INDIAN INSTITUTE OF TECHNOLOGY PATNA

Programme: Bachelor of Technology in Computer Science & Engineering
Academic Year 2009-10 (Semester III)

Third Semester		
MA201	Mathematics – III	3-1-0-8
CS201	Object Oriented Programming and Data Structures	3-0-3-9
HS2xx	HSS Elective*	3-0-0-6
CS203	Discrete Mathematics	3-0-0-6
CS221	Digital Design	3-0-0-6
EE220	Signal, System and Networks	3-1-0-8
	Total L-T-P-C	**18-2-3-43**

Programme: Bachelor of Technology in Electrical Engineering
Academic Year 2009-10 (Semester III)

Third Semester		
MA201	Mathematics – III	3-1-0-8
CS201	Object Oriented Programming and Data Structures	3-0-3-9
HS2xx	HSS Elective*	3-0-0-6
EE200	Semiconductor Devices and Circuits	3-0-0-6
EE201	Digital Circuits and Microprocessors	3-0-0-6
EE202	Digital Circuits Laboratory	0-0-3-3
EE220	Signal, System and Networks	3-1-0-8
	Total L-T-P-C	**18-2-6-46**

Programme: Bachelor of Technology in Mechanical Engineering
Academic Year 2009-10 (Semester III)

Third Semester		
MA201	Mathematics – III	3-1-0-8
CS201	Object Oriented Programming and Data Structures	3-0-3-9
HS2xx	HSS Elective*	3-0-0-6
ME 201	Solid Mechanics	2-1-0-6
ME 204	Fluid Mechanics-I	2-1-0- 6
ME 205	Thermodynamics	3-1-0-8
ME 211	Machine Drawing	0-0-4-4
	Total L-T-P-C	**15-4-7-47**

*** HSS Electives**		
HS201	Introductory Microeconomics	3-0-0-6
HS221	Fundamentals of Linguistics Science	3-0-0-6

B.Tech. II year (Semester III) Course Syllabi

COMMON COURSES (ALL BRANCHES)

MA201 MATHEMATICS-III (3-1-0-8)

Prerequisites: Nil

Complex Analysis: Complex numbers, geometric representation, powers and roots of complex numbers. Functions of a complex variable: Limit, Continuity, Differentiability, Analytic functions, Cauchy-Riemann equations, Laplace equation, Harmonic functions, Harmonic conjugates. Elementary Analytic functions (polynomials, exponential function, trigonometric functions), Complex logarithm function, Branches and Branch cuts of multiple valued functions. Complex integration, Cauchy's integral theorem, Cauchy's integral formula. Liouville's Theorem and Maximum-Modulus theorem, Power series and convergence, Taylor series and Laurent series. Zeros, Singularities and its classifications, Residues, Rouches theorem (without proof), Argument principle (without proof), Residue theorem and its applications to evaluating real integrals and improper integrals. Conformal mappings, Mobius transformation, Schwarz-Christoffel transformation.

Fourier series: Fourier Integral, Fourier series of 2π periodic functions, Fourier series of odd and even functions, Half-range series, Convergence of Fourier series, Gibb's phenomenon, Differentiation and Integration of Fourier series, Complex form of Fourier series.

Fourier Transformation: Fourier Integral Theorem, Fourier Transforms, Properties of Fourier Transform, Convolution and its physical interpretation, Statement of Fubini's theorem, Convolution theorems, Inversion theorem

Partial Differential Equations: Introduction to PDEs, basic concepts, Linear and quasi-linear first order PDE, Second order PDE and classification of second order semi-linear PDE, Canonical form.. Cauchy problems. D' Alemberts formula and Duhamel's principle for one dimensional wave equation, Laplace and Poisson equations, Maximum principle with application, Fourier method for IBV problem for wave and heat equation, rectangular region. Fourier method for Laplace equation in three dimensions.

Texts:

1. R. V. Churchill and J. W. Brown, Complex Variables and Applications, 5th Edition, McGraw-Hill, 1990.
2. K. Sankara Rao, Introduction to Partial Differential Equations, 2nd Edition, 2005.

References:

1. J. H. Mathews and R. W. Howell, Complex Analysis for Mathematics and Engineering, 3rd Edition, Narosa, 1998.
2. I. N. Sneddon, Elements of Partial Differential Equations, McGraw-Hill, 1957.
3. E. Kreyszig, Advanced Engineering Mathematics, 5th / 8th Edition, Wiley Eastern / John Wiley, 1983/1999.

