its transmissibility, moment of a force, couples, condition for equilibrium, forces for different engineering elements such as planes, hinges etc.; Plane trusses, method of joints and sections; Friction, contact friction, belt friction, the square screw-thread, rolling friction; Properties of surfaces, first moment of an area and centroid, second moment and product of area for planar area, polar moment of inertial principle axes, mass moment of inertia; Work of a force and principle of virtual work; Vector algebra in planar polar coordinates, cylindrical and spherical coordinates, dimensional analysis; Solution of 1d equation of motion in various situations, application of Newton's laws in motion involving friction, constraints and pulleys; Conservative forces, work energy theorem and energy diagrams (use curl divergence gradient already taught in Math); Conservation of linear momentum and collisions, variable mass problem; Kinematics and Kinetics of rigid bodies. Fixed axis rotation, conservation of angular momentum, Moments of inertia, full rotational dynamics coming up to Euler's equation but restriction problems up to the level of precession of rigid bodied, Gyroscope; Simple harmonic oscillator with damping and forced vibrations.

Textbook: Kleppner & Kolenkow, An Introduction to Mechanics, Tata McGraw Hill, 1999.

IT 101 Fundamentals of Computing [2-0-3-4] ***Prerequisites: #***

Concept of Programming Languages, A quick overview of OS-Windows/Linux, Writing, compiling and running the program on Linux/Windows, The Compiler, Program Builder, Debugging: types of errors and debugging techniques, Problem solving aspects, Introduction to Algorithms and flow charts, Data structures in C, Variables, Variables names, I/O, The standard Input/Output file, Formatted inputs/Output, Expressions and Operators, connectors, control statements, Functions: Scope of Function variable, Modifying function arguments, Pointers, Array, String, Structures and Unions, file handling, File redirection, File pointers, Advantages of using multi files, Organization of data in each file, Compiling multi-file programs, The Preprocessor, Library Functions and Low level programming.

Textbook: Kelley, Al and Pohl, Ira, A book on C, Fourth Edition, Pearson Education, 1998.

DS 101 Engineering Graphics [2-0-3-4] ***Prerequisites: #***

Lines, Lettering, Sketching, Principle of Dimensioning, Orthographic Projection: Projection of Points, Lines, Planes, Auxiliary Views, Projection of Solids, Sections of Solids, Intersections of solids and development of lateral surfaces of simple solids, Isometric Projections, Oblique and Perspective Projection.

Textbook Bhatt, N. D., Engineering Drawing, Charotar Publishing House, 2006.

ES 101 Fundamentals of Electrical Engineering [3-1-0-4] ***Prerequisites: #***

Circuit Analysis: D.C. Circuits, Ohm's law, Kirchoff's laws, Nodal Analysis, Mesh Analysis, Superposition Theorem, Source Transformations, Thevnin's and Norton's Theorems, A.C. Fundamentals, Solution of series and Parallel Circuits, power and power factor, Resonance in series and parallel circuits. Three-phase A. C. Circuits, 3-phase voltage and current, Star and Delta connection, measurement of power by two-wattmeter method. Magnetic Circuit, Mmf, Magnetising force, Magnetic flux and flux density, permeability, Reluctance and permeance, B-H curve, Simple magnetic circuits, Hysteresis and eddy current loss.
Transformer: Single-phase transformer, Construction, principle of operation, emf equation, losses and efficiency, Three-phase Transformer, Construction and connection.
D. C. Machines: D. C. Generator, Construction, emf equation, various types and characteristics, D. C. Motor, Principle, torque and speed formula, types and their characteristics, Speed control, A. C. Machine, Single Phase Induction Motor, Construction, principle of operation, Three-phase Induction Motor, Construction, principle of operation, Slip-torque characteristic, Three-phase Alternator, Construction, principle of operation, emf equation.

Textbook: Toro, Del V., Electrical Engineering Fundamentals, Printice Hall of India, 1994.

HS 101 Effective Communication [2-1-0-3] ***Prerequisites: #***

General Introduction: Why English?; The purpose of communication; Communication through body language, listening, speaking, reading and writing; Phonetics: Air speech mechanism; Classification of vowel sounds; Classification of consonant sounds; Accent, Pronunciation, Intonation; Problems of Tense; Use of Verbs; Proverbs and Idioms; Vocabulary, Technical Vocabulary; Punctuation; Comprehension; Expansion; Definition,

Scope and Significance of technical writing; Features of technical style; Mechanics of technical writing: Equation, Abbreviation, Numerals, Figures, Charts, Tables, and Graphs etc. Report writing, Essentials of technical report writing; Non-formal reports and its format; Formal reports and its format; Different kinds of reports: Progress Report, Feasibility Report, and Trouble Report; Committee Report.; Annual Report; Business Correspondence - Introduction; Elements of a good letter; Format of a letter; Letter of Enquiry; Letter for placing orders; Letter of complaint and its Reply; New Trends in Business Communication; Job Application; Preparation of Curriculum Vitae/Resume; Preparation of Notices, Agenda, Minutes; Tender Notices; Interviews; Essentials of Group Discussions; Presentation.

Textbook: None, Notes to be provided.

Reference Books:

1. Mohan, Krishna and Banerji, Meera, Developing Communication Skills, Fourteenth Edition, Macmillan & Co., New Delhi, 2005.
2. Nagaraj, Geetha, English Language Teaching-Approaches MethodsTechniques, Sixth Edition, Orient Longman, Kolkata, 2005.
3. Peterson, Mark, Group Discussions, First Edition, Lotus Press, New Delhi, 2007.
4. Aurther, John, Personality Development, Second Edition, Lotus Press, New Delhi 2007.
5. Mishra, Rajiv K., Personality Development, Seventh Edition, Rupa & Co, New Delhi, 2007.
6. Prasad, Hari Mohan & Sinha, Uma Rani, Objective English, Twelfth Edition, Tata McGrow-Hill Publishing Co., New Delhi,2004.
7. Seely, John, The Guide to Oxford Writng and Speaking, Third Edition, Oxford University Press, New Delhi, 2002.
8. Mishra, Sunita & Muralikrishna, C., Communication Skills for Engineers, First Edition, Pearson Education, Singapore, 2006.
9. Mohan, Krishna and Banerji, Meera, Professional Practice, Fourteenth Edition, MacMillan, New Delhi, 2005.
10. Madhurkar, R. K., Business Communication and Customer Relation, Fourth Edition, Vikas Publishing House, New Delhi, 2004.

IT 102 IT Workshop I [0-0-3-2] ***Prerequisites: #***

AutoCAD (4 turns): Introduction to 3D Wireframe/Solid Modeling, Modeling of Primitive 3D Solids, Modeling of unique 3D Solids by Extrusion, Revolution, Sweeping and Lofting, 3D Operations and Solid Editing.

MATLAB (8 turns): Basics: Mathematics, Data Analysis, Programming, Graphics, Creating GUI Toolboxes - Curve Fitting: Data fitting, Preprocessing data, post processing data, Using library functions for Data fitting, Symbolic Math: Calculus, Linear Algebra, Simplifications, Solutions of Equations, Matlab Compiler: Programs involving control statements, data structure etc., User defined functions, Simulink: building a model, running a model, setting Simulink preferences.

Semester II

NS 103 Mathematics for Continuous & Discrete Domain [3-1-0-4] ***Prerequisites: NS101***

Review of Matrices Algebra, Solution of Matrices Equation, Row reduced Echelon form, Determinant, Kramer's rule, Vector spaces, subspaces, basis, Orthogonal basis, Gram-Schmidt orthogonalization, Linear Operators, Matrix representation, Rank, Solution of Linear equations using matrices (invertibility, null space etc.), Eigenvalues, eigenvectors, diagonalisability, Symmetric systems, Positive definite, Complex analysis, Review of complex numbers and operations, Functions of a Complex Variable, Analytical functions, Cauchy-Reimann equations, Elementary functions, Confonnal mapping, Contour integrals, Cauchy's Theorem, Residue Theorem, Power series, Taylor and Laurent series, zeros, poles, essential singularities, evaluation of integrals.

Text Book: Kreysig E., Advanced Engineering Mathematics, Eighth Edition, Wiley Eastern Limited, 1999.

NS 104 Engineering Physics II [2-1-2-4] ***Prerequisites: NS102***

Electrostatic/ Gauss' law, applications, Curl of E, Electrostatic potential, Work and Energy in electrostatic field, Laplace's and Poisson's equation, Dirac-Delta, function, Unique solutions of Laplace and Poisson Equations, Method of images, Multipoles, force and torque on dipoles, Polarization, bound charges, electric displacement and boundary conditions, Magnetostatics : Current density, Bio-Savart law, curl and divergence of B, Ampere's law, Applications of amperes law, Magnetization, bound-carriers, magnetic field H magnetic susceptibility, Ferro-, para- and dia- magnetism, boundary conditions on B and H, Farady's law, energy in magnetic field, Displacement current, Maxwell's equations in vacuum and linear medium, Waves in one-d, EM waves in one-d, Plane waves, Poynting theorem, energy and momentum in EM, waves, Polarization of EM waves, Propagation of EM waves through linear medium and dielectrics, conductors. Reflection and transmission at normal incidence for dielectric and metallic surfaces

Textbook: Griffith D., Introduction to Electrodynamics, Printice Hall of India, 2005.

ES 102 Data Structures and Algorithms [3-0-0-4] ***Prerequisites: #***

Notion of Algorithm, Space and Time Complexity, Analyzing algorithms; Arrays, Stacks, Queues, Linked Lists, Trees, Binary Trees, Tree Traversals, Applications of Binary Tree (Huffman Algorithm), Threaded Binary Tree; Graphs and their representations, Graph Traversal Algorithms, Minimum Spanning Tree, Shortest Paths, Transitive Closure; Searching Algorithms & their time complexity: Sequential Search, Binary Search; Sorting Algorithms & their time complexity: Quick sort, Merge sort, Bubble sort, insertion sort, Selection sort, Heap & Heap sort; Static & Dynamic Memory Management: Binary Search Tree, Optimal Binary Search Tree, Balanced Tree, AVL Tree; Files, Indexing: Hashing, Tree Indexing: B-tree; Basic Algorithm Design Paradigms: Divide & Conquer, Greedy method, Dynamic Programming, Back tracking, Branch and Bound [Discussion with the help of some example which are already discussed].

Textbooks:

1. Horowitz, Sahni, Fundamentals of Data Structures, Galgotia, 2001.
2. Cormen et al., Introduction to Algorithms, Second Edition, Printice Hall of India, 2004.

ES 103 Materials Design & Processing [3-0-2-4] ***Prerequisites: #***

Overview of materials systems and processes, Bonding in materials, crystalline and amorphous structures of metals, polymers and ceramics, Miller indices in crystalline materials, Defects in crystalline materials, single crystals and poly-crystals, Diffusion in solids; Phase Diagrams of engineering materials systems; Solidification; Diffusion-assisted and diffusionless solid-state phase transformations, Elastic and Plastic deformation, Fracture; Mechanical properties of metallic, polymeric and ceramic materials and also of their composites; Band gap in semiconductors, Material design considerations for the fabrication of electronic chips, Magnetic materials and their properties, Optical materials and their properties; Case studies in materials design and selection.

Textbooks:

1. William, Smith F., Foundations of Materials Science and Engineering, Fourth Edition, Tata McGraw Hill.
2. Callister William D., Materials Science and Engineering: An Introduction, Seventh Edition, John Wiley & Sons, 2007.

HS102 Culture & Human Values [1-0-1-2] ***Prerequisites: #***

The syllabus comprises of excerpts from the writings of great masters like Swami Vivekananda, Mahatma Gandhi, Chanakya, Rabindranath Tagore, Dr. S. Radhakrishnan, H.E. Dr. APJ Kalam, Carl Sagan, Gurunanak Dev, Wordsworth, O. Henry, Maupassant and many others. The wisdom of the philosophical texts would be brought to them through the **Reading Material** prepared specifically for the students. It is expected that their English communication and general awareness would improve through this discursive and interactive method.

