MAHAMAYA TECHNICAL UNIVERSITY, NOIDA

Syllabus
for
B. TECH. SECOND YEAR
Of
MECHANICAL ENGINEERING
PRODUCTION ENGINEERING
MANUFACTURING ENGINEERING
MANUFACTURING TECHNOLOGY
AUTOMOBILE ENGINEERING

(Effective from the Session: 2013-14)
**SCHEME OF EVALUATION OF B. TECH SECOND YEAR (MECHANICAL STREAM)**

**SEMESTER III**

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>Subject Code</th>
<th>Subjects</th>
<th>Periods</th>
<th>Evaluation Scheme</th>
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<td>HU-301 / AS-306</td>
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*TA = 10 (5 for teachers assessment plus 5 for attendance)*

*TA = 20 (10 for teachers assessment plus 10 for attendance)*

*P= 15(4 marks for practical exam. 4 marks viva. 4 marks for lab. records and 3 marks for quiz).*

*P= 30(10marks for practical exam. 10marks viva. 5marks for lab. records and 5 marks for quiz).*
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L: Lecture  T: Tutorial  P: Practical/Project  CT: Class Test  TA: Teacher’s Assessment  Th: Theory  TOT: Total

TA = 10 (5 for teachers assessment plus 5 for attendance)

P = 30 (10 marks for practical exam, 10 marks viva, 5 marks for lab. records and 5 marks for quiz).
Objective of the Course: The course intends to impart knowledge and learning of different aspects of human behaviour especially in the organisational context that directs human behaviour. This has special significance to the professionals as these aspects of human behaviour needs to be accounted for while taking a decision with respect to enhancement of human productivity.

UNIT-I

UNIT-II

UNIT-III
Motivation: Meaning, Maslow's, Herzberg, McClelland’s Theories of Motivation, Leadership: Style and Theories of Leadership-Trait, Behavioural and Situational Theories, Conflict Management: Conflict: Concept, Sources, Types, Classification of Conflict Intra, Individual, Interpersonal, Intergroup and Organisational, Resolution of Conflict.

UNIT-IV
Group Dynamics: Types of Group and their development stages, concept, status, norms size and cohesiveness. Power and Politics: Concept, Sources of Power, Distinction between Power, Authority and Influence, Approaches to Power, Political Implications of Power: Dysfunctional Uses of Power.

References:
1. Newstrom John W. - Organizational Behaviour: Human Behaviour at Work (Tata McGraw Hill,
2. Luthans Fred - Organizational Behaviour (Tata McGraw Hill, 10th edition)
4. Robbins Stephen P. - Organizational Behaviour (Pearson Education)
5. Hersey Paul, Blanchard, Kenneth H and Johnson Dewey E. - Management of Organisational Behaviour:
8. Ian Brooks : Organizational Behaviour, Pearson Learning
Objective of The Course

To impart basic skills in Technical Communication in various formats of technical writing to MCA and second year UG students in the English language. Having achieved the basic skills in professional communication in English through laboratory practice teaching, the students are required to learn various forms of technical writings. Communication is not restricted to forms of verbal interaction among the professionals. Every professional is required to be proficient in Technical Communication as well. Such proficiency is desired to be achieved through class room learning of different formats of technical writing which are usually used in any technical profession.

Desired Outcome of The Course

The students must be able to:

(a) Understand Communication as a process and channels of it in general and Technical Communication in particular.
(b) Learn Technical writing including sentence structure and be able to understand and use technology specific words.
(c) Write scientific articles, synopsis, reports (routine and annual) including Project and Sample Reports.
(d) Write Technical Notes, Proposals and Articles.
(e) Learn to record minutes of meetings, Seminars, workshops, make technical presentations and learn resume/CV writing.

Key Concepts

Communication as a process of interaction between originator and receiver.

Context of Technical Communication as means of indulgence in various forms and formats of technical writings as required in organizations-technological as well as commercial.

Writing Skills: Selection of words and phrases in technical writing leading to sentence structure as well as length and structure of paragraph. Writing scientific Articles, Reports, recording minutes and Notes, authoring and review of Research Articles.

Speaking Skills: Participation in Meetings, Seminars, Workshops and Technical Presentation.

Teaching Methodology

1. Equipping the student for competent techno-specific Technical Communication in English Language and enabling the student to be proficient in technical writing.
2. The teacher is required to teach the course through lectures, tutorials and samples of written technical formats.
3. The teacher must project himself as a proficient expert in technical writing of English language.
4. The course has to be taught in small batches so as to give individual attention to students – both, in the process of learning to write as well as participation in conferences, seminars, workshops and project presentations.
5. The Books suggested have portions of Technical Communication in each and as such the same be treated as base texts. Expansion of the parts be undertaken with the help of relevant matter through internet. Infact, the students be encouraged to enhance their technical writing skills by self learning.
Unit - I
**Communication**—Nature and process.
**Channels of Communication**—Down ward, upward and horizontal Communication.
Networks and Barriers to Communication.
Importance and Need for Technical Communication
Nature of Technical Communication—Aspects and Forms of Technical Communication
Technical Communication Skills—Listening, Speaking, Reading and Writing (Improving these with comprehensions).