CS 201 OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES (3 0 3 9)

Pre-requisites: CS101

From C to Java: basics of Java, introduction to the object oriented programming (OOP) concepts (such as classes, objects, constructors, destructors, inheritance, polymorphism, operator overloading) using Java, JVM, applets, APIs, GUI Programming. From Java to C++: the OOP concepts using C++. Performance of algorithms: space and time complexity, asymptotics. Fundamental Data structures: linked lists, arrays, matrices, stacks, queues, binary trees, tree traversals. Algorithms for sorting and searching: linear search, binary search, insertion-sort, bubble-sort, quicksort. Priority Queues: lists, heaps. Graphs: representations, depth first search, breadth first search. Hashing: separate chaining, linear probing, quadratic probing. Search Trees: binary search trees, red-black trees, AVL trees, splay trees, B-trees.

Texts:

1. M. A. Weiss, *Data Structures and Problem Solving Using Java*, 2nd Ed, Addison-Wesley, 2002.
2. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, *Introduction to Algorithms*, MIT Press, 2001.

References:

1. J. Gosling, B. Joy, G. L. Steele and G. Bracha, *The Java Language Specification*, 3rd Ed, Addison-Wesley, 2005.
2. B. Stroustrup, *The C++ Programming Language*, 3rd Ed, Addison-Wesley Longman Reading MA, 1997.
3. S. B. Lippman, *C++ Primer*, 4th Ed, Addison-Wesley, 2005.
4. S. Prata, *C++ Primer Plus: Teach Yourself Object Oriented Programming*, 2nd Ed, Waite Group Press Corte Madera CA, 1995.
5. T. Budd, *C++ for Java Programmers*, Addison Wesley, 1999.
6. M. C. Daconta, *Java for C/C++ programmers*, John Wiley & Sons, 1996.
7. M. J. Augenstein, Y. Langsam and A. M. Tenenbaum, *Data Structures Using Java,* Prentice Hall, 2003.
8. A. H. Aho, J. E. Hopcroft and J. Ullman, *Data Structures and Algorithms,* Addison-Wesley, 1983.

HS201 INTRODUCTORY MICROECONOMICS (3-0-0-6)

Introduction: Why Economics, The Central Economic Problem, Production Possibility Curve (PPC)
Overview of Markets: Demand and Supply, Elasticity, Efficiency and Equity, Markets in Action
Determinants of Demand and Supply: Utility and Demand, Production and Costs
Markets for Goods and Services: Competition, Monopoly, Monopolistic Competition and Oligopoly
Markets and Government: Externalities, Public Goods and Taxes, Factor markets, Income distribution

Texts:

1. Paul A. Samuelson and William Nordhaus ,Economics, Tata M.Hill, 2005.

References:

1. A.Koutsoyiannis, Modern Microeconomics, Macmillan, 2008.
2. Richard G. Lipsey and Alec Chrystal**,** Economics, Oxford, 2007.
3. Microeconomics: An Integrated Approach , David Besanko and Ronald R. Braeutigam ,John Wiley and Sons, 2002.

HS221 FUNDAMENTALS OF LINGUISTICS SCIENCE (3-0-0-6)

Introduction: Language; Linguistics; Language Learning
Phonetics (Sound Systems): Mechanism of Speech Production, Consonants, Vowels, Phonotactic Rules, Phonology: Phonemes
Morphology: Morphemes, Structure of Words,
Syntax: Constituents of a Sentence, Structure of a Sentence; Grammar; Acceptability and Grammaticality; Principles and Parameters; Prescriptive, Descriptive, and Explanatory Adequacy, Syntactic Tools; Principles of modern linguistics with special reference to English and Hindi syntax
Use of language: Language in Literature, Media, Language in Advertisement
Sociolinguistics: Language is Social Context; Multilingualism
Language and Politics: Language in Constitution; Language and Dialect
Psycholinguistics: Language Acquisition; Universal Grammar
Semantics 2, Language Change and Language Variation, Language and Computers

Text and References:

1. Bloomfield, L. 1933 Language, pp. 21-41. Holt, Rinehart and Winston
2. Chomsky, N. 1965 Aspects of the Theory of Syntax, pp. 3-15, 18-27, 47-59. MIT Press
3. Farmer, Ann and Richard Demers 2001 *A Linguistics Workbook* MIT Press

COMMON COURSE (CSE AND EE)