IT 103 IT Workshop II [0-0-3-2] ***Prerequisites: #***

Data Structures and Algorithms (6 Turns): Implementation of various data structures (Arrays, Linked List, Stacks, Queues, Trees, and Graphs) in C/C++.

SolidWorks (6 Turns): Introduction, GUI and Sketcher, Part and Assembly Design — Introduction, Basic and Advanced Features, Analysis & Simulation – Introduction, Simple Mechanical Parts and Assemblies

Semester III

NS 205 Mathematics for Discrete Domain [3-1-0-4] ***Prerequisites: #***

Abstract Algebra: Introduction of Sets, Axioms of Set Theory, Operations, Functions, Relations, Algebraic structures, Group, Properties of Groups, Symmetric Group, Permutation, Subgroup, Cosets and Lagrange's Theorem, Homomorphism and Isomorphism of groups, Automorphism and Normal Subgroup, First and Second Isomorphism Theorem, Ring, Integral Domain, Field, Skew field, Ideal, Polynomial Ring, Ring homomorphism.
Graph Theory: Introduction of Graph, Bipartite Graph, Tree and Spanning Tree, Matrices representations of Graph, Adjacency Matrix, Incidence Matrix, and Isomorphism of Graphs.
Recurrence Relations: Linear Recurrence relations with constant coefficients, Backward Tracking and Forward Chaining Method, Non-Homogeneous Recurrence Relations, Homogeneous Solutions, Particular Solutions, Generating Functions, Solutions by Generating Functions.

Text Books:

1. Liu, C. L., Elements of Discrete Mathematics, Tata McGraw Hill, 2007.
2. Balakrishnan, V. K., Graph Theory, Schaum Series, McGraw Hill, 1997.

ES 205 Fundamentals of Electronics [3-1-0-4] ***Prerequisites: #***

Introduction to basic electronics, Theory of semiconductor, PN junction diode, Diode circuit rectifier, LED, photodiodes, SCR, BJT, BJT Biasing, Transistor in CB, CE configuration, JFET, characteristic, JFET biasing, MOSFET, Introduction to Amplifiers, RC Coupled Amplifiers, Transistor RE Model, Transistor H parameter, BJT Small Signal Analysis, JFET Small signal model, JFET Small signal Analysis, BJT and FET High frequency modelling, Feedback Amplifier, Oscillators (Different types), Differential Amplifiers, Operational Amplifiers and its Applications, Power Amplifiers, Realization of Logic Gates (Sequential and Combinational), Flip-Flops, Registers and Counters.

Textbooks:

1. Millman, Jacob and Halkias, Christos C., Integrated Electronics: Analog and Digital Circuits and Systems, Mc Graw Hill, 2004.
2. Boylestad, Robert L., and Nashelsky, Louis, Electronics Device and Circuit Theory, Ninth Edition, Printice Hall of India, 2005.

ES 207 Computer Graphics, Simulation & Visualization [3-0-0-4] ***Prerequisites: #***

Conceptual Framework of an Interactive Graphical Simulation System, Raster Scan and Random Scan Displays, Graphics Architectures, The fundamentals of input, display, and hardcopy devices.
Scan conversion for geometric primitives (This will include Line, Circle, Ellipse and Other Curves Generation Algorithms, Filling Algorithms and Character Generation), Attributes of output primitives and antialiasing techniques, 2D and 3D Geometrical Transformations and Viewing Transformations, Windowing and 2D clipping: line clipping, Polygon clipping.
Graphical User Interfaces, Interactive Input Methods, Texture generation and Rendering, Basic Modelling concepts through curves and surfaces, Visual Realism, Algorithms for Visible Surface Determination, Illumination Models, Shading models, Color Models.
Discrete and Continuous Systems, Graphical Modeling and simulation of discrete events and continuous motion, Animation: Concept and Techniques.

Text Book: Hearn, Donald and Baker, M. Pauline, Computer Graphics: C version, Second Edition, Pearson Education, 2006.

Reference Books:

1. Hill F. S., Jr., Computer Graphics Using OpenGL, Second Edition, Printice Hall of India, 2006.
2. Foley, James D., Dam, Andries van, Feiner, Steven K., Hughes, John F., Computer Graphics: Principles and Practice in C, Second Edition, Pearson Education, 2005.
3. Wright, Richard S. and Sweet, Michael, OpenGL Super Bible, Second Edition, Techmedia, New Delhi, 2006.

MN 201 Fundamentals of Manufacturing Processes [3-0-0-4] ***Prerequisites: #***

Introduction to Manufacturing, Historical perspective Importance of manufacturing, Classification of manufacturing processes.

Fundamentals of Casting, Sand casting, Permanent mold casting including pressure die casting, Shell, investment & centrifugal casting processes, Continuous casting, Casting defects.

Metal Forming, Basic concepts of plastic deformation, Hot & cold working, Common bulk deformation processes (Rolling, Forging, Extrusion and Drawing). Common sheet metal forming processes (Shearing and Drawing operations).

Machining, Chip formation and generation of machined surfaces, Tool geometry, tool material, tool wear and practical machining operations (turning, milling and drilling), Grinding processes, Finishing processes; Introduction to unconventional machining processes (EDM, ECM, UCM, CHM, LBM) etc.

Welding & Other Joining Processes, Fundamentals of welding & classification of welding processes, Gas and arc welding, Brazing and soldering, Adhesive bonding, Mechanical fastening (e.g. riveting, metal stitching, crimping, etc.).

Manufacturing of Polymer and powder Products, Classification of polymers, Introduction to extrusion, injection molding, blow molding, compression and transfer molding , Green compacts from powders (metals and ceramics) including slip casting of ceramics, Sintering.

Material Handling: Principles and equipment, Conveyors, Robotics, etc.

Manufacturing Systems – Layouts, Assembly line planning, Line balancing.

Modern Trends in Manufacturing/ Novel Manufacturing Techniques, Programmable automation (FMS, CIM, etc.), Rapid prototyping, Semiconductor manufacturing.

Text book: Serope, Kalpakjian, Manufacturing Engineering and Technology, PHI / Pearson, 2005.

MN 202 Manufacturing Processes Workshop [0-0-3-2] **Prerequisites: #**

Welding and related processes: Introduction; Weldability; Types of welding; Heat affected zone; Gas welding: Oxyacetylene welding; Gas flame; Welding equipments; Arc welding; Arc welding equipments; Soldering; Brazing

Bench work and Fitting: Introduction; Vices; Hammers; Chisels; Chipping; Files; Hacksaw; Marking tools; Drill; Reamer; Taps; Dies and Stocks

Measurement and inspection: Introduction; Standards of measurement; Classification of measuring instruments; Linear measurement (nonprecision); Linear measurement (precision); Comparators; Measuring machines; Angular measurement; Taper measurement; Surface measurement; Gauges.

Sheet metal work: Introduction; Metals used in sheet metal work; Sheet metal hand tools; Sheet metal operations; Sheet metal joints; Sheet metal allowance; Sheet metal working machines; Laying out a pattern.
Power Transmission: Drives: Belt, Rope, Chain; Gear: Spur, Helical, Worm and worm wheel, Rack and Pinion
Lathe: Size of lathe; Description and functions of various lathe parts; Thread cutting mechanism; Different operations: Turning, Taper turning, Chamfering, Thread cutting, Facing, Knurling, Drilling, Reaming, Boring, Parting off; Cutting speed; Feed; Depth of cut; Metal removal rate; Cutting time
Shaper: Parts; Shaper size; Cutting speed; Feed; Depth of cut; Machining time
Grinding: Surface grinder; Centreless grinder; Abrasives; Bonds and bonding processes; Glazing and loading in wheels; dressing
Milling: Types of milling machines; Principal parts; Work holding devices; Cutter holding devices; Elements of a plain milling cutter; Influence of tooth angles on cutter performance; Fundamentals of the milling processes; Cutting speed; Feed; Depth of cut; Machining time
Gear Cutting: Indexing and dividing head; Indexing methods: Simple indexing
Jigs and Fixture: Definition; Advantages

Text books:

1. Lab Manual
2. Hajra Choudhury Sk, Hajra Choudhury Ak, Roy, Nirjhar, Elements of Workshop Technology, Volume I, Indian Book Distributing Co. Calcutta, 1964.
3. Hajra Choudhury Sk, Bose Sk, Hajra Choudhury Ak, Elements of Workshop Technology, Volume II, Indian Book Distributing Co. Calcutta, 1964.

ME 201 Thermodynamics [3-1-0-4] ***Prerequisites: #***

Introduction to Thermodynamics, Systems, Properties, State of a system. Thermodynamic Equilibrium, Processes; Zeroth law of thermodynamics, Ideal Gas, Work and Heat Transfer, Principles of Energy Conversion, Energy Interactions, First Law, Energy Transport Mechanisms, Point and Path Function, Internal Energy.
First Law applied to various Processes; Constant Volume, Constant Pressure, Isothermal, Reversible- adiabatic, etc.; Applications of First Law to Flow and Non-flow Processes.
Second Law of Thermodynamics, Kelvin-Planck and Clausius statements; Carnot theorem; Available Energy, Entropy, Heat Engine, Heat Pump.
Applications: Gas Power Cycles, Otto, Diesel and Brayton; Vapour Power Cycles, Rankine Cycle, Power Plant Operation; Refrigeration Cycles.

Text Books:

1. Wylen, Van, Fundamentals of Thermodynamics, Fourth Edition, John Wiley & Sons 2005.
2. Nag, P. K., Engineering Thermodynamics, Second Edition, Tata McGraw Hill, 2003.

CS 201 Fundamentals of Computer Systems [3-1-0-4] ***Prerequisites: #***

Computer functionality, A personal computer system, Data representation and computer arithmetic, Boolean logic, combinational, sequential and Flip Flop circuits, CPU, 8086 processor, Memory organization, Primary memory, secondary memory, I/O, Operating System, System software and Application software, Examples, RISC and CISC Computers, A brief idea about parallel computing and networking,

Text Books:

1. Mano, M. Morris, Computer System Architecture, Third Edition, Prentice Hall of India, 2007.
2. Hamacher, Vranesic, Zaky, Computer Organization, Fifth Edition, Prentice Hall of India, 2002.

Reference Book: Mano, M. Morris, Digital Design, Third Edition, Pearson Education, 2002.

IT 205 IT Workshop III [0-0-3-2] ***Prerequisites: #***

Computer Graphics (6 Turns): To implement the ideas and concepts of Computer Graphics using OpenGL.

P-Spice(6 Turns) : Learning how to_design and simulate some basic and important electronic circuits.

Semester IV

DS 202 Engineering Design [3-1-0-4] ***Prerequisites: DS 101***

Introduction to Engineering Design: Importance of Design, Design Philosophy, History of Design, Theory of Colour, Design Paradigm, the Design Process, Good Design, Engineering Analysis, Design phases, Product and Process Cycle, Product Realization Process, Concurrent Engineering.
Need Identification and Problem Definition: Identifying customer needs, Benchmarking, Quality Function Deployment, Engineering Design Specification.
Concept Design: Creativity and Problem Solving, Functional requirements, Product Component Decomposition, Product Function Decomposition, Conceptual Decomposition, Generating Design Concepts, Evaluating alternative Concepts, Theory of Inventive Problem Solving, Axiomatic Design, Evaluation Methods, Decision Making.
Embodiment Design: Introduction, Product Architecture, Configuration Design, Parametric Design, Best Practices, Industrial Design, Human Factors Design, Design For X (DFX) – Function, Assembly, Manufacture, Environment, Robustness, Reliability, Recyclability, etc., Computer Aided Design, Computer Aided Engineering, Computer Visualization.
Materials Selection: Performance Characteristics of Materials, the Material Selection Process, Economics of Materials, Material Selection Methods.
Selection of Manufacturing Processes: Manufacturing Processes, Costs of Manufacturing, Process Selection.
Building and Testing Prototypes: Building Traditional Prototypes, Building Rapid Prototypes, Testing Prototypes.
Design for Failure, Safety and Tolerance - Failure Modes and Effects Analysis, Design for Safety, Tolerance Design.
Human Factors / Ergonomics - Sensory input limitations – Sight, Hearing, Touch, Kinesthetic, Vestibular, Human Decision Making Limitations, Physical Size Limitations, Workspace Consideration.
Detail Design - Making Detail Design Decisions, Detail Drawings, Bill of Materials, Communicating Design and manufacturing Information, Product Data Management, Final Design Review.