Unit - II
Techniques of Writing, Selection of words and phrases in technical writing.
Difference between Technical Writing and General Writing.
Abstract and specific words
Sentence structure, Requisites of sentence construction.
Paragraph Length and structure
Jargons and Cliché.

Unit - III
Scientific Article Writing.
Synopsis Writing, Project writing and Dissertation /Thesis Writing.
**Report Writing**—meaning, significance, structure and style.
Different type of Reports—routine reports and annual reports.
Project Reports
Sample Reports
**Technical Articles**—nature, significance and types.
Journal Articles and Conference Papers.

Unit - IV
Technical Note Making
Mechanics and Note Writing Techniques.
Technical Proposals—meaning, structure, types and significance.
Types of Proposals
Review and Research Articles.
Elements of Technical Articles.

Unit - V
**Meetings**—Preparation of Agenda, participation, chairing and writing minutes of meetings.
Conferences, Seminars, Technical Presentations and Workshops.
Video Conferencing, technical description of engineering objects/produces and processes.
Slogan Writing, Speech advertising.
CV Writing, difference between Biodata, CV and Resume. Types of resume and tips for resume writing.

**Text Books & References**


**Performance & Evaluation System**

The students shall write two internal sessional tests as for other subjects besides the end-semester written exams. The internal sessionals will have a weightage of 20 marks and the end-semester theory examination shall carry 80 marks making the subject of Technical Writing worth 100 marks.

Assignments are to be given to reinforce the concepts and ensure total understanding of technical writing.

**Suggested web-links:**

http://www.ego4u.com/
http://www.english4today.com/
http://www.learnamericanenglishonline.com/
http://learnenglish.britishcouncil.org/en/
http://www.englisch-hilfen.de/en/
http://www.englishclub.com/
http://www.englishlearning.com/
http://learningenglish.voanews.com/
http://www.usingenglish.com/dictionary.html
1. **Title of the course**: ENGINEERING MATHEMATICS-III (AS-301B)

2. **Work load per week**
   - **a. Lecture (L):** 3 hrs/week  
     **Total Lecture Hours per Semester:** 42
   - **b. Tutorials (T):** 1 hrs/week  
     **Total Tutorial Hours per Semester:** 12+12
   - **c. Total Credits:** L+T+P  
     **4**
   - **d.** One credit is defined as one lecture load per week and two hours of self-study to be connected with tutorial and assignments.

3. **Prerequisites of the course:** Engineering Mathematics I & II.

4. **Why you need to study this course:**
   Engineering Mathematics is one of the important tools of engineering. It is essential for an engineering student to know the mathematical terminology, concept and methods used in various engineering disciplines.

   **Course Objective:**
   Basic idea of the course will be to introduce the concept of Complex analysis, Mathematical Methods (Fourier analysis, Z-transform and Difference equation), Mathematical Statistics, Numerical Techniques I and II.

5. **Learning outcomes expected from the course:**
   At the completion of this Course, student will have the basic skills required to:
   - a. Understand the concept of Complex analysis including complex integration and conformal mapping which are useful to all branches of engineering.
   - b. The concept of Mathematical Methods helps the students to understand various transforms which are useful all branches of engineering.
   - c. The concept of Mathematical statistics will enable the students to understand models of probability distribution to be tested by statistical methods.
   - d. Numerical Methods enable students to evaluate of definite integrals, the solution of equations and linear systems, the solution of differential equations etc.
Unit-I: Complex Analysis
Analytic functions, Cauchy-Riemann equations. Conformal mapping (for linear transformation). Cauchy’s theorem, Cauchy integral formula. Power Series, Taylor series, Laurent series. Zeros, Singularities, Poles. Residue theorem, Evaluation of real integrals of the type \( \int_0^\frac{\pi}{2} f(\cos x, \sin x) \, dx \) and \( \int_\infty^{-\infty} f(x) \, dx \).

Unit-II: Mathematical Methods

Unit-III: Mathematical Statistics

Unit-IV: Numerical Techniques – I
Solution of Algebraic and Transcendental equations, Regula-Falsi method, Newton-Raphson method, Rate of convergence. Solution of linear simultaneous equations: Crout’s method, Gauss-Seidel method. Interpolation, finite differences, difference tables, relations between operators, Newton’s forward/backward difference formulae, Newton’s divided difference formula, Gauss’s Central difference formula. Cubic Spline method.

Unit-V: Numerical Techniques – II
Text Books:

Reference Books:
Unit- I

**Fundamental Concepts & Definitions**

Thermodynamics: Terminology; definition and scope, microscopic and macroscopic approaches. Engineering Thermodynamics: Definition, some practical applications of engineering thermodynamics. System (closed system) and Control Volume (open system); Characteristics of system boundary and control surface; surroundings; fixed, moving and imaginary boundaries, examples. Thermodynamic state, state point, identification of a state through properties; definition and units, intensive and extensive various property diagrams, path and process, quasi-static process, cyclic and non-cyclic processes; Restrained and unrestrained processes; Thermodynamic equilibrium; definition, mechanical equilibrium; diathermic wall, thermal equilibrium, chemical equilibrium. Zeroth law of thermodynamics. Temperature as an important property.