EE220 SIGNAL, SYSTEM AND NETWORKS (3-1-0-8)

Signals: classification of signals; signal operations: scaling, shifting and inversion; signal properties: symmetry, periodicity and absolute integrability; elementary signals.
Systems: classification of systems; system properties: linearity, time/shift-invariance, causality, stability; continuous-time linear time invariant (LTI) and discrete-time linear shift invariant (LSI) systems: impulse response and step response; response to an arbitrary input: convolution; system representation using differential and difference equations; Eigen functions of LTI/ LSI systems, frequency response and its relation to the impulse response. Signal representation: signal space and orthogonal bases; Fourier series representation of continuous-time and discrete-time signals; continuous-time Fourier transform and its properties; Parseval's relation, time-bandwidth product; discrete-time Fourier transform and its properties; relations among various Fourier representations.
Sampling: sampling theorem; aliasing; signal reconstruction: ideal interpolator, zero-order hold, first-order hold; discrete Fourier transform and its properties. Laplace transform and Z-transform: definition, region of convergence, properties; transform-domain analysis of LTI/LSI systems, system function: poles and zeros; stability. Review of network theorems: superposition, Thevenin's, Norton's, reciprocity, maximum power transfer, Millman's and compensation theorems;
Network topology: definition of basic terms, incidence matrix, tie-sets, cut-sets; Two port networks: characterization in terms of impedance, admittance, transmission, hybrid parameters and their relationships, interconnection of two port networks; Symmetrical two port network: T and π equivalents, image impedance, characteristic impedance and propagation constant.
Texts:

1. M. J. Roberts, "Fundamentals of Signals and Systems", Tata McGraw Hill, 2007.
2. B. P. Lathi,"Signal Processing and Linear Systems", Oxford University Press, 1998.
3. M. E. Van Valkenburg, Network Analysis, 3/e, Prentice Hall of India, 2003.
4. C. A. Desoer and E. S. Kuh, Basic Circuit Theory, McGraw-Hill, 1985

References:

1. A.V. Oppenheim, A.S. Willsky and H.S. Nawab, "Signals and Systems", Prentice Hall of India, 2006.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4/e, Prentice Hall, 1998.
3. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons, 1998.
4. F. F. Kuo, Netwok Analysis and Synthesis, 2/e, Weily India, 2007.
5. K. S. Suresh Kumar, Electric Circuits and Networks, Pearson Education, 2009.

CORE COURSES (COMPUTER SCIENCE AND ENGINEERING)

CS203 DISCRETE MATHEMATICS (3-1-0-8)

Set theory: sets, functions, relations, partial orders, lattices. Logic: propositional logic (formulae, truth tables, proof systems, soundness and completeness of proof systems), predicate logic (formulae, interpretations, proof systems, soundness and completeness of proof systems).
Combinatorics: permutations, combinations, partitions, Stirling numbers. Recurrences, summations, generating functions, asymptotics.
Graph Theory: paths, connectivity, subgraphs, isomorphic and homeomorphic graphs, trees, complete graphs, bipartite graphs, matchings, colourability, planarity, digraphs.
Algebraic Structures: semigroups, groups, subgroups, homomorphisms, rings, integral domains, fields.

Texts:
J. P. Tremblay and R. P. Manohar, *Discrete Mathematics with Applications to Computer Science*, Tata McGraw-Hill, 1997.

References:

1. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed, Tata McGraw-Hill, 2000.
2. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed, Addison-Wesley, 1994.
3. N. Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, 1974.
4. S. Lipschutz and M. L. Lipson, Schaum's Ou*tline of Theory and Problems of Discrete Mathematics*, 2nd Ed, Tata McGraw-Hill, 1999.

CS221 DIGITAL DESIGN (3-0-0-6)

Number Systems: representations of numbers (binary, octal, decimal, and hexadecimal), arithmetics of signed and unsigned numbers. Boolean Algebra and logic gates: gate level minimization of Boolean functions.
Combinational logic circuits: design and analysis, some standard combinational circuits (encoders, decoders, multiplexers). Sample and hold Circuits, Analog-to-Digital Converter, Digital-to-Analog Converter.
Synchronous sequential logic circuits: design and analysis; flip-flops, registers, counters; finite state model: state tables and state diagram, state minimization.
Asynchronous sequential logic circuits: design and analysis; incompletely specified machines; reduction of states and flow tables; race free state assignments. Programmable logic devices: memory, PLA, PAL. Representation and synthesis using ASM charts.