Textbook: None, Notes to be provided.
Reference Books:

1. Dieter, George E. and Schmidt, Linda C., Engineering Design, Fourth Edition, McGraw Hill, 2008.
2. Eggert, Rudolph J., Engineering Design, First Edition, Prentice Hall, 2005, ISBN-10: 013143358X | ISBN-13: 9780131433588.
3. Hyman, Barry, Fundamentals of Engineering Design, Second Edition, Prentice Hall of India, 2003, ISBN-10: 013046712X | ISBN-13: 9780130467126.
4. Pahl, G, and Beitz, W, Engineering Design, Springer, 1996.
5. Ulrich, Karl T. and Eppinger, Steven D., Product Design and Development, McGraw-Hill, 2008.
6. Lindbeck ,R.J,Product Design & Manufacture, Prentice Hall of India, 1994.
7. Ullman, D. G., The Mechanical Design Process, McGraw Hill, 1997.
8. Samuel, Andrew and John, Weir, Introduction to Engineering Design, Second Edition, Butterworth-Heinemann, 1999, ISBN-10: 0750642823.

ES 206 Mechanical Drives and Devices [2-0-2-4] ***Prerequisites: #***

Strength of Materials: Simple stress and strain; Hooke's law; Composite bars, stress due to own weight and temperature; plane stress and strains, shearing force and bending moments, torsion of circular shafts, springs – closed coil and open coil springs, leaf springs, flat spiral springs and composite springs

Vehicle Engineering: Clutch: single plate, multi plate, cone clutch, semi centrifugal, electromagnetic, vacuum and hydraulic clutches. Gears: type of gears, applications and basic dimensions. Belt & chain drives – types, power transmitted. Gear trains: velocity ratio, mechanical advantage, sliding mesh, constant mesh, synchromesh and epicyclic gear trains. Automatic transmission system, universal joints, propeller shaft, differential. Steering system: steering linkages, steering mechanism, under and over steering. Steering Geometry, effect of camber, caster, king pin inclination, toe in and toe out, power steering. Brakes: types and function, mechanical, hydraulic, vacuum, air and power brakes, brake shoes and lining materials. Dynamometer: basic theory, types – Rope brake, Poney brake, Epicyclic power transmission, fluid – Tesla.

Internal Combustion Engines: IC engine parts and their functions, 4-stroke engine basics, mechanical cycle working, CI vs SI engines, 2-stroke engine, working through mechanical cycle, Petrol vs Diesel as fuels of ICE. Composition, CV, impact on environment, alternate fuel, compression ratio, Fuel injection system: evolution, spark plug, ignition system, Advanced fuel injection system like MPFI, etc.

HVAC: Working principle, purpose of refrigeration and air conditioning. Refrigerator Parts and their working. Air conditioning system, basics, types. Window unit, split unit, chilled water unit, cooling tower unit.

Textbook: Beer and Johnston, Mechanics of Materials, Fifth Edition, McGraw Hill, 2008.

Mechanical Drives and Devices Lab

1. To study four stroke MPFI petrol engine and to measure power of the engine using Hydraulic Dynamometer.
2. To study power transmission system in automobile/machine tools - Constant, Synchromesh and Sliding mesh gear box.
3. To study working of IC engines.
   The aim of this experiment is to study working of the following IC engines using working models: Four and Two stroke SI and CI engines.
4. To determine B.H.P. and break thermal efficiency of a four stroke four cylinder diesel engine.
5. To study various types of clutches and perform dismantling and assembly of a transmission clutch.
6. To study various types of disc/drum brakes, and perform assembling and dismantling of a given disc/drum brakes.
7. Study of vapour compression refrigeration system and calculation of COP.
8. Study on advanced fuel injection and spark ignition system.
9. To dismantle and assemble a bicycle.
10. To study steering system of an automobile.
11. To perform Compression and Shear test using precision testing machine of universal type.
12. a) To determine mass moment of inertia of unsymmetrical masses using trifilar suspension method

b) To determine mass moment of inertia of a flywheel and calculate flywheel effect GD^2.

ES 209 Signals, Systems and Networks [3-1-0-4] ***Prerequisites:#***

Continuous and discrete time signals; Fourier series, Fourier, Laplace and Z transform techniques; DFT. Sampling Theorem. **LTI systems:** I/O description, impulse response and system functions, pole/ zero plots, FIR and IIR systems. Analog and digital filters. **Networks:** topological description, network theorems, two port analysis.

Text Book: Oppenheim, Alan V., Willsky, Alan S., Signals and Systems, Prentice Hall Signal Processing Series, Second Edition, 2007.

HS 203 Arts and Aesthetics [2-0-2-4] ***Prerequisites: #***

Traditional Art, Modern Art, Art and Perception, Style, Style in Painting, Colour, Space Illusion, Space in Painting, Space in Sculpture, Style in Sculpture, Space in Architecture, Style in Architecture, Printmaking, Comic Art A POP Culture, Photography and Film, Methodology of Art Criticism and Appreciation.
Studio Assignments: to familiarize students with various 2-D & 3-D media works.

Textbook: None, Notes to be provided.
Reference Books:

1. Read, Sir Harbert, A Concise History of Modern Painting, Thames & Hudson, London, 1988.
2. Colligwood, R. G., The Principles of Art, Delhi: Oxford University Press, 1958 (paperback).
3. Chilvers, Ian, A Dictionary of Twentieth-Century Art, Oxford University, New York Press, 1998.

ME 202 Solid Mechanics [3-0-0-4] ***Prerequisites: #***

Introduction: Free body diagram revisited, Notion of stress and strain, Mechanical properties, Deformation of axial members, Compatibility, Statically indeterminate problems, Design considerations, Thermal effects, Strain energy, Dynamic loads.
Stress: Stress at a point – matrix of stress / stress tensor, Equilibrium of a body – differential equations of equilibrium, Different states of stress – uniaxial, biaxial, plane stress, etc., Transformation of plane stress; Principal stresses and maximum shear stress, Mohr's circle
Strain: Strain at a point – matrix of strain / strain tensor, Different states of strain – uniaxial, plane strain, etc., Transformation of plane strain; Principal strains, Mohr's circle for plane strain
Mechanical properties: Generalized Hooke's law, Eastic modulus, bulk modulus, Relationship between different elastic constants
Bending: Relation between transverse loads, shear and bending moments, Shear and bending moment diagrams, Pure bending – beams with symmetric cross-sections, Beams with composite cross-section, Shear stresses in beams, Deflections in beams: Double Integration method, method of superposition, introduction to area moment method.
Torsion: Torsional moment diagrams, Torsion formula for circular cross-sections, Maximum normal and shear stresses, Angle of twist.
Elastic stability: Notion of stability of equilibrium, Euler buckling, Members with eccentric loading, Initially imperfect columns, Beam-columns.

Text Book: Beer and Johnston, Mechanics of Materials, Fifth Edition, McGraw Hill, 2008.
Reference Books:

1. Popov, E. R., Engineering Mechanics of Solid, Pearson Education,1999.

2. Shames and Pitarresi, Introduction to Solid Mechanics, Third Edition, Prentice Hall of India, 1999.

CS 202 Principles of Operating Systems [3-0-0-4] ***Prerequisites: #***

Operating systems for mainframe and desktops: A Historical Overview, Batch OS, Multiprogramming OS, Time sharing OS, Multiprocessor and Distributed systems, Clustered systems, Real Time Systems.
Operating system structure: OS services, system calls, System programs, System structure, Virtual machines.
Process Management: Process concept, Process scheduling, Operations on processes, Threads.
CPU Scheduling: Scheduling Criteria, Scheduling algorithms, Multiprocessor scheduling, Real time scheduling, Thread scheduling.
Inter process communication: Cooperating processes, The Critical Section problem, Two tasks solutions, Semaphores, Classical synchronization.
Deadlocks: Characterization, Methods for handling deadlocks, Prevention, avoidance and detection, Recovery.
Memory management: Background, swapping, Contiguous memory allocation, Paging and segmentation, Virtual memory, Demand paging, Page replacement, thrashing.
File system management: File concept, Access method, Directory structure, File System mounting, File sharing, Allocation methods, Protection.
Mass storage structure and management: Disk structure, Disk scheduling and management, Swap space management, RAID structure.
Protection and Security: Goals, Domain of protection, Access matrix, Capability based systems, Security problems, User authentication, Program threats and system threats

Text Book: Silberschatz, A, Galvin, B. P., Gagne, G., Operating System Concepts with Java, Sixth Edition, John Wiley & Sons Inc., 2004.

ME 203 Kinematics & Dynamics of Mechanical Systems [3-1-0-4] ***Prerequisites: NS102***

Kinematics: Kinematic pair, diagrams and inversion. Displacement, velocity and acceleration of planar linkages. Dimensional synthesis for motion, path and function generation. **Dynamics:** Cam profile synthesis. Gears, Dynamic force analysis, flywheel, inertia forces and balancing of rotating and reciprocating machines.

Text Books:

1. Ghosh & Mallick, Theory of Mechanisms & Machines, Third Edition, EWP.
2. Rattan, S.S., Theory of Machines, Second Edition, Tata McGrawHill, 2007.

Reference Books:

1. Norton, Design of Machinery, Pearson Education, 2007.
2. Bevan, Thomas, Theory of Machines, Third Edition, CBS, 1959.

EC 201 Digital Electronics & Microprocessor Technology [3-1-0-4] ***Prerequisites: #***

Analysis of digital logic families: TTL, MOS, CMOS Inverters, Interfacing between logic and families; various logic functions and their implementation; Bistable circuits: R-S, J-K, D and PLA; Design of synchronous sequential circuits. Microprocessor based systems: Number systems, Arithmetic operations in integer and floating-point numbers. ASCII code; General micro-processor organization, Memory interfacing, Assembly language and bus signals of 8086 processor; Interrupts and their applications; Serial and Parallel Ports; DMA and its controller, 8253 Timer; 8259 interrupt controller.

Text Books:

1. Roth, C. H., Fundamentals of Logic Design, Fourth Edition, 2006.
2. Hall, D. V., Microprocessor System Design-Hardware, Programming, and Interfacing, McGraw Hill, 2006.

IT 206 IT Workshop III [0-0-3-2] ***Prerequisites: #***

LabVIEW (4 turns): Front Panels, Block Diagrams, Tools palettes, Loops and Charts, Arrays and File I/O, Waveform Graphs, Virtual Instrument, Data Acquisition.

MAYA (4 Turns): Maya Fundamentals, Maya Animation and Character Animation, Maya Rendering & Paint Effects, Dependency graph.

PCB Design Tool (4 turns): (For CSE and ECE Students only)
ADAMS (4 turns): (For ME Students only)

Semester V

ES 310 Sensing: Methods, Devices and Applications [2-0-3-4] ***Prerequisites: NS 104***

Introduction to transduction principle and classification of various sensors/transducers. Active and passive transducers. Introduction to mechanical transducers, electrical transducers: resistive potentiometer, strain gauges, inductive transducers, capacitive transducers and pezioelectric transducers. Introduction to position, velocity and acceleration sensors; force, torque, strain, pressure sensors; flow rate sensors, humidity sensors and their industrial applications, Introduction to thermal sensors, magnetic sensors, radiation sensors and their industrial applications.

Text Books:

1. Dunn, William C., Introduction to Instrumentation, Sensors, and Process Control, Second Edition, Artech House., Inc., ISBN: 1-58053-011-7, 2006.
2. Patranabis, D, Sensors and Transducers, Prentice Hall of India, New Delhi.ISBN:-978-81-203-2198-4, 2008.