**Work and Heat**

Mechanics definition of work and its limitations. Thermodynamic definition of work and heat, examples, sign convention. Displacement works at part of a system boundary and at whole of a system boundary, expressions for displacement works in various processes through p-v diagrams. Shaft work and Electrical work. Other types of work. Examples and practical applications.

Unit- II

**First Law of Thermodynamics**

Statement of the First law of thermodynamics for a cycle, derivation of the First law of processes, energy, internal energy as a property, components of energy, thermodynamic distinction between energy and work; concept of enthalpy, definitions of specific heats at constant volume and at constant pressure. Extension of the First law to control volume; steady state-steady flow energy equation, important applications such as flow in a nozzle, throttling, adiabatic mixing etc., analysis of unsteady processes, case studies.

Unit- III

**Pure Substances & Steam Tables and Ideal & Real Gases**

Ideal and perfect gases: Differences between perfect, ideal and real gases, equation of state, evaluation of properties of perfect and ideal gases. Real Gases: Introduction. Van der Waal’s Equation of state, Van der Waal’s constants in terms of critical properties, law of corresponding states, compressibility factor; compressibility chart, and other equations of state (cubic and higher orders). Pure Substances: Definition of a pure substance, phase of a substance, triple point and critical points, sub-cooled liquid, saturated liquid, vapor pressure, two-phase mixture of liquid and vapor, saturated vapor and superheated vapor states of a pure substance with water as example. Dryness fraction and its measurement process involving in closed and open system. Representation of pure substance properties on p-T, h-S and p-V diagrams, detailed treatment of properties of steam for industrial and scientific use.

Unit -IV

**Second Law of Thermodynamics**

Identifications of directions of occurrences of natural processes, Offshoot of II law from the I. Kelvin-Planck statement of the Second law of Thermodynamic; Clasius's statement of
Second law of Thermodynamic; Equivalence of the two statements; Definition of Reversibility, examples of reversible and irreversible processes; factors that make a process irreversible, reversible heat engines; Evolution of Thermodynamic temperature scale.

**Basics of Energy conversion cycles**

Devices converting heat to work and vice versa in a thermodynamic cycle Thermal reservoirs. Heat engine and a heat pump; schematic representation and efficiency and coefficient of performance. Carnot cycle.

**Unit -V**

**Entropy**

Clausius inequality; statement, proof, application to a reversible cycle. \( \frac{\delta Q_R}{T} \) as independent of the path. Entropy; definition, a property, principle of increase of entropy, entropy as a quantitative test for irreversibility, calculation of entropy, role of T-s diagrams, representation of heat, T-ds relations, Available and unavailable energy.

**Availability and Irreversibility**

Maximum work, maximum useful work for a system and a control volume, availability of a system and a steadily flowing stream, irreversibility. Second law efficiency.

**Books and References:**


**Lab. ME-301P**

(This lab is to explain the basics of thermodynamics models)

1. Study of Fire Tube boiler
2. Study of Water Tube boiler
3. Study and working of Two stroke petrol Engine
4. Study and working of Four stroke petrol Engine
5. Study of Velocity compounded steam turbine
6. Study of Pressure compounded steam turbine
7. Study of Impulse & Reaction turbine
8. Study of steam Engine model.
9. Study of Gas Turbine Model
UNIT -I

Introduction, concept of Fluid and continuum, Physical properties of fluids, Basic laws of fluid mechanics, Rheology of fluids (3)

Fluid Statics: Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis. (5)

UNIT -II

Kinematics of Fluid flow: Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential, source, sink, doublet and half-body. (8)

UNIT- III

Dynamics of Fluid flow: Energy equation, Momentum equation, Linear momentum equation, Angular momentum equation, Euler’s Equation of motion along a streamline and its integration, Bernoulli’s equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer and LDA, notches and weirs, momentum equation and its application to pipe bends, Flow through pipes, losses in pipes, pipe in series and parallel, power transmission through a pipe, siphon, water hammer. (5)

Dimensional Analysis and Hydraulic Similitude: Dimensional analysis, Buckingham’s Pi theorem, important dimensionless numbers and their significance, geometric, kinematics and dynamic similarity, model studies. (3)

UNIT- IV

Laminar Flow: Introduction, Reynolds experiment, Equation of motion for laminar flow through pipes, transition from laminar to turbulent flow, Critical velocity, upper and lower critical velocities, Stokes’ law, Momentum correction factor, Kinetic energy correction factor. (4)

Turbulent Flow: Introduction, types of turbulent flow, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow. (4)
UNIT -V

Boundary Layer Analysis: Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sublayer, separation and its control, Drag and lift, Magnus effect.

Introduction to Computational Fluid Dynamics (CFD): Introduction, Governing equation of CFD, Computational fluid dynamics as a design tool, Impact of CFD, Discussion of physical meanings and Presentation of forms particularly suitable to CFD. Practical Application of CFD- Automobile and Engine application, Industrial manufacturing, Environmental Engineering Application.