Texts:
M. M. Mano, *Digital Design*, 3rd Ed, Pearson Education Asia, 2002.

References:

1. S. Brown and Z. Vranesic, *Fundamentals of Digital Logic - With Verilog Design*, Tata McGraw-Hill, 2002
2. S. Brown and Z. Vranesic, *Fundamentals of Digital Logic - With VHDL Design*, Tata McGraw-Hill, 2002
3. J. P Uyemura, *A First Course in Digital System Design - An Integrated Approach*, Vikas Publishing House, 2001.
4. Z. Kohavi, *Switching and Finite Automata Theory*, 2nd Ed, Tata McGraw-Hill, 1995.

CORE COURSES (ELECTRICAL ENGINEERING)

EE200 SEMICONDUCTOR DEVICES AND CIRCUITS (3-0-0-6)

Energy bands; semiconductors; charge carriers: electrons and holes, effective mass, doping. Carrier concentration: Fermi level, temperature dependence of carrier concentration. Drift and diffusion of carriers: excess carriers; recombination and life time, Five equations of carrier transport. p-n Junction: depletion region, forward and reverse-bias, depletion and diffusion capacitances, switching characteristics; breakdown mechanisms; SPICE model. BJT: carrier distribution; current gain, transit time, secondary effects; SPICE model. Metal-semiconductor junctions: rectifying and ohmic contacts. MOSFET: MOS capacitor; Cv-Iv characteristics; threshold voltage; SPICE model. Single stage amplifiers: CE-CB-CC and CG-CD-CS modes of operation, large signal transfer characteristics of BJT and MOSFET, Different types of biasing for BJT and MOSFET, Small signal parameters, Body effect in MOSFET, Parasitic elements, frequency response of CE and CS amplifiers. Analog ICs: DAC, ADC, VCO, PLL and 555-timer.

Texts:

1. R. Pierret, Semiconductor Device Fundamentals, PHI, 2006
2. P. R. Gray, Paul Hurst, S.H. Lewis and R. G. Meyer, Analysis and Design of Analog Integrated Circuit, John Wiley, 2001.
3. S. Sedra and K. C. Smith, Microelectronic Circuits, Oxford University Press, 1997.

References:

1. M. S. Tyagi, Introduction to Semiconductor Materials and Devices, John Wiley & Sons Inc.
2. Michael Shur, Introduction to Electronic Devices, John Wiley & Sons Inc., 2000
3. R. T. Howe and C. G. Sodini, Microelectronics: An Integrated Approach, Prentice-Hall Inc. 1997.
4. Ben G. Streetman, Solid State Electronic Devices, PHI, 5/e, 2001.
5. J. Singh, Semiconductor Devices - Basic Principles; John Wiley & Sons Inc., 2001.

EE201 DIGITAL CIRCUITS AND MICROPROCESSOR (3-0-0-6)

Digital logic families: TTL, MOS, interfacing between logic families;
Combinational circuits: multiplexer/ demultiplexer, encoder/ decoder, adder/ subtractor, comparator and parity generators;
Sequential circuits: latches and flip-flops (RS, JK, D, T, and Master Slave); Registers;
Counters: ripple, ring, and shift register counters; Design and analysis of synchronous sequential finite state machine; Programmable logic devices; Introduction to HDL.
Microprocessors: 8085 addressing modes, memory interfacing, interrupts, instructions, timing diagram; Introduction to 8086; Peripheral chips: I/Os, timer, interrupt controller, USART, DMA.

Texts:

1. C. H. Roth Jr., Fundamentals of Logic Design, 4/e, Jaico Publishers, 2002.
2. J. F. Wakerly, Digital Design principles and practices, 4/e, Pearson Education; 2006.
3. Z. Kohavi, Switching and Finite Automata Theory, 2/e, Tata McGraw-Hill, 2008.
4. R. K. Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Penram International Publishing (India), 2000.

References:

1. M. D. Ercegovac, T. Lang, and J.H. Moreno, Introduction to Digital Systems, John Wiley, 2000.
2. V. P. Nelson, H. T. Nagle, B. D. Carroll & J. D. Irwin, Digital Logic Circuit Analysis and Design, Prentice-Hall, 1995.
3. D. V. Hall, Microprocessors and Interfacing: programming and hardware, TMH, 1995.