MS301 Management: Concepts & Techniques [3-0-0-4] ***Prerequisites: #***

Foundations of business: Business and economics, global business, entrepreneurship and business start-ups, social responsibility and ethics.
Managing business: Management and leadership, organizational design and team work, Managing production and operations.
Human resources practices: Human relations and motivation, Managing human resources
Marketing management: Marketing strategy, Product, pricing and promotion strategies, Distribution and supply chain management.
Managing information: Managing information technology, Accounting practices and principles.
Managing Financial Resources: Financial management, Investments and securities, Financial institutions, Financial planning and control

Text Books:

1. Prasanna, Chandra, Financial Management Theory & Practice, Sixth Edition,TataMcGraw Hills,1989.
2. Everett, Adam E., Production & Operations Management Concepts Models, Fifth Edition Prentice Hall of India,1989.
3. Heinz, Weihrich; Koontz, Harold, Management A Global Perspective, Eleventh Edition Tata McGraw Hills, 2004 .
4. Kotler, Philip, Marketing Management, Pearson India, Twelfth Edition, 2008.

Reference Books:

1. Pandey, I. M., Financial Management, Ninth Edition, Vikas Publishing, 1999.
2. Buffa, E. S., Modern Production Operations Management, Eighth Edition, John Wiley & Sons, New York, 1987.
3. Monks, Joseph G, Operations Management, Second Edition, Tata McGraw Hills, 1996.
4. Stoner, James A F; Freeman, R Edward, Management, Sixth Edition, Prentice Hall of India, 1992.
5. Prasad, L. M., Principles & Practice of Management, Sultan Chand & Sons, New Delhi.
6. Hisrich, Rober D; Peters,Michael P; Shepherd, Dean A, Entrepreneurship, Sixth Edition, Tata McGraw Hills, 2004.

ME 304 Fluid Mechanics & Heat Transfer [3-1-0-4] ***Prerequisites: #***

Fundamental concepts: Continuum models, characteristics of fluids. Fluid Statics, hydrostatic pressure, forces on submerged surfaces. Integral Analysis, Fundamental laws, systems and control volumes, conservation of mass, momentum equation and the first law of thermodynamics.
Differential Analysis of fluid flow: Flow Kinematics, Types of flow, Flow field, velocity, acceleration, stream function, vorticity. Incompressible inviscid flow, Euler's and Bernoulli's equation. Dimensional analysis and similitude. Flow in conduits and pipes – Incompressible viscous flow, fully developed flow in pipes, head loss, major and minor losses, Flow measurement, pipeline networks. Boundary layers and flow over objects. Introduction to Compressible Flow - speed of sound, stagnation properties. Steady state-one-dimensional compressible flow - basic equations for isentropic flow, adiabatic flow with friction.
Heat Transfer: Introduction, Conduction: Fourier's Law, One dimensional heat transfer with and without heat generation, Transient conduction, Through Composite walls.
Extended Surfaces: Heat transfer from finned surfaces, Fin Efficiency, Effectiveness. Convection: Free and forced convection, Flow and thermal boundary layer eqations, laminar flow through circular pipe, constant heat flux and constant wall temperature conditions, Overall heat transfer coefficient. Heat exchangers.
Thermal Radiation: Radiation properties, Plank's Law, Kirchoff's law, Heat exchange between two surfaces.

Textbooks:

1. White, Frank M., Fluid Mechanics, McGraw Hill, 2005
2. Fox and McDonald, Introduction to Fluid Mechanics, Wiley, 2008.
3. Incropera, F. P., and Dewitt D. P., Fundamentals of Heat and Mass Transfer, Wiley, 2006.

EC 302 Principles of Communications [3-1-0-4] ***Prerequisites: #***

Introduction to Communication Systems: Communication process, Primary communication resources. Communication network and channel. Difference between Analog and Digital type of signal and Communication. Digital communication problems. Analysis of signals and systems.
Introduction to Signals and Operations: Classification of Signals. Some Useful Functions and Operations.
Frequency Domain Analysis: Fourier Series, Fourier transform and its examples and properties. Examples of some useful functions. Sampling of band-limited signals and band-pass signals.
Classification of Systems, Impulse Response, and Transfer Function: Classification of filters and discussion of its mathematical expressions.
Random Process and Power Spectrum: Probability of Random variable. Random processes (basic concepts), transmission of a random process through a linear Time invariant system, Random process in frequency domain, energy and power spectral density functions, Gaussian and white process, correlation functions, narrow-band noise, band-limited process and sampling, band-pass process.
Analog signal Transmission and Reception: Modulation, Amplitude Modulation (Double-Sideband Modulation. Single-Sideband and Vestigial-Sideband Modulations. Implementation of AM Modulators and demodulators. Frequency/Phase Modulation. Signal multiplexing.)
Angle Modulation: Representation of FM and PM signals. Spectral characteristic of Angle Modulated signals. Implementation of Angle modulation and Demodulations. Narrowband

FM, wideband FM, average power in angle modulated waveforms, generation of wideband FM, Demodulation of FM signals.

Effect of Noise on Analog Communication Systems: Non-linear effect on FM systems, Super-heterodyne receiver, Noise in FM and FM receiver. Effect of noise on linear modulation systems (Base-band systems, DSB-SC AM, SSB Am, Conventional AM.). Career phase estimation with a PLL, Effect of additive noise on phase estimation. Effect of Noise on Angle modulation, Comparisons of Analog modulation systems. Effect of Transmission loss and Noise in Analog communication Systems.

Information Sources, Source Coding and Pulse Modulation: Modeling of Information Sources. Source coding Theorems (Huffman and Lempel-Ziv), Rate Distortion theory. Sampling and Quantization process. Waveform coding (PAM, PCM, DPCM, ADPCM, Delta Modulation), TDM, Digital Multiplexer.

Digital Transmission Through the Additive white Gaussian noise channel: Geometric Representation of Signal waveform, PAM, Two dimensional and multidimensional Waveforms, Optimal receiver for Digitally Modulated Signal in AWGN. Probability of Error for Signal detection in AWGN.

Digital Transmission Through Band-limited AWGN Channels: Digital Transmission Through band-limited channel, Power spectrum of Digitally Modulated Signal. Signal Design for Band limited channels. Probability of Error in detection of Digital PAM. Digitally modulated Signal with Memory.

Fundamental of Information Theory, Channel Capacity and Coding: Introduction, Information and Entropy, Source coding Theorem. Data Compaction, Discrete Memory less Channels, Mutual Information, Channel capacity, Channel Coding Theorem, Information Capacity Theorem, Rate Distortion Theorem, Data Compression. Bound on Communication, Linear Block Code, Cyclic Code, Convolution Code, Complex Code based on Combination of Simple Code, Coding for Band width constraint Channel. Application of Coding.

Text Books:

1. Proakis John G.; Salehi, Masoud., Communication Systems Engineering, Second Edition, 2001.
2. Haykin, S., Communication Systems, Fourth Edition, Wiley and Sons, 2005.
3. Lathi, B. P., Modern Digital and Analog Communication Systems, Third Edition, Oxford University Press, 2006.

CS 303 Object Oriented Design & Analysis [3-1-0-4] ***Prerequisites: #***

Objects and inheritance, Classes and objects, Classification, Polymorphism. Unified Modeling Language, (UML), Use case modeling, Methodologies for object-oriented analysis and design (OOAD), Class diagrams, State transition diagrams, Object diagrams, Interaction diagrams, Process diagrams, Method, Process (micro and macro development processes), Pragmatics. Design patterns, Introduction, Common design patterns. Structural and Behavioural patterns.

Text Books:

1. Booch, Grady, Object Oriented Analysis and Design with Applications, Pearson Education, 2006.
2. Blaha, M, and Rambaugh, James, Object Oriented Modelling and Design with UML, Prentince Hall of India, 2005.

ME 305 Design of Mechanical Components [3-0-0-4] ***Prerequisites: ME201, ME202***

Introduction, Design of Cotter and Knuckle Joint, Design of Thick and Thin cylinders, Design of Shafts, Keys and Coupling, Design of Bolted and Welded Joints, Design of Springs, Selection of Bearings, Design and Selection of Gears and Belts, Design of Clutches and Brakes, Design for variable loading.

Text Books:

1. Shigley, J., Mechanical Engineering Design, Sixth Edition, Tata McGraw Hill, 2003.
2. Bhandari, V., Design of Machine Elements, Second Edition, Tata Mc- Graw Hill, 2007.
3. Design Data Book, PSG College of Technology, Coimbatore.

Reference Book: Juvinall, R. C. and Marshek, K.M., Fundamentals of Machine Component Design, Wiley, 2005.

EC 303 Fundamental of Electromagnetic Theory [3-0-0-4] ***Prerequisite: NS102***

Review of fundamental concepts and definitions (including a rehash of circuit theory), Transmission Line Theory, Electromagnetics and Maxwell's Equations, Boundary Conditions, Wave Equation, Uniform and Non-Uniform Plane Waves, Analysis of Coaxial Line, Analysis of Rectangular Waveguide, Analysis of Circular Waveguide, Resonators, Microwave Integrated Circuits (MICs), Coupled Transmission Lines, Radiation fundamentals, Antenna performance parameters and their definitions, Propagation of radio waves (basics only)

Text Books:

1. Jordan, Edward C. and Balmain, K. G., Electromagnetic Waves and Radiating Systems, Prentice Hall of India, 2003.
2. Raju, G S N., Electromagnetic Field Theory and Transmission Lines, Pearson Education, 2005.
3. Sadiku, Matthew N. O., Elements of Electromagnetics, Oxford University Press, 2001.
4. Pozar, David M., Microwave Engineering, John Wiley, 2003.

CS 304 Design and Analysis of Algorithms [3-0-0-4] ***Prerequisite: #***

Review of basic concepts; Worst case and average case analysis: big oh; small oh, omega and theta notations

Advanced Data Structures: Search Trees: TRIE; B+ Trees, Binomial Trees, Red-Black trees

Paradigms of Algorithms with suitable examples: divide and conquer; greedy paradigm; dynamic programming; backtracking; branch and bound; Examples can be taken from sorting, searching, selection, graph theory

String processing algorithms, algebraic algorithms

Lower Bound Theory: Maximum finding, Minimum & Maximum Finding, Sorting

Hard problems and approximation algorithms: Problem classes P, NP, NP-hard and NP-complete, deterministic and nondeterministic polynomial-time algorithms. Approximation algorithms for some NP-complete problems

Text Books:

1. Cormen, Lieserson, Rivest, Stein, Introduction to algorithms, Second Edition, Prentice Hall of India, 2005.
2. Rajsekharan, Sahni, Horowitz, Fundamentals of Computer Algorithms, Galgotia Publishers, 2001.

ME305 Professional Lab I (ME) [0-0-3-2] ***Prerequisite: ME 201, ME 202, ME 203***

1. a) To perform bending test on steel bar and determine bending stress of the beam using strain gauges.
   b) To determine the Brinell Hardness and Rockwell Hardness number for the given specimen.
2. To determine the energy absorbed by the given specimen by Izod Impact Test and Charpy Impact Test.
3. To determine fatigue strength of given specimen.
4. To determine Coriolli's Component of Acceleration at various speeds of rotation.
5. To fabricate circuit for strain gauge, mount the strain gauge and measure torque on a rotating shaft.
6. To measure epicyclic gear ratio between input shaft and output shaft (Actual and Theoretical) and to measure input torque, holding torque and output torque for epicyclic gear train.
7. To perform static and dynamic Balancing
8. To verify the relation T=I.W.Wp. for gyroscope and stability of vehicles.
9. To perform the whirling of a shaft.
10. To conduct load test on four stroke-four cylinder diesel engine.
11. To find out the corrected performances parameters (compression ratio, valve timing, etc) on petrol engine and to plot the heat balance sheet.
12. To perform Torsion test of a circular shaft

EC301 Professional Lab I (ECE) [0-0-3-2] **Prerequisite: #**

Sensors based lab experiments using LabVIEW:

1. Displacement Measurement Using LVDT.
2. Displacement Measurement Using Strain Gauge.
3. Measurement of Load by Strain Gauge based Load Cell.
4. Measurement of Water Level Using Strain Gauge.
5. Measurement of Flow Rate by Anemometer.
6. Measurement of Temperature by RTD
7. Measurement of Temperature using Thermocouple.
8. Displacement or Position Measurement using Ultrasonic Sensor.