Books and References:

9. www.nptel.iitm.ac.in/courses.

Lab.ME-302P

1. To verify the momentum equation using the experimental set-up on diffusion of submerged water jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter, Venturi-meter, and bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
5. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile using Pitot tube.
6. To study the variation of friction factor, ‘f’ for turbulent flow in commercial pipes.
7. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
8. Conduct experiment on Pontoon in order to determine the Metacentric height.
Unit-I

Crystallography and Imperfections: Concept of unit cell, space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices. X-ray crystallography techniques. Imperfections, Defects & Dislocations in solids

Unit-II
Mechanical properties and Testing: Stress strain diagram, Ductile & brittle material, Stress vs strength. Toughness, Hardness, Fracture, Fatigue and Creep. Testing such as Strength testing, Hardness testing, Impact testing, Fatigue testing, Creep testing, Non-destructive testing (NDT)

Microstructural Exam: Microscope principle, Preparation of samples and Microstructure exam and grain size determination. Comparative study of microstructure of various metals & alloys such as Mild steel, CI, Brass.


Unit-III
Ferrous materials: Brief introduction of iron and steel making furnaces. Various types of carbon steels, alloy steels and cast irons, its properties and uses.

Heat Treatment: Various types of heat treatment such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams.

Non-Ferrous metals and alloys: Non-ferrous metals such as Cu, Al, Zn, Cr, Ni etc. and its applications. Various type Brass, Bronze, bearing materials, its properties and uses. Aluminum alloys such as Duralumin. Other advanced materials/alloys.

Unit-IV
Magnetic properties: Concept of magnetism - Dia, para, ferro Hysteresis. Soft and hard magnetic materials, Magnetic storages.


Unit-V
Ceramics: Types and properties and applications of ceramics. Mechanical and Electrical behaviour and processing of Ceramics.


Composite Materials: Types of Composite materials, Properties and its applications.


Books and References:
7. ‘Elements of Material Science & Engineering’, Van Vlas, John Wiley & Sons

Lab.ME-303P
(A). Material Science Lab Experiments: at least 5 of the following:
1. Making a plastic mould for small metallic specimen.
2. Specimen preparation for micro structural examination-cutting, grinding, polishing, etching.
3. Grain Size determination of a given specimen.
4. Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after.
5. Material identification of, say, 50 common items kept in a box.
6. Faradays law of electrolysis experiment.
7. Study of microstructure of welded component and HAZ. Macro & Micro Examination.

(B). Material Testing Lab Experiments : at least 5 of the following
1. Tensile strength testing of a given mild steel specimen on UTM with full details and s-e plot on the machine.
2. Shear strength testing of a given mild steel specimen on UTM with full details and s-e plot on the machine.
3. Bending strength testing of a given mild steel specimen on UTM with full details and s-e plot on the machine.
4. Impact testing on impact testing machine like Charpy, Izod or both.
5. Hardness testing of given specimen using Rockwell and Vickers/Brinell testing machines.
6. Spring index testing on spring testing machine.
7. Creep testing on creep testing machine.
8. Deflection of beam experiment, comparison of actual measurement of deflection with dial gauge to the calculated one, and or evaluation of young’s modulus of beam.
9. Torsion testing of a rod on torsion testing machine.
UNIT-I

Simple Stress and Strain: Introduction, Normal and Shear Stress, Relation between elastic Constants, One dimensional loading of members of varying cross sections, strain energy. Compound stress and strains: Introduction, state of plane stress, Principal stress and strain, Mohr’s stress circle, Impact load & stresses.

UNIT –II

Stresses in Beams: Pure Bending and stresses in beams of different cross sections. Direct and shear stresses in beams due to transverse and axial loads, Composite beams. Introduction to shear force and bending moment, Differential equation for equilibrium, Shear force and bending moment diagrams for statically determinate beams. Deflection of Beams: Equation of elastic curve, Macaulay’s Method, moment area method, Castiglione’s Theorem

UNIT-III

Torsion of circular shaft: Review of Torsion, torque and twist, shear stress due to torque combined bending & torsion of solid & hollow shafts. Helical and Leaf Springs: deflection of springs by energy method, helical springs under axial load and under axial twist axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.

Columns and Struts: Combined bending and direct stress, middle third and middle quarter rules. Struts with different end conditions. Euler’s theory and experimental results, Ranking Gardon Formulae, Examples of columns in mechanical equipment and machines

UNIT-IV

Thin cylinders & spheres: Hoop and axial stresses and strain. Volumetric strain. Thick cylinders: Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, Compound cylinders, Stresses due to interference fits.