EE202 DIGITAL CIRCUITS LABORATORY (0-0-3-3)

Combinational Logic design using decoders and multiplexers; design of arithmetic circuits using adder ICs; Flip flop circuit (RS latch, JK & master slave) using basic gates; Asynchronous Counters, Johnson & Ring counters; Synchronous counters; Sequential Circuit designs (sequence detector circuit), DAC circuit; Assembly language programming of 8085: a) sorting and code conversion, b) matrix multiplication; 8085 interfacing: a) parallel port interface (square wave generation), b) counter and timer interface (polling and using interrupts); ADC/DAC interfacing with 8085.

Text/References:

1. Niklaus Wirth, Digital Circuit Design: An Introductory Textbook, Sringer, 1995.
2. D. P Leach, A. P. Malvino and G. Saha, Digital Principles and Applications, 2/e, Tata McGraw-Hill, 2006
3. R. S. Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Penram International Publishing (India), 2000.
4. TTL IC Data Sheets (www.datasheetarchive.com/).

CORE COURSES (MECHANICAL ENGINEERING)

ME201 SOLID MECHANICS (2-1-0-6)

Introduction to Stress and strain: Definition of Stress, Normal Stress in axially loaded Bar, Stress on inclined sections in axially loaded bar, Shear Stress, Analysis of normal and shear stress, Deterministic design of members, probabilistic basis for structural design. Tension test and normal Strain, Stress strain relation and Hooke's law. Poisson's ratio, Thermal strain and deformation.
Stress as a tensor: stress at point, Cauchy stress tensor, equilibrium equations, analysis of deformation and definition of strain components,
compatibility relations: One-to-one deformation mapping, invertiblity of deformation gradient, Compatibility condition.
Some properties of Stress and Strain Tensor: Principal stresses and strains, stress and strain invariants, Mohr's circle representation.
Constitutive relations: An short introduction to material symmetry transformations, Isotropic material, true and engineering stress-strain curves, Material properties for isotropic materials and their relations. Theories of failures for isotropic materials.
Application of Mechanics of Material in Different Problems: Shear Force and Bending Moment diagrams; Axially loaded members; Torsion of circular shafts; Stresses due to bending: pure bending theory, combined stresses. Deflections due to bending: moment-curvature relation, load-defection differential equation, area moment method, and superposition theorem; Stresses and deflections due to transverse shears.
Energy Methods: Strain energy due to axial, torsion, bending and transverse shear. Castigliano's theorem, reciprocity theorem etc.

Text and References:

1. S. C. Crandall, N. C. Dahl, and T. J. Lardner, *An Introduction to the Mechanics of Solids*, 2nd Ed, McGraw Hill, 1978.
2. E. P. Popov, *Engineering Mechanics of Solids*, Prentice Hall, 1990.
3. I. H. Shames, *Introduction to Solid Mechanics*, 2nd Ed, Prentice Hall, 1989.
4. S. P. Timoshenko, *Strength of Materials*, Vols. 1 & 2, CBS publ., 1986.

ME204 FLUID MECHANICS - I (2-1-0-6)

Introduction to fluids: Definition of fluid, Difference between solid and fluid, Application of fluid dynamics

Properties of fluids: Intensive and Extensive properties, Continuum, density, specific gravity, specific heat, viscosity, surface tension etc.

Fluid statics: pressure, manometer, hydrostatic forces on submerged on plane surfaces, stability of immersed and floating bodies, fluids in rigid body motion etc.

Fluid kinematics: Lagrangian and Eulerian description of fluid flow, Velocity and Acceleration Fields, Fundamentals of flow visualization, streamlines, stream tubes, pathlines, streaklines and timelines, deformation of fluid elements, vorticity and rotationality.

Inviscid incompressible flows: Stream function, velocity potential for 2D, irrotational, incompressible flows;

Dimensional analysis and similitude: Nature of dimensional analysis, Buckingham-pi theorem, significant dimensionless groups in fluid mechanics, flow similarity and model studies.

Integral relations for a control volume: Reynolds transport theorem, conservation equations for mass, momentum and energy;

Differential relations for a fluid particle: conservation equations for mass momentum and

energy in differential form

External incompressible viscous flow: boundary layer concept, fluid flow about immersed bodies.

Internal Incompressible viscous flow: Fully developed laminar flow in a pipe, major and minor losses in a pipe flow etc., flow measurement-constriction meters, rotameters, anemometer etc.