Mechatronics based lab experiments using LabVIEW:

1. Servo controller interfacing for open & closed loop.
2. PID controller interfacing.
3. Modeling and analysis of basic Electrical, Hydraulic and Pneumatic systems using LABVIEW
4. Computerized Data Logging system with Control for Process variables like Temperature.
5. Study of P/PI/PID Controllers.
6. Study of Spectrum Analyzer.
7. To study Bourdon tube, Bellows Diaphragms, Pressure Switches.
8. Study of Strain gauge.

Biomedical based lab experiments and projects using LabVIEW:

1. Physiological Signal Acquisition Using NI-DAQmx.
2. Analysis of Biopotential Signal Using LabVIEW. (Fast Fourier Transform (FFT) & Digital Filtering Analysis)
3. Filtering the Noise from Physiological Signal Using Low-Pass and High-Pass Filters.

4. Amplification of Physiological signal using Instrumentation Amplifier
5. Amplifiers For Signal Conditioning Of Physiological Signals Chopper Stabilized Amplifiers
6. Heart Sound Study by Electronic –stethoscope.
7. Pulse and ECG Measurement.

CS305 Professional Lab I (CSE) [0-0-3-2] ***Prerequisite: IT101***

Object Oriented Programming and Java Technology

Course Objective and Contents: To provide basic knowledge of Object-Oriented Concepts, the Java programming language, and general knowledge of Java Platforms and Technologies. A brief introduction to UML representation of OO concepts will also be given.

Part 1: Object-Oriented Concepts

1) Implementation of the concept of classes, interfaces, and how inheritance applies to them.
    a. Develop code that uses primitives, enumeration types, and object references, and recognize literals of these types.
    b. Develop code that declares concrete classes, abstract classes, and interfaces
    c. Develop code that supports implementation and interface inheritance, code that declares instance attributes and methods, and code that uses the Java access modifiers: private and public.
2) Implementation of the concept of class compositions, and associations (including multiplicity: (one-to-one, one-to-many, and many-to-many), and association navigation.
    a. To develop code implementing simple class associations, code that implements multiplicity using arrays,
    b. Develop code that implements compositions as opposed to simple associations, and codes that correctly implement association navigation.
    c. To develop code that uses polymorphism for both classes and interfaces, and recognize code that uses the "program to an interface" principle.
3) Programs using the concept of information hiding (using private attributes and methods), encapsulation, and exposing object functionality using public methods;
4) JavaBeans conventions for setter and getter methods.
5) Programs implementing polymorphism as it applies to classes and interfaces.

Part 2: Java Development Fundamentals and Java Platforms

1) Packages in the Java language and the use of import and package statements.
2) Use of the "javac" command (including the command-line options: -d and –classpath), and the use of the "java" command (including the command-line options: -classpath, -D and –version).
3) Java packages: java.awt, javax.swing, their purpose and usage.
4) Java packages: Java.io, java.net, java.util, their purpose and usage.
5) Basic characteristics of the three Java platforms: J2SE, J2ME, and J2EE, selection of appropriate Java platform or platforms depending of a high-level architectural goal.

DS 303 PROJECT I – Design Project [0-0-6-4] ***Prerequisites: DS 202***

The course DS 303 Project – I Design Project is meant to nurture creativity, innovation and ideas. Design Project will primarily include working on detailed design process including need identification and problem definition, concept design, embodiment design and detailed designing of the product with the end output at functional model.

The course expects the students to observe the innovate idea, simple solution of the problem, a detail list of plan of execution (alternative method in case of the failure of the primary methodology), a detail plan of execution step by step. The submitted project must be a functional proto-type model/scale model.

Semester VI

ES311 Control Systems: Theory, Software and Hardware [2-0-0-2]
Prerequisite:ES101, ES209

Basic Concepts and System Representation: Terminology and basic structure-feedback control theory-multivariable systems – dynamic models-state variable models-impulse response models and transfer function models-application to mechanical, thermal, hydraulic, pneumatic and electromechanical systems – block diagram representation and signal flow graphs-control system components.
Time Response Analysis and Design: I and II order systems-performance specifications-feedback analysis-P, PI, PID controllers design-effect of pole, zero addition-desired closed loop pole location-root locus plot and applications-steady state and dynamic error coefficients-robust control.
Frequency Response Analysis and Design: Performance specifications-correlation to time domain specifications-bode plots and polar plots-gain and phase margin-constant M and N circles and Nichols chart-all pass and non-minimum phase systems.
Stability: BIBO stability – Routh-Hurwitz criterion – stability ranges for a parameter – Nyquist stability criterion – relative stability assessment using Routh and Nyquist criterion and bode plots.

Text Books: Nagrath, I. J. and Gopal, M., Control Systems Engineering, 2007.
Reference Books:
1. Gopal, M., Control Systems - Principles & Design, 2006.
2. Elgerd, Olle I., Control Systems Theory, 1967.
3. Ogata, K., State Space Analysis of Control Systems, 1967.
4. Popov, E.P., The Dynamics of Automatic Control Systems, 1967.
5. Kuo, Benjamin C., Automatic Control Systems, 2009.

ES 312 Mechatronics & Robotics [3-0-2-4] ***Prerequisites: #***

Introduction: Definition of Mechatronics, Mechatronics in design and manufacturing. Comparison between Traditional and Mechatronics approach. Integration of electronics, controls and information technology with mechanical engineering.
Sensors and Actuators for Mechanical Systems: Basic principles, characteristics and selection issues for data conversion devices, sensors, transducers, actuators used in mechatronic systems. Microprocessors and controllers. Drives: Stepper motors, DC/AC servos, solenoids, Mechanical, hydraulic and pneumatic actuators. Piezoelectric sensors and actuators, Shape memory alloys. Design and fabrication of Mechatronics systems.
Signal Processing: Integration of actuators and sensors in digital systems, DSP controllers, embedded controllers, and fuzzy logic controllers.
Programmable Logic Controllers: Hardware components and Programming of PLCs. Applications.
Robotics: Fundamentals of robotics, definition and classification of ROBOTS and manipulators, motion and degrees of freedom, motion categories, uses, field of applications,
Robot Arm Kinematics: Direct and Inverse, Robot arm dynamics, Manipulator trajectories, control of robot manipulators. Introduction to sensing and vision in robotics.

Textbooks:

1. Bolton, W., Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, Pearson Education, 2007.
2. Groover, M P.; Weiss, M.; Nagel R. N., & Odrey, N. G., Industrial Robotics: Technology, Programming and Applications, McGraw Hill, 1986.
3. Schilling, R J., Fundamentals of Robotics: Analysis and Control, Prentice Hall of India, 2005.

Core Elective I: NS 311 Numerical Methods [3-0-0-4] ***Prerequisites :IT 101, IT 102***

Approximation and round off errors, interpolation by polynomials, the solution of nonlinear equations and iterative methods, systems of equations and unconstrained optimization, data fitting and least squares approximation. Backward, Forward and Central difference relations and their uses in Numerical differentiation and integration. Numerical solution of differential equations by Euler, Modified Euler, Runge-Kutta and Predictor-Corrector methods. Stability of numerical methods.

Text Books:

1. Conte, Samuel Daniel.& Boor, Carl de, Elementary Numerical Analysis: An Algorithmic Approach, Third Edition, McGraw Hill, New York, 1980.
2. Householder, A. S., Principles of Numerical Analysis, Dover Publications, 2006.

Core Elective I: NS 312 Probability Theory & Statistics [3-0-0-4] ***Prerequisites: #***

Mathematical Statistics & Probability: Sample space and events, The axioms of probability, conditional probability, Bayes' probability, Elementary theorems of probability, Random variables, Generating functions, Mode of convergence, Important distributions (discrete and continuous) and their characteristics, Central Limit Theorem, Law of Large Numbers.
Statistical Inference: Introduction of sampling, Sampling distributions of mean and variance, Point and interval estimation, Simple and composite hypothesis, NP-Lemma, Tests of mean and variance, Relation between tests and Confidence Interval, P-value, Goodness of fit test.

Text Books:

1. Miller and Freund, Probability and Statistics for Engineers, 2007.
2. Hogg and Craig, Introduction to Mathematical Statistics, 2004.

Core Elective I: EC611 Image Processing [3-0-0-4] ***Prerequisites: NS102***

Human visual system and image perception, colour vision, colour representation; image sampling & quantization; 2-D systems; image transforms; image coding; statistical models for image representation; image enhancement, restoration & reconstruction. Image analysis using multiresolution techniques, Stereo imaging like camera model, Image compression, segmentation, reconstruction from projections, morphology and some descriptors.

Text Books:

1. Gonzalez and Woods, Digital Image Processing, Prentice Hall of India, 2008.
2. Jain, A. K., Fundamentals of Digital Iimage Processing, Prentice Hall, 1989.

ME 307 Computer Aided Design [3–0–0–4] ***Prerequisites: DS 202***

Overview of Transformations, Projections, Curves, Surfaces and Solids.
Differential Geometry applied to Curve and Surface Design.
Curves: Non uniform B-Spline (NUB) Curve Models, Rational Curves, Non Uniform Rational B-spline (NURB), Properties of Bezier curves. Manipulation of Curves.
Surfaces: Quadric Surfaces, Blending, Sculptured, Coons patches, Rational Parametric, NUB, NURB, Polygonal and Quadric Representation of Surfaces. Curves on Surfaces, Surface with Irregular Boundaries, Manipulation of Surfaces.
Analytical and Relational Properties of Curves and Surfaces; Curves and Surfaces in Solids; Plane, Curve, Surface Intersections. Evaluation of some methods of Geometric Modeling.
Solid Modeling Fundamentals: Mathematical Models of Solids, Constructive Solid Geometry, Boundary Representation, Non-Manifold Geometry, Global Properties of Solid Model.
Geometric Modeling using Point Clouds.
CAD/CAM Data Exchange. Shape Grammar and the generation of the designs.

Text Book: Mortenson, Michael E., Geometric Modeling, Third Edition, Industrial Press Inc., 2006.
Reference Books:

1. Zeid, Ibraheim, CAD/CAM: Theory and Practice, Revised First Edition, Tata McGraw Hill, 2007.
2. Faux, I. D. and Pratt, M. J., Computation Geometry for Design and Manufacture, John Wiley (Ellis Horwood Ltd.), 1983.
3. Choi, B. K., Surface Modeling for CAD/CAM, Elsevier.
4. Farin, Gerald, Curves and Surfaces for Computer Aided Geometric Design – A Practical Guide, Academic Press Inc.1991.
5. Lee, Kunwoo, Principles of CAD/CAM/CAE Systems, Addison Wesley, 1999.
6. Yamaguchi, Curves and Surfaces in Computer Aided Geometric Design, Springer, 1988.
7. Ryan, D. L., Computer-Aided Graphics and Design, Marcel Dekker Inc., 1994.

EC 305 Digital Signal Processing [3–0–0–4] ***Prerequisites: DS 202***

Characterization and classification of signals, Time domain representations of signals and systems, Linear time invariant discrete time systems, Characterization of LTI systems, Transform domain representation of signals and systems, Discrete time Fourier transform, z-transform, Region of convergence of z-transform, Structures for discrete time systems, Block diagram and signal flow representation of constant coefficient linear difference equation, Basic structures for IIR systems, Basic structures for FIR systems, Lattice structures, Effects of coefficient quantization, Effect of round off noise in digital filters, Filter design techniques, Design of discrete time IIR filters from continuous time filters, Design of FIR filters by windowing, Optimum approximation of FIR filters, Linear phase filters, Sampling of continuous time signals, Periodic sampling, Frequency domain representation of sampling, Reconstruction of bandlimited signal from its samples, Discrete time processing of continuous time signals, Continuous time processing of discrete time signals, Changing the sampling rate using discrete time processing, Some recent developments.