UNIT-V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression. Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, shear centre and its application

Books and References:

8. ‘Strength of Materials’, Timoshenko and Yoons
Lab. ME-304P
Introduction

Graphics Language, Classification of drawings, Principles of drawing, IS codes for machine
drawing, scales, types of lines, section lines, Dimensioning 2

Orthographic Projections

Revision of Principle of first angle and third angle projection, drawing of machine elements
in first angle projection, selection of views, sectional views 2

Free hand sketching

Introduction, Need for free hand sketching, Free hand sketching practice of foundation bolts,
studs, pulleys, couplings etc. 2

Screwed fasteners

Thread nomenclature, Forms of thread, Thread series, designation, Representation of threads,
Bolted joints, locking arrangement of nuts 2

Keys and Cotters and Pin joint 2

Types of keys, Cotter joint or Knuckle joint

Shaft Couplings 2

Introduction, Rigid coupling or Flexible coupling

Riveted joints

Introduction, rivets and riveting, Types of rivet heads, Types of riveted joints, Boiler joint 2

Assembly Drawing

Introduction, Engine parts-stuffing box, cross head 2

Books and References:

5. ‘Engineering drawing Practice for School and Colleges’, SP46-1988 (BIS)
Human Values & Professional Ethics

(Syllabus for the Value Education Course to be introduced in MTU Colleges/Institutes)

Subject Code-AU-301/AU-401

Course Objective

This introductory course input is intended

a. To help the students appreciate the essential complementarily between ‘VALUES’ and ‘SKILLS’ to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

b. To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of value based living in a natural way.

c. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with nature.

Thus, this course is intended to provide a much needed orientational input in Value Education to the young enquiring minds.

Course Methodology

- The methodology of this course is universally adaptable, involving a systematic and rational study of the human being vis-à-vis the rest of existence.
- It is free from any dogma or value prescriptions.
- It is a process of self-investigation and self-exploration and not of giving sermons. Whatever is found as truth or reality is stated a proposal and the students are facilitated to verify it in their own right based on their Natural Acceptance and Experiential Validation
- This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with and within the student himself/herself family.
- This self-exploration also enables them to evaluate their pre-conditionings and present beliefs.
Content for Lectures:

Unit-I

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

(6)

1. Understanding the need, basic guidelines, content and process for Value Education.
2. Self Exploration-what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation-as the mechanism for self exploration
3. Continuous Happiness and Prosperity-A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities-the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly-A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Unit-II

Understanding Harmony in the Human Being-Harmony in Myself (6)

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
8. Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha
9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
11. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Swasthya
   -Practice Exercised and Case Studies will be taken up in Practice Sessions.

Unit-III

Understanding Harmony in the Family and Society -Harmony in Human-Human Relationship (6)

13. Understanding harmony in the Family- the basic unit of human interaction
14. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti;
   Trust (Vishwas) and Respect (Samman) as the foundational values of relationship
15. Understanding the meaning of Vishwas; Difference between intention and competence
16. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship
17. Understanding the harmony in the society (society being an extension of family):
   Samadhan, samridhi, Abhay, Sah-astitva as comprehensive Human Goals
18. Visualizing a universal harmonies order in society-Undivided Society (Akhand Sama), Universal Order (Sarvabhaum Vyawastha) - from family to world family.
   -Practice Exercise and Case Studies will be taken up in Practice Sessions.

Unit-IV

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

(5)

19. Understanding the harmony in the Nature
20. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulations in nature
21. Understanding existence as Co-existence (Sah-astitva) of mutually interacting unites in all-pervasive space.
22. Holistic perception of harmony at all levels of existence

   -Practice Exercise and Case Studies will be taken up in Practice Sessions.

Unit-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

(5)

23. Natural acceptance of human values
24. Definitiveness of Ethical Human Conduct
25. Basis of Humanistic Education, Humanistic Constitution and Humanistic Universal Order
26. Competence in professional ethics;
   a. Ability to utilize the professional competence for augmenting universal human order.
   b. Ability to identify the scope and characteristics of people friendly eco-friendly production systems
   c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
27. Case studies of typical holistic technologies, management models and production systems
28. Strategy for transition from the present state to universal Human Order;
   a. At the level of individual: as socially and ecologically responsible engineers, technologies and mangers.
   b. At the level of society: as mutually enriching institutions and organizations
Content for Practice Sessions:

Unit-I

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

PS 1: Introduction yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcomings in your life? Observe and analyze them.

Expected Outcome: the students start exploring themselves; get comfortable to each other and to the teacher and start finding the need and relevance for the course.

PS 2: Now a days, there is a lot of voice about many techno-genic maladies such as energy and natural resource depletion, environment pollution, global warming, ozone depletion, deforestation, soil degradation, etc. - all these seem to be man-made problems threatening the survival of life on Earth- What is the root cause of these maladies & what is the way out in your opinion?

On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships, generation gap, depression & suicidal attempts, etc - what do you thing, is the root cause of these threats to human happiness and peace - what could be the way out in your opinion?

Expected Outcome: the students start finding that technical education without study of human values can generate more problems than solutions. They also start feeling that lack of understanding of human values is the root cause of all problems and the sustained solution could emerge only through understanding of human values and value based living. Any solution brought fear, temptation or dogma will not be sustainable.

PS 3:

1. Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of:
   (i) What is Naturally Acceptable to you in relationship-Feeling of respect or disrespect?
   (ii) What is Naturally Acceptable to you - to nurture or to exploit others?
   Is your living the same as your natural acceptance or different?