Text and Reference Books:

1. F. M. White, 1999, *Fluid Mechanics*, 4th Ed, McGraw-Hill.
2. B. R. Munson, D. F. Young and T. H. Okhiishi, *Fundamentals of Fluid Mechanics*, 4th Ed, John Wiley, 2002.
3. R. W. Fox and A. T. McDonald, 1998, *Introduction to Fluid Mechanics*, 5th Ed, John Wiley.

4. S. W. Yuan, 1988, *Foundations of Fluid Mechanics*, Prentice Hall of India.
5. Pijush Kundu, 2002, *Fluid Mechanics*, 2nd Ed., Academic Press.
6. Irwing Shames, *Mechanics of Fluids*, 4th Ed., McGraw Hill.
7. Batchelor G.K., 2000, An Introduction to Fluid Dynamics,2nd edition, Cambridge University press,
8. V. Streeter and Benjamin, 2001, *Fluid Mechanics:First SI-Metric Edition*, Tata Mc Graw Hill.
9. Cengel and Cimbala, *Fluid Mechanics: Fundamentals and Applications*, Mc Graw Hill.
10. James Fay, *Introduction to Fluid Mechanics*, Prentice hall India.

ME205 THERMODYNAMICS (3-1-0-8)

Thermodynamic Systems, properties & state, process & cycle
Heat & Work: Definition of work and its identification, work done at the moving boundary, Zeroth law,
Properties of pure substance: Phase equilibrium, independent properties, and equations of state, compressibility factor, Tables of thermodynamic properties & their use, Mollier Diagram
First law: First law for control mass & control volume for a cycle as well as for a change of state, internal energy & enthalpy, Specific heats; internal energy, enthalpy & specific heat of ideal gases. SS process, Transient processes.
Second Law of Thermodynamics: Reversible process; heat engine, heat pump, refrigerator; Kelvin-Planck & Clausius statements ,Carnot cycle for pure substance & ideal gas, Concept of entropy; the Need of entropy definition of entropy; entropy of a pure substance; entropy change of a reversible & irreversible processes; principle of increase of entropy, thermodynamic property relation, corollaries of second law, Second law for control volume; SS & Transient processes; Reversible SSSF process; principle of increase of entropy, Understanding efficiency.
Irreversibility and availability: Available energy, reversible work & irreversibility for control mass and control volume processes; second law efficiency.
Thermodynamic relations: Clapeyron equation, Maxwell relations, Thermodynamic relation for enthalpy, internal energy, and entropy, expansively and compressibility factor, equation of state, generalized chart for enthalpy.
Thermodynamic Cycles: Otto,Diesel, Dual and Joule
Third Law of Thermodynamics

Text and References:

1. Sonntag R.E., Claus B. & Van Wylen G., "Fundamentals of Thermodynamics", John Wiley & Sons, 2000, 6th ed.
2. GFC Rogers and Y R Mayhew, Engineering Thermodynamics Work and Heat Transfer 4e, Pearson 2003
3. J P Howell and P O Bulkins, Fundamentals of Engineering Thermodynamics, McGraw Hill,1987
4. Y A Cengal and M A Boles, Thermodynamics, An Engineering Approach, 4e Tata McGraw Hill, 2003.
5. Michael J. Moran & Howard N. Shapiro, Fundaments of Engineering Thermodynamics, John Wiley & Sons, 2004, 4th ed.

ME211 MACHINE DRAWING (0-0-4-4)

Conventional representation of Machine Components: screw threads, spring, gears, bearings, splined shaft,

Assembly and Part Drawings: couplings, clutches, bearings, gear assemblies, I.C. Engine components, valves, machine tools, etc.;

Limits, tolerances and Fits, Surface finish: Fundamental deviations for holes and shafts. Types of fits, IS/ISO codes for limit and tolerances,

Symbols: Symbols for surface roughness, Weldments, process flow, electrical and instrumentation units

Solid Modeling: Introduction to solid modelers, solid modeling of various machine parts,

Project: A drawing project.

Texts:

1. Ajeet Singh, Machine drawing Includes AutoCAD, Tata Mc GrawHill, 2008.
2. ND Junnarkar, Machine Drawing, Pearson Education, 2007.
3. N. D. Bhatt, *Machine Drawing*, Charotar Book Stall, Anand, 1996.
4. N. Sidheswar, P. Kanniah and V. V. S. Sastry, *Machine Drawing*, Tata McGraw Hill, 1983.
5. SP 46: 1988 Engineering Drawing Practice for School & Colleges. Bureau of Indian Standards