Text Book: Oppenheim, A. V.; Schafer, R W. and Buck, J. R., Discrete-Time Signal Processing, Pearson Education, 2003.
Reference Books:

1. Proakis, J. G. and Manolakis, D. G., Digital Signal Processing: Principles, Algorithms and Applications, Pearson Education, 2004.
2. Proakis, J G. and Ingle, V. K., Digital Signal Processing: A MATLAB based approach, Cengage Learning, 2009.

CS 306 Language Theory [3-0-0-4] ***Prerequisites: #***

Introduction of Automata, Computability, and Complexity; Mathematical notations and terminology; Finding proofs and types of proofs.
Finite Automata and regular languages: Formal definitions, Designing finite automata, Deterministic finite automata, Non-deterministic finite automata, Equivalence of NFAs and DFAs, finite automata with ε-transition; regular expressions and languages, Properties of Regular languages, conversion of RE to FA and vice versa.
Pumping Lemma.
Push down Automata and Context free languages: Context free grammars, Designing context free grammar, Ambiguity in CFG and its removal, Chomsky normal form
Push down Automata: formal definition, graphical notations, Languages accepted by PDA, Equivalence of PDA and CFG, Non-context free languages, Pumping Lemma for CFGs.
Turing Machines and Computability: Formal definition of Turing machines with examples, Graphical notations, Variants of Turing machines, Church-Turing thesis, Hilbert's problem.
Decidability, undecidability and reducibility: Decidable languages; Decidable problems concerning regular languages and context free languages, The halting problem, Post correspondence problems, Undecidable problems, Mapping reducibility, Decidability of logical theories, Turing reducibility.
Computational Complexity & NP-Completeness: The class P, The class NP, Reductions, The class NP-Complete, Dealing with NP-Completeness.

Text Book: Hopcroft, John E.; Motwani, Rajeev & Ullman, Jeffrey D., Introduction to Automata Theory, Languages, and Computation, Third Edition, Pearson Education Inc., New Delhi, 2007.
Reference Book: Sipser, Michael, Introduction to the Theory of Computation, Second Edition, Cengage Learning India Pvt. Ltd., New Delhi, 2007.

ME 308 Energy Conversion Devices [3-0-0-4] ***Prerequisites: ME201, ME304***

General outline of energy conversion devices.
Hydraulic machines: Pumps and Turbines.
Steam Turbines: Basics and analysis.
Gas Turbines: Basics and analysis.
Non-conventional systems: Renewable energy – sources and features, Hybrid energy systems, Distributed energy systems and dispersed generation, Micro Hydel, Bio mass, Fuel Cell.

Text Books:

1. Yahya, S. M., Turbines, Compressors and Fans, Tata McGraw Hill, 2005.
2. Rao Govinda, N. S., Fluid Flow Machines Energy Conversion, Tata McGraw Hill.
3. Decher, R., Systems, Flow Physics, and Engineering, Oxford University Press, NY, 1994.

EC 306 Microprocessor and Interfacing [3-1-0-4] ***Prerequisites: #***

Basic concepts of Microprocessors and assembly language programming; 8085 **Microprocessor Architecture:** ALU, Registers, Timing & Control unit, Data & Address Buses, Memory and IO Devices; 8085 Microprocessor Pin Configuration.
Microprocessor Operation: Fetching and Executing instructions, Machine Cycles and Bus Timing.
Programming the 8085: Introduction to 8085 Instruction Set, writing and debugging assembly language program, Data Transfer, Arithmetic Operations, Logic Operations, Looping, Indexing, Counters and Time delays, Stack and Subroutines; Assemblers.
Interfacing to a Microprocessor: Interrupts, Data Converters, Programmable Interface Devices (8155, 8279), Programmable Peripheral Devices and Timers, DMA Controller.
Introduction to 16-bit microprocessor 8086 family and its internal architecture, 8086 instruction set and assembly language programming, Assemblers Directives. 8086 interrupts and 8259A interrupt controller.
Introduction to 80286, 80386 and Pentium processors. Introduction to 8-bit 8051 microcontroller.

Texts Books:

1. Gaonkar, Ramesh S., Microprocessor Architecture, Programming, and Applications with the 8085, Penram International Publishing (I) Pvt. Ltd, 2002.
2. Hall Douglas V., Microprocessor and Interfacing, Tata McGraw Hill, 2006.

References Books:

1. Ray A. K., Bhuvchandi K.M., Advance Microprocessor and Peripheral, Tata McGraw Hill, 2003.
2. Brey, Barry B, Intel Microprocessor, 8086/8088/80186/80188, 80286, 80386, 80486, Pentium Pro Processor, Architecture Programming, Prentice Hall India, 2002.
3. Ram, B., Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai & Sons, Delhi, 1988.
4. Gibson G.A., Liu Y.C., Microcomputer System: The 8086/8088 Family, Prentice Hall India Pvt. Ltd, 1984.

CS 307 Database Design and Management [3-0-0-4] ***Prerequisites: ES102***

Evolution of Database Management Systems; Database System architecture; Entity Relationship Modeling and Design; Data Models: Relational, Hierarchical, Network; Relational Model: Algebra, Calculus, Normal Forms; Structured Query Language; Transaction Processing: Concurrency Control and Recovery; Database Security and Authorization; Introduction to Client Server and Distributed databases.

Text Book: Elmaseri; Navathe, Fundamental of Database Systems, Fourth Edition, Pearson, 2007.

Reference Books:

1. Date; Kannan; Swamynathan, An Introduction to Database Systems, Eighth Edition, Pearson Education, 2007.
2. Silberschatz; Korth; Sudarshan, Database System Concepts, McGraw Hill, 2005.

ME 309 Professional Lab II (ME) [0-0-3-2] ***Prerequisite: ME304***

1. Flow Measurement using Venturimeter and Orificemeter.
2. Flow Measurement using Orifice fitted in a tank.
3. Verification of Bernoulli's Principle.

4. To determine Major and minor losses in a flow through Pipe.
5. To plot pressure distribution curves on a journal bearing.
6. Measurement of temperature distribution of PC processor by thermocouple together with investigating effects of different fins.
7. To find Centre of Pressure for plane submerged surfaces
8. To determine Impact of a Jet of Water.
9. To find Pressure Distribution on Cylinder/Aerofoil in a Wind Tunnel.
10. To perform Drag and Lift Force measurement.
11. To design and evaluate the performance of Heat Exchanger: Parallel and counter flow.
12. To perform Emissivity Measurement and RTD.
13. To determine and plot main and operating characteristics of Impulse turbine.
14. To determine and plot main and operating characteristics of Centrifugal Pump.
15. Measurement of a Fan/ Compressor Horse Power

EC307 Professional Lab II (ECE) [0-0-3-2] ***Prerequisite: #***

1. (a) To familiarize with 8085 microprocessor trainer kit, its commands and concept of manual assembly of Assembly Language Program.
   (b) To familiarize with 8085 simulation software.
   (c) To familiarize with 8086 assembler and linker software (TASM/MASM).
2. To write very simple assembly language program for 8085 microprocessor.
   a. 8-bit & 16-bit data addition.
   b. 1's & 2's compliment.
   c. Finding a data from an array (Specific data & Largest /Smallest).
   d. Arranging data array in ascending/descending order.
3. To write simple assembly language program for 8085 microprocessor.
   a. BCD numbers addition.
   b. 8-bit multiplication & division.
   c. Finding a factorial of a number (less than 6).
   d. Finding nth number of Fibonacci series.
   e. Time Delay Subroutine.
   f. To convert any given temperature from degree Celsius to degree Fahrenheit.
4. To program onboard 8255 for 8085 microprocessor.
   a. Reading data from input port (A), masking specified bits and sending at output port (B).
   b. Reading data from input port (A) in handshake mode and displaying double of it through LEDs connected at the output port (B) in normal mode.
5. To write small application oriented assembly language program for 8085 microprocessor.
   a. Speed control of DC Motor.
   b. Stepper Motor Control.
   c. Temperature control.
6. Developing & executing simple 8086 assembly language program on DOS editor.
   a. To familiarize with DOS commands and editor.
   b. Finding average of two numbers NUM1 & NUM2.
   c. Finding Square of a number NUM.
7. Developing & executing simple 8086 assembly language program using TASM/MASM.
   a. 8-bit & 16-bit addition.
   b. Multiply two 4 digit Hexadecimal numbers.

8. Using 8086 interrupts in assembly language program to communicate data with peripherals.
    a. Display a welcome message at the screen.
    b. Read a character from keyboard and display at the screen.

Note: Lab record must include (whatever is applicable) Problem Description, Flow Chart, Interfacing diagram, Assembly Language Program, Calculation (Time Delay, Control Word, Theoretical Values etc), Result (Register/Memory contents, physical output) and Conclusion.

CS308 Professional Lab II (CSE) [0-0-3-2] ***Prerequisite: #***

Database Design and Management: The concepts will be explained by designing and managing a sample database.
Part I: Database Design: Database and Tables creation
Part II: Querying Database using SQL
Part III: Front End Design
Part III: Creating a Client-Server Environment

MN 303 PROJECT II – Fabrication Project [0-0-6-4] ***Prerequisites: DS 202, DS 303***

The course MN 302 Project – II (Fabrication Project) is meant to nurture creativity, innovation and ideas. It follows the course Project – I (Design Project). In this course, the students have to properly fabricate the product whose design was developed and proposed in the course DS 303 so that it has the proper finishing and packaging, ready to be launched into the market. Fabrication Project will primarily include selection of materials and manufacturing processes along with prototype building and testing with the end output as fully functional product.

The course expects to observe the step by step detailed plan of execution, such as- purchase of material, fabrication, testing, finishing, display, etc.

Semester VII

ES413 Micro Nano Science and Technology [3-0-0-4] ***Prerequisite: NS102***

Introduction to MEMS; Working Principles and Applications: Sensors, Actuators, Micro-accelerometer; Scaling Laws in Miniaturization: Scaling in geometry, dynamic forces (Trimmer Force Scaling Vector), Electrostatic Forces, Electricity, Electromagnetic Forces; Materials for MEMS: Single Crystal Silicon, Poly-silicon, Quartz, Polymers; MEMS Fabrication Processes: Substrates and Wafers, Bulk, Surface, LIGA; Microsystems Design: Design Processes, Micro Pressure Sensor and Micro Accelerometer.
Introduction to Nanostructured materials, Nano science and technology ; Properties of Nanostructured materials (Mechanical, Physical, Chemical, Optical, Magnetic and Electrical properties); Synthesis and fabrication of nano materials (Physical and Chemical); Characterization of Nano-materials (X-ray diffraction, Scanning Electron Microscopy, Tunneling Electron Microscopy, Vibrating sample magnetometer, SQUID, Atomic Force Microscopy and Scanning tunneling microscopy); Carbon based nano-materials, Spintronics (GMR, Spin Valve, and TMR).

Text Books:

1. Hsu, T. R., MEMS & Microsystems Design and Manufacturing, Tata McGraw Hill,2002.
2. Ratner & Ratner, Nanotechnology, Pearson Education low price Edition, 2002.

Reference Books:

1. Zappe, Tabata & Gianchandani., Comprehensive Microsystems, Elsevier, 2007.
2. Gad-el-Hak, Mohamed, MEMS: Design and Fabrication, Taylor & Francis Group, 2005.

ME 412 Advanced Manufacturing Processes & Technologies [3-0-0-4] ***Prerequisite: #***

Electron Beam Machining (EBM) And Plasma Arc Machining (PAM), Laser Beam Machining (LBM), Abrasive Jet Machining (AJM), Water Jet Cutting, Ultrasonic Machining (USM), Electro-Chemical Machining (ECM), Electric Discharge Machining (EDM), Wire EDM.