2. Out of the three basic requirements for fulfillment of your aspirations-right understanding, relationship and physical facilities, observe how the problems in your family are related to each. Also observe how much time & effort your devote for each in your daily routine.

Expected Outcome

1. The students are able to see that verification on the basis of natural acceptance and experiential validation through living is the only way to verify right or wrong, and
referring to any external source like text or instrument or any other person cannot enable them to verify with authenticity; it will only develop assumptions.

2. The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time and all they need to do is to refer to their natural acceptance to remove this disharmony.

3. The students are able to see that lack of right understanding leading to lack of relationship is the major cause of problems in their family and not the lack of physical facilities in most of the cases, while they have given higher priority to earning of physical facilities in their life ignoring relationships and not being aware that right understanding is the most important requirement for any human being.

Unit-II

Understanding Harmony in the Human Being-Harmony in Myself

PS 4: List down all your desires. Observe whether the desire is related to Self (I) or Body. If it appears to be related to both, see which part of it is related to Self (I) and which part is related to Body.

Expected Outcome: the students are able to see that they can enlist their desires and the desires are not vogue. Also they are able to relate their desires to ‘I’ and ‘Body’ distinctly. If any desire appears related to both, they are able to see that the feeling is related to I while the Physical facility is related to the body. They are also able to see that ‘I’ and ‘Body’ are two realities, and most of their desires are related to ‘I’ and not body, while their efforts are mostly centered on the fulfillment of the needs of the body assuming that it will meet the needs of ‘I’ too.

PS 5:

1. (a) Observe that any physical facility you use, follows the given sequence with time: Necessary & tasteful-unnecessary & tasteful-unnecessary & tasteless-intolerable

(b) In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If naturally acceptable, you want it continuously and if not acceptable, you do not want it any moment.

2. List down all your activities. Observe whether the activity is of ‘I’ or of Body or with the participation of both ‘I’ and Body.

3. Observe the activities within ‘I’. Identify the object of your attention for different moments (over a period of say 5 to 10 minutes) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

Expected Outcome:

1. The students are able to see that all physical facilities they use are required for limited time in limited quantity. Also they are able to see that in case of feelings, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable even for a single moment.

2. The students are able to see that activities like understanding, desire, thought and selection are the activities of ‘I’ only, the activities like breathing, palpitation of
different parts of the body are fully the activities of body with the acceptance of ‘I’
while the activities they do with their sense organs like hearing through ears, seeing
through eyes, sensing through touch, tasting through tongue and smelling through
nose or the activities they do with their work organs like hands, legs etc. are such
activities that require the participation of both ‘I’ and body.
3. The students become aware of their activities of ‘I’ and start finding their focus of
attention at different moments. Also they are able to see that most of their desires are
coming from outside (through preconditioning or sensation) and are not based on their
natural acceptance.

**PS 6:**

1. Chalk out programs to ensure that you are responsible to your body-for the
nurturing, protection and right utilization of the body.
2. Find out the plants and shrubs growing in and around your campus. Find out their
use for curing different diseases.

**Expected Outcome:** The Students are able to list down activities related to proper upkeep of
the body and practice them in their daily routine. They are also able to appreciate the plants
wildly growing in and around the campus which can be beneficial in curing different diseases

**Unit-III**

**Understanding Harmony in the Family and Society -Harmony in Human-
Human Relationship**

**PS 7:** From small groups in the class and in that group initiate dialogue and ask the eight
questions related to trust. The eight questions are:

1. a. Do I want to make myself happy? 1b. Am I able to make myself always happy?
2. a. Do I want to make the other happy? 2b. Am I able to make the other always happy?
3a. Does the other want to make him happy? 3b. Is the other able to make him always
happy?
4a. Does the other want to make me happy? 4b. Is the other able to make me always happy?

What is the answer? What is the answer?

Intention (Natural Acceptance) Competence

Let each student answer the questions for himself and everyone else. Discuss the difference
between intention and competence. Observe whether you evaluate your intention &
competence as well as the others & competence.

**Expected Outcome:** The students are able to see that the first four questions are related to
our Natural Acceptance i.e. intention and the next four to our Competence. They are able to
note that the intention is always correct, only competence is lacking! We generally evaluate
ourselves on the basis of our intention and others on the basis of their competence! We
seldom look at our competence and others’ intentions as a result we conclude that I am a
good person and other is a bad person.
PS 8:

1. Observe on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasions you are disrespecting by way of under-evaluation, over-evaluation or otherwise evaluation.
2. Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.

Expected Outcome: the students are able to see that respect is right evaluation, and only right evaluation leads to fulfillment in relationship. Many present problem in the society are and outcome of differentiation (lack of understanding of respect), like gender biasness, generation gap, caste conflicts, class struggle, dominations through power play, communal violence, clash of isms, and so on so forth. All these problems can be solved by realizing that the other is like me as he has the same natural acceptance, potential and program to ensure a happy and prosperous life for him and for others though he may have different body, physical facilities or beliefs.

PS 9:

1. Write a note in the form of story, poem, skit, essay, narration, dialogue to educate a child. Evaluate it in a group
2. Develop three chapters to introduce ‘social science-its need, scope and content’ in the primary education of children

Expected Outcome: The students are able to use their creativity for education children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible to them. The students are able to develop an outline of holistic model for social science and compare it with the exiting model.

Unit-IV

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

PS 10: List down units (things) around you. Classify them in for orders. Observe and explain the mutual fulfillment of each unit with other orders.

Expected Outcome: The students are able to differentiate between the characteristics and activities of difference orders and study the mutual fulfillment among them. They are also able to see that human beings are not fulfilling to other orders today and need to take appropriate steps to ensure right participants (in terms of nurturing, protection and utilization) in the nature.

PS 11:

1. Make a chart for the whole existence. List down different courses of studies and relate them to different units or levels in the existence.
2. Choose any one subject being taught today. Evaluate it and suggest suitable modifications to make it appropriate and holistic.

**Expected Outcome:** The students feel confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different courses of study related to the different units and levels. Also they are able to make out how these courses can be made appropriate and holistic.

**Unit-V**

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

**PS 12:** Choose any two current problems of different kind in the society and suggest how they can be solved on the basis of natural acceptance of human values. Suggest steps you will take in present conditions.

**Expected Outcome:** The students are able to present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.

**PS: 13**

1. Suggest ways in which you can use your knowledge of Technology/Engineering/Management for universal human order, from your family to the world family.
2. Suggest one format of humanistic constitution at the level of nation from your side.

**Expected Outcome:** The students are able to grasp the right utilization of their knowledge in their streams of Technology/Engineering/Management to ensure mutually enriching and recyclable productions systems.

**PS:14** The course is going to be over now. Evaluate your state before and after the course in terms of:

Do you have any plan to participate in the transition of the society after graduating from the institute? Write a brief note on it.

**Expected Outcome:** The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make us of their understanding in the course for a happy and prosperous society.

**Term Paper**

**Text Book and Reference Material**

a. **The text book:**
b. **Teacher’s Manual:**

  Video CD of Teacher Orientation Workshop will be made available on website.

c. **Reference Books**
7. AN Tripathy, 2003, Human Values, New Age International Publishers
8. Subhas Palekar, 2000, How to practice Natural farming, Pracheen (vaidik) Krishi Tantra Shodh, Amravati

d. **Relevant websites, CDs, Movies and Documentaries:**
1. Value Education website, [http://www.uptu.ac.in](http://www.uptu.ac.in)
3. AL Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology-the Untold Story
6. Anand Gandhi, Right here right now, Cyclewala Production
SYLLABUS OF SEMESTER -IV

AS-402: Basics of System Modelling & Simulation

L.T.P: 3.1.0

Course Description:

This course will cover both theoretical & application aspects of mathematical modelling of existing or new basic systems to demonstrate the concepts of modelling, approach and use of simulation techniques and their relationships to the real world systems.

Course Objectives:

1. To present concepts of computer modelling and simulation to various natural, man-made, social and engineering systems.
2. The course will provide experience of modelling & simulation specifically suited to engineering systems to show how it can help in the analysis, design, performance evaluation, operational behaviour and assessment of performance & efficiency with respect to specific goals.

Learning Outcomes:

1. Understand the modelling concepts & types of models used to represent different classes of real world systems.
2. Applying various mathematical concepts & techniques to define physical, natural & social systems.
4. Understand how to evaluate, validate & verify models of simple systems.
5. Understand how complex and heterogeneous systems can be simplified and modelled for a specific task and thus understand the limitations of modelling & simulation.

Cognitive Skills learnt:

1. Ability to mathematically model any system from various fields.
2. Ability to implement simple numerical algorithms to solve various modelling equations that are used to describe real world systems.
3. Ability to select suitable techniques for generating system models, simulate them on computers and evaluate the system performance.

Course Pre-requisites: Probability & Statistical Method

Course Content:

Unit -I: Introduction to System Modelling & Simulation: (7 lectures)

Need & use of Simulation, system models, advantages & limitations of models, simplified representation of complex & large systems, Principals & Steps in creating system models, capturing system environment, components of systems and selection of appropriate modelling techniques & simulation methodologies; relationships between selected models & simulation techniques.
Unit -II: System Modelling Concepts: (8 Lectures)

Types of system models, continuous & discrete systems, comparison of analytical & simulation methods, Event & Data Modelling, Model building, Data modelling & techniques of building useful Input Data models, multivariate & time series input models. Steps in system model building: Monte Carlo Method, verification, calibration & validation of models for simple systems.

Unit -III: Probability & Random Number generation: (7 Lectures)


Unit IV: Queuing Systems & Discrete System Simulation: (6 Lectures)


Unit -V: Real World Application of Simulation: (12 Lectures)

Transfer Line Model, Inventory System Model, Deadlock Detection Model, Computer Center Model, Job Shop Model, Just-In-Time Model, Pi value estimation, Capital recovery Model, Economics of Insurance policy, Reliability Estimation, Warranty Problem & Estimation, Computer Network Model. Interpretation of Confidence Interval of a Parameter.