Text Books:

1. Boothroyd, G and Knight, W A., Fundamentals of Machining and Machine Tools, Third Edition, Saint Luice Pr, 2005.
2. Black, S. C., Chiles, V., Lissaman, A. J., Martin, S. J., Principles of Engineering Manufacture, Arnold Edn, 1996.
3. Kalpakjian, S. and Schimd S. R., Manufacturing Engineering and Technology, Prentice Hall, Fourth Edition, 2005.

EC 408 Linear Integrated Circuits [3-0-0-4] ***Prerequisite: ES 205***

Basic Information of Op-Amp, Ideal Op-amp, FET Op-amp Monolithic IC operational amplifiers, specifications, frequency compensation, slew rate and methods of improving slew rate. Application of Operational Amplifiers, Analysis of four quadrant and variable transconductance multipliers, Voltage controlled Oscillator, Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators. Frequency synthesizers, Compander ICs, analog to digital and digital to analog to digital convertors, and special function ICs.

Text Books:

1. Gayakwad, Ram, Op-Amps and Linear Integrated Circuits, Prentice Hall, Fourth Edition, 1999.
2. Choudhury, Roy D., Linear Integrated Circuits, John Wiley & Sons.,1992-06
3. Floyd, Thomas L.,Floyd,Buchla, Basic Operational Amplifiers and Linear Integrated Circuits, Prentice Hall,1998.

Reference Books:

1. Stanley, Willam D., Op-Amps and Linear Integrated Circuit, Third Edition, Merrill, 2001.
2. Winzer, Jack, Linear Integrated Circuits, First Edition, Saunders College Publishing, 1992.
3. Coughlin, Robert F., Operational Amplifiers and Linear Integrated Circuits, Sixth Edition, Prentice Hall of India, 2000.

CS 409 Compiler Design [3-0-0-4] ***Prerequisite: #***

Introduction: Model of a compiler, translators, interpreters, assemblers, languages, types of compilers.

Finite Automata and Regular Expressions: Finite automata, non-deterministic and deterministic finite automata, Acceptance of strings by NDFA and DFA, Transforming NDFA to DFA, minimization/Optimization of a DFA, related algorithm, Regular sets and regular expression, Obtaining regular expression from finite automata, lexical analyzer design.

Context-Free Grammar and Syntax Analysis: Syntax analysis, CFG, derivation of a parse tree, reduction of grammar, useless grammar symbols, Elimination of null and unit productions, elimination of left recursion Regular grammar, Right linear and left linear grammar. Parsing, Top-Down and Bottom-up parsing, general parsing strategies, Brute-force approach, recursive descent parser and algorithms, simple LL(1) grammar, LL(1) with null and without null rules grammars, Bottom-up parsing- Handle of a right sentential form, LR(1) parsers, Shift-reduce parsers, operator precedence parsing.

Symbol Table Management: Symbol table contents, organization for non- block structured language-unordered, ordered, and tree-structured and hash symbol tables. Organization for block structured languages-stack symbols tables. Stack-implemented tree structured stack implemented hash structured symbol tables.

Syntax-Directed Definitions and Translations: Specification of translations, implementation of translation specified by syntax-directed definition, L-attributed definitions, and syntax-directed translation schemes, intermediates code generation, representing three-address statement, translation schemes for programming language constructs.

Code Optimization: Definition, Loop optimization, Elimination of local and global common sub Expressions, Loop Unrolling, Loop Jamming.

Code Generation: Definition, machine model, code generation methods, peephole optimization.

Error Handling: Error recovery, recovery from various phases and parsing.

Text Book: Aho Alfred; Sethi, Ravi, Ullman Jeffery, Compiler Principles, Techniques and Tools, 2007.

Reference Books:

1. Aho, Alfred; Ullman Jeffery, Principles of Compiler Design, 1989.
2. Tremblay, Jean Paul; Sorenson, Paul G.; The Theory and Practice of Compiler Writing, 2005.

3. Holub, Allen I., Complier Design in C, 1990.
4. Bates, Barrett; Gustafson, Couch, Compiler Construction Theory and Practice,1988.

ME 415 Computer Integrated Manufacturing [3–0–0–4] ***Prerequisite: MN 201***

Fundamental blocks of Automation in Manufacturing Systems; Computer processes monitoring and control, off-line use of computers.Various Manufacturing Systems - Batch, Mass, Group, Cellular and Flexible manufacturing systems; Classification and coding and Group Technology. Fundamentals of Numerical Control - Direct numerical control (DNC) and computer numerical control (CNC), adaptive control of manufacturing processes. Classification of NC systems, Manual and computer aided programming, Computer Aided Process Planning. Automated Material Handling Systems, Flexible Manufacturing System: Introduction and analysis. Rapid Prototyping, Tooling and Manufacturing Technologies. Concurrent Engineering.

Text Book: Groover, Mikell P., Automation, Production System and Computer Integrated Manufacturing System, Third Edition, Prentice Hall International / Pearson, Edition,2007.

Reference Books:

1. Chang, Wysk and Wang, Computer Aided Manufacturing, Third Edition, Prentice Hall International, 2009.
2. Rambold U., Blume C. and Dillmen R., Computer Integrated Manufacturing System, Marcell Dekkar Inc.
3. Kochan D., CAM: Developments in Computer Integrated Manufacturing System, Springer Verlag, 1986.
4. Chang, T.C., An Introduction to Automated Process Planning Systems, Prentice Hall International, 1985.
5. Kundra, Rao and Tiwari, Numerical Control and CAM, Tata McGraw Hill.
6. Koren, Computer Control of Manufacturing Systems, Tata McGraw Hill, 1998.
7. Kochan D., Integration of CAD/CAM, North Holland, 1984.

EC 409 Power Electronics [3-0-0-4] ***Prerequisites: #***

Introduction: Power semiconductor devices, Types of power electronic circuits and design of Power electronics equipment, Applications of Power electronics.

Power Semiconductor Diodes and Circuits: Diode Characteristics, Power Diode Types, Series and Parallel connected diodes, Diodes with different types of loads(R, RC, RL, LC, RLC Loads), Free wheeling diodes.

Diode Rectifiers: Single phase half wave rectifier, Single phase full wave rectifier, Single phase full wave rectifier with RL Load, Three phase Bridge rectifier, Three phase Bridge rectifier with RL Load.

DC-DC Converters: Principles of step-down chopper and operation, Principle of step-up chopper and operation, classification of choppers.

Thyristors: Thyristor Characteristics, Thyristor Turn on and Turn off, Two-transistor model of Thyristor, Thyristor types, Series and Parallel operation of Thyristor.

Controlled Rectifiers: Principle of phase controlled converter operation, Single phase full-converters, Single phase semi-converter, Principle of three phase half wave Converters, Three phase full converters, Three phase Semi-converter.

Inverters: Single phase series resonant inverter, Single phase bridge inverters, Three phase bridge inverters, Voltage control of inverters.
AC Voltage Controllers: Principle of On-Off and phase controls, Single phase ac voltage controller with resistive load, Single phase ac voltage controller with inductive load, Three phase ac voltage controllers , Single phase Cyclo Converters, Three phase Cyclo Converters Some Applications.

Text Book: Rashid, M. H., Power Electronics: Circuits, Devices & Applications, Third Edition, Prentice Hall of India Ltd., 2004.

CS 410 Artificial Intelligence [3-0-0-4] **Prerequisite: #**

Introduction to AI, Agents and environments. Problem solving by search; uninformed search, informed ("heuristic") search, constrained satisfaction problems, adversarial search, Knowledge representation and reasoning; Bayesian Reasoning, Introducing Bayesian Networks, Inference in Bayesian networks, Application of Bayesian Networks, Statistical Learning methods; Naïve Bayes Models, Learning with hidden variables-EM algorithm, Instance Based learning- Nearest neighbor models, Kernel model, Neural nets.

Text Books:
1. Nilsson, Nils J., Artificial Intelligence: A New Synthesis, Morgan-Kaufmann, 1998.
2. Russell, Stuart J. and Norvig, Peter, Artificial Intelligence: A Modern Approach, Second Edition, Pearson/ Prentice Hall, 2003.
3. Korb, Kevin B. & Nicholson, Ann E., Bayesian Artificial Intelligence, Chapman & Hall/CRC, 2004.

ME 412 Finite Element Methods [3-0-0-4] ***Prerequisites: NS101***

Introduction to Finite Element, Basic Steps in FEM Formulation, General Applicability of the Method. 1-D Elements, Basis Functions and Shape Functions, Convergence Criteria, assembly, imposition of boundary conditions. Variational Functional, Ritz Method. Derivation of Elemental Equations. Solutions of the Equations. Natural Coordinates, Numerical Integration, Solvers. Alternate Formulation: Weighted Residual Method, Galerkin Method. Beam Bending, Connectivity and Assembly of C1 Continuity Elements. 2-D Elements (Triangles and Quadrilaterals) and Shape Functions. Sub-parametric, Iso-parametric and Super-parametric Elements. Free Vibration Problems, Formulation and solution of Eigen Value Problem.

Text Books:
1. Seshu, P., Text Book of Finite Element Analysis, First Edition, Prentice Hall International 2003.
2. Cook, Malkus and Plesha, Concepts and Applications of Finite Element Analysis, Fourth Edition, John Wiley and Sons, 2007.

Reference Books:
1. Reddy, J. N., An Introduction to the Finite Element Method, Third Edition, Tata McGraw Hill, 2005
2. Zienkiewicz O. C., The Finite Element Method in Engineering Sciences, Second Edition, McGraw Hill, 1972.

EC 410 Advanced Electronic Devices ***Prerequisites:*** **ES 205**

Introduction and applications of solid state devices such as zener, varactor, light emitting diodes. Bipolar junction transistors, applications and their biasing. Multistage and differential amplifiers. Interaction of photons with semiconductor materials. Band theory of solids. Fundamentals of semiconductor lasers, homo-junction and hetero-junction diode lasers. Optical modulators, electro-optic modulators, acousto-optic modulators. Light detectors, semiconductor diode detectors, Avalanche Photodiodes. Introduction to fibre optics, optical fibres. Fibre optical communications.

Test books:

1. Streetman, Ben G. and Banerjee, Sanjay, Solid State Electronic Devices, Sixth Edition, Prentice Hall Series in Solid State Physical Electronics ,2005.
2. Keiser, Gerd E, Optical Fibre Communications, McGraw Hill, 1991.

CS 411 Computer Networks [3-0-0-4] ***Prerequisites: #***

Introduction, History and Development of Computer Networks, Networks Topologies. Physical Layer: Theoretical Basis, Transmission Media, Wireless Transmission, Digital Transmission, Switching. MAC Layer: Aloha Protocols, Local Area Networks -- Ethernet, Wireless LAN, Broadband Wireless. Bluetooth Data link layer: Sliding Window Protocols. Network Layer: Routing Algorithms, Congestion Control Algorithms, Internetworking -- Bridges and Routers. Transport Layer, Application Layer. Use of TCP/IP Protocol Suite as Running Example. Network Security.

Text Book: Tannenbaum, S., Computer Networks, Fourth Edition, Prentice Hall, 2006.

ME 413 Professional Lab III (ME) ***Prerequisite: #***

1. To measure the three-dimensional cutting forces and torque in case of prismatic machining and / or grinding.
2. To manufacture a die using ECM / EDM machining processes with the proper selection of various process parameters like feed rate, current, voltage, etc. for different operations and find out MRR in each case.
3. Using the die/impression made in the above experiments, make the final product using injection molding machine. Find out the dimensional accuracy, and strength of the part. List various reasons for errors in the part. Propose the modifications required on the die to improve the surface finish and strength of the product.
4. To observe the chatter together with measuring machining accuracy and tool wear using centre lathe / milling machine.
5. To study the linear drive system of machine tool table by AC servo-motor and to evaluate the traveling and positioning accuracy.
6. To manufacture an engineering product using Abrasive Waterjet machining process with the proper selection of various process parameters like size and type of abrasive particles, nozzle dimensions, water pressure and characteristics, feed rate, etc. for different operations and find out MRR in each case.
7. To manufacture a master pattern to create a die using Rapid Prototyping process. Find out the effects of various process parameters (e.g. temperature, feed rate, slice thickness, etc.) on the master.
8. To manufacture toolings using the master pattern created using RP process for soft and hard tooling.
9. To write G & M code (NC Part program) to manufacture the die / engineering product along with the desired machining sequence, tool selection, cutter path

planning and post-processing methods and verify the code on a sample on a CNC machine.

10. To write G & M code (NC Part program) to manufacture an axisymmetric product having steps, taper and external / internal threads and verify the code on a sample on a CNC turning machine.
11. To generate CNC part program to manufacture the die / engineering product along with the selection of proper and different cutting tools, machining sequences, cutter path planning and post-processing methods and simulate on a CAM software.
12. To generate CNC part programs to manufacture an axisymmetric product involving multiple processes and simulate on CAM software.

EC 411 Professional Lab III (ECE) ***Prerequisite: #***

1. To study the characteristics and behavior of semiconductor devices (SCR/IGBT/MOSFET etc).
2. To study the operation of R, RC and UJT firing circuits.
3. To study the operation of Single Phase Fully Controlled Full Wave Bridge rectifier with R & RL Load and verify performance parameters.
4. To study, design and develop control/firing circuit for single phase full converter circuit.
5. To study the SCR based DC choppers and its commutation technique.
6. To study the open loop speed control of DC motor.
7. To study the single phase bridge converter based closed loop speed control of DC motor with speed and current feedback.
8. To study SCR McMurray Inverter based speed control of single phase Induction Motor.
9. To design and develop MOSFET based DC Chopper with protection circuit.
10. To design and develop SCR based single phase half wave AC Controller.

CS 412 Professional Lab III (CSE) ***Prerequisite: #***

Part I: Compiler Design and Implementation (6 turns)

The aim of this lab course is to implement a compiler for a simple imperative language, using modern tools to help generate parts of the code. Using the compiler generation tools `lex`, `yacc`, and `iburg` for generating MIPS code accepted by the `spim` simulator for the following language features:

1. Constant expressions.
2. Expressions involving variables.
3. Assignment statements
4. Array references
5. Declarations
6. Function calls

Part II: Artificial Intelligence (6 turns)

Implementation of BFS, DFS, DLS/RDLS, A* (Misplaced Tiles Heuristic, Manhatten Distance Heuristic), RBFS algorithms.

Semester VIII

ME414 Design of Mechanical System [3-0-0-4] ***Prerequisite: ME305***

Design for strength, rigidity, stiffness, reliability and manufacturing: Theory of failures – design for variable loading, Special consideration while designing for rigidity. Effect of hollow section on rigidity, methods for improving rigidity. Reliability considerations in design.
Design for Manufacturing: General design principles for manufacturability - strength and mechanical factors, mechanisms selection, evaluation method, Process capability - Feature tolerances Geometric tolerances - Assembly limits -Datum features - Tolerance stacks.
Design features to facilitate machining - drills - milling cutters - keyways - Doweling procedures, counter sunk screws - Reduction of machined area - simplification by separation - simplification by amalgamation
Design for machinability - Design for economy - Design for clampability - Design for accessibility - Design for assembly.
Design for Light Weight - Design to minimize material usage – Design for disassembly – Design for recyclability – Design for remanufacture – Design for energy efficiency – Design to regulations and standards.
Design of IC Engine Parts: Piston, Piston Ring, Cylinder and cylinder lining, Connecting rod, Crankshaft.
Design of Transmission Devices: Design of speed gear box – Aims of speed regulation, stepped and stepless drive, intermediate spindle speeds, speed diagram, structural (Ray) diagram, speeds in G.P., kinematic arrangement of gears, calculation of number of teeth, deviation diagram, selection of module, check for dynamic load and wear. Shaft design. Selection of bearing and seals. Design of housing.
Optimum Design: Basic concepts of optimal design.

Text Books:
1. Mehta, N. K., Machine Tool Design and Numerical Control, Tata McGraw Hill.
2. Norton, Robert L., Machine Design: An Integrated Approach, Third Edition, Pearson Education, 2005.

EC412 VLSI: Design and Testing [3-0-0-4] ***Prerequisites: #***

Introduction to VLSI Methodologies - VLSI Physical Design Automation - Design and Fabrication of VLSI, Devices - Fabrication process and its impact on Physical Design. A Quick Tour of VLSI Design Automation Tools. Simulation-logic synthesis -Verification-High level synthesis- Compaction. Digital system design process – Hardware simulation – Levels of abstraction – VHDL requirements – Elements of VHDL – Top down design VHDL operators – Timing – Concurrency – Objects and classes – Signal assignments – Concurrent and sequential assignments. Modeling a test bench – Top down wiring components – Subprograms. Multiplexing and data selection – State machine descriptions – Open collector gates – Three state bussing. Physical Design Automation of FPGAs, Implementation of Simple Circuits using VHDL. **With hands-on experience.**

Text Books:
1. Perry, Douglas, VHDL, Third Edition, McGraw Hill, 2001.
2. Bhasker, J., VHDL, Third Edition, Addison Wesley, 1999.

Reference Books:

1. Chan, P K. and Mourad, S., Digital Designing Field Programmable Gate Array, First Edition, Prentice Hall, 1994.
2. Old Field, J. V., &. Dorf, R. C., Field Programmable Gate Array, John Wiley, 1995.
3. Bolton, M., Digital System Design with Programmable Logic, Addison Wesley, 1990.
4. Dillinger, Thomas E., VLSI Engineering, First Edition, Prentice Hall, 1998.

CS 414 Design & Validation of Software Systems [3-0-0-4] ***Prerequisites: #***

Software Development Process, Software Life Cycle Models, Software Architecture, Requirement Analysis; Software Design – Concepts, Function-Oriented Design Methods, Object-Oriented Design Methods; Software Verification and Validation, Functional Testing Methods, Structural Testing Methods, Fundamentals of Integration and System Testing, Introduction to Software Metrics.

Text Books:

1. Jalote, Pankaj, An Integrated Approach to Software Engineering, Third Edition, Narosa Publictaions, 2005.
2. Jorgensen, Paul C., Software Testing A Craftsman's Approach, CRC Press, Indian Reprint, 2008.

Reference Books:

1. Pressman, Software Engineering, McGraw Hill, 2005.
2. Sommerville, Software Engineering, Pearson Education, 2007.

ME 411 Management of Production Systems [3-0-0-4] ***Prerequisites: #***

Facilities Planning, Production Planning and Control, Production Scheduling, Inventory Control, Project Management, Quality Control, Management of Entrepreneurial System.

Text Book:

1. Robert, Hisrich D.; Michael, Peters P.; Dean A. Shepherd; Entrepreneurship, Tata McGraw Hill, Sixth Edition, 2007.
2. Martin, Starr K., Production and Operations Management, Biztantra, 2007.

Professional Elective II: ME 416 Vibrations of Mechanical Systems [3-0-0-4]
Prerequisite: #

Introduction: Types of vibrations, S.H.M, principle of super position applied to SimpleHarmonic Motions, Beats. Fourier theorem and simple problems. Single degree offreedom systems and Simple problems.
Undamped free vibrations –. Introduction, undamped free vibration – natural frequencyof free vibration, stiffness of spring elements, effect of mass of spring.
Damped free vibrations: Single degree freedom systems, different types of damping, concept of critical damping and its importance, study of response of viscous damped systems for cases of under damping, critical and over damping, Logarithmic decrement.
Forced Vibration: Single degree freedom systems, steady state solution with viscousdamping due to harmonic force, solution by complex algebra. Concept of response, Reciprocating and rotating unbalance, vibration isolation – transmissibility ratio. Energy dissipated by damping, sharpness of resonance, base excitation.
Vibration measuring instruments: Accelerometer and vibrometers. Whirling of shafts with and without air damping. Discussion of speeds above and below critical speeds.

Systems with two degrees of freedom: Introduction, principal modes and normal modes of vibration, co-ordinate coupling, generalized and principal co-ordinates, free vibration in terms of initial conditions. Geared systems. Forced Oscillations – Harmonic excitation. Applications: (a) Vehicle suspension (b) Dynamic vibration absorber (c) Dynamics of Reciprocating Engines.
Continuous Systems: Introduction, vibration of string, longitudinal vibration of rods,torsional vibration of rods, Euler's equation for beams, simple problems, M D OF systems. Introduction, Influence co-efficient, Maxwell reciprocal theorem.
Numerical methods for Multi degree Freedom Systems: Dunkerley's equation. Orthogonality of principal modes, Holzer's method, Geared and branched systems, Rayleigh's method, Stodola method.
Vibration monitoring and analysis: Introduction, Machinery signatures, Selection of Transducers and signal conditioning. Analysis Techniques, Machine failure modes, Measurement location, Vibration severity criteria, vibration frequency analysis. Introduction to optical vibration monitoring, Introduction to holographic interferometry, holographic vibration analysis, Introduction to speckle metrology and its applications to vibration monitoring. Case studies.

Text Books:

1. Thomson, W.T., Theory of vibration with applications, Third Edition,1997.
2. Rao, S. S., Mechanical Vibrations, Fourth Edition, Addison Wesley, 2004.

Reference Books:

1. Caollacott, R. A.; Chapman, Mechanical Fault Diagnosis and Condition Monitoring, Chapman and hall, 1977.
2. Rao, J. S., Advanced Theory of Vibration, Wiley Eastern Ltd. New Delhi, 1992.
3. Jones, R. J. and Wykes, C., Holographic and Speckle Interferometry, Cambridge University Press, Cambridge, 1983.

Professional Elective II: EC 414 RF and Microwave Engineering [3-0-0-4] ***Prerequisite: #***

Effect of high frequencies on performance of analog and digital circuits; Lumped versus distributed components; Surface Mount Components. Transmitter, Receiver, and Transceiver Architectures S-Parameters: Definitions and Applications Isolators and Circulators. Directional Couplers, Power Dividers and Power Combiners, Filter Design at high frequencies, Impedance Matching (lumped component approach, single and double stubs, transformers, tapers) Design of commonly used antennas and their feed networks & Antenna Arrays. With hands-on-experience.
Semiconductor device modeling and Reliability, Basic physics and device operation for modern VLSI design. Electrical property of CMOS devices and scale-down effects. Updated VLSI and reliability issues.

References:

1. Pozar, David M., Microwave Engineering, John Wiley, 2003.
2. Jordan, E. C, and Balmain, K. G., Electromagnetic Waves and Radiating Systems, Prentice Hall of India, 2005.

CS415 Introduction to Machine Learning [3-0-0-4] ***Prerequisite: #***

Decision tree learning, pruning, overfitting, Occam's razor, Naive Bayes, Conditional independence, Bayes rule, Bayesian classifiers, Perceptrons and linear classifiers, Logistic regression, Generative and discriminative classifiers, maximizing conditional data likelihood, MLE and MAP estimates, Statistical Estimation, PAC Learning, Bayes nets, Representation and Inference, Inference and Learning from fully observed data, Learning from partly unobserved data, EM, Mixture of Gaussians. Hidden Markov Models, Support vector machines, Semi-supervised learning, Dimensionality reduction, feature selection, PCA, Artificial neural networks, Nearest neighbor methods , Reinforcement Learning.

Text Book: Mitchell, Tom**,** Machine Learning, Mc-Graw Hill, ISBN 0070428077, 1997.
Reference Books:

1. Bishop, Christopher M, Pattern Recognition and Machine Learning, ISBN 0387310738, 2006, 2007.
2. Duda, Hart and Stork, Pattern Classification, Second Edition, Wiley (WSE), 2000.