References & Bibliography:


www.ocw.mit.edu: Course on “Introduction to Modelling & Simulation”.

www.wolfarm.com/system-modeler: For system modelling software & Visualizer.
List of experiments:

1. Simulation of Scheduling Algorithms: CPU Scheduling Techniques: FCFS, SJF, & Priority Scheduling, Using Queuing Theory
2. Simulation of Disk Scheduling Algorithms.
4. Simulation of System Reliability of any given system and determine its reliability and average failure rate based on the given component reliability.
6. Telephone Exchange Modelling & Call rate & Call drop estimation based on exchange capacity.
7. Congestion Modelling & Analysing the impact of congestion control algorithms in Mobile systems/ Computer networks/ Assembly Line operations.

Note: Students shall perform practicals in tutorial periods using Sci Lab which is freely downloadable from www.
Objective & Outcome of learning
This is intended to be a compulsory course for all branches of Engg. The objective of the course is to familiarize with different types of main sensors and transducers used in Industry and to familiarize how signal conditioning is to be carried out for further use. Then how to acquire this data for computer and to telemeter it over a distance. Some basic fundamental of virtual instrumentation system and display devices is stressed. This course enables the students to learn the sensors and transducers & their application course in industry.

Pre-requisite: Basic courses of Electrical and Electronics Engg EE-101/EC-101

Unit-I

Unit-II
Signals Definition, Analog Signal Processing Circuits: Bridges, Op-amp Amplifiers, Differential Amplifiers, Active Filters(Low Pass & High Pass), Frequency to Voltage Converter, Voltage to Frequency Converter, Modulator (AM), & Demodulator (Envelope Detector).

Unit-III

Unit-IV
Virtual Instrumentation
Instrumentation System for Flow, Pressure, and Temperature Measurement

Measurement Errors: Gross errors and systematic errors, Absolute and relative errors, Accuracy, Precision, Resolution and Significant figures.

UNIT V
Metrology and Inspection:
Text Books
1. DVS Murthy “Transducers and Instrumentation, PHI 2nd Edition 2013
3. Ranjan CS (et.al) “Instrumentation and Device Systems” PHI.

Reference Books
5. Principle of Textile Testing; J.E. Booth; The Textile Institute Publication.
6. Instrumental Colour Measurement and Computer Aided Color Matching for Textiles; H.S. Shah, R.S. Gandhi; Mahajan Book Distributors
7. Computer Color Matching, M.L. Gulrajani; Northern India Textile Research Association (NITRA)

Web Resource: NPTEL course.

EE-405P: List of Experiments:
2. Study of LVDT sensor
4. Frequency measurement of supply voltage
5. Study of Ultrasonic Flow Sensor
6. Study of ADC & DAC
7. Study of Proximity Sensors.
8. Acquisition of various sensors Output using USB DAQ.
10. Study of Strain Gauges.
UNIT-I

Introduction:
Classification of Fluid Machines & Devices, Application of momentum and momentum equation to flow through hydraulic machinery, Euler’s fundamental equation

Impact of jet:
Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat & curve), Effect of inclination of jet with the surface

Hydraulic Turbines:
Classification of turbines, Impulse turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Governing of Pelton wheel

UNIT-II

Reaction Turbines:
Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principles of similarity, Unit and specific speed, Performance characteristics, Selection of water turbines

UNIT-III

Centrifugal Pumps:
Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, Specific speed, Model testing, Cavitation & separation and their control, Performance characteristics.

UNIT-IV

Positive Displacement Pumps:
Reciprocating pump theory, Slip and coefficient of discharges, Indicator diagram, Effect and acceleration, Work saved by fitting air vessels, Comparison of centrifugal and reciprocating pumps, Positive rotary pumps, Gear and Vane pumps, Performance characteristics.

UNIT-V

Other Machines:
Hydraulic accumulator, Special duty pumps, Intensifier, Hydraulic press, Lift and cranes, Theory of hydraulic coupling and torque converters, Performance characteristics

Water Lifting Devices: Hydraulic ram, Jet pumps and Air lift pumps.

Books and References:

6. ‘Hydraulic Machines’, R K Rajput, S. Chand& Co Ltd.

Lab. ME-401P

(Minimum 8 experiments from following)
1. Performance test on a Pelton wheel.
2. Performance test on a Francis turbine.
3. Performance test on a Kaplan turbine.
4. Experiment on a Reciprocating pump.
5. Experiment on a Centrifugal pump.
6. Experiment on Hydraulic Jack/Press
7. Experiment on Hydraulic Brake
8. Experiment on Hydraulic Ram
9. Study through detailed visit of any water pumping station/plant
10. Experiment on Compressor
Unit-I
Introduction:

Metal Forming Processes:
Elastic, plastic deformation and yield criterion. Introductions to Hot and Cold working processes and their differences.
Analysis (equilibrium equation method) of Forging process for load estimation with sliding friction, sticking friction and mixed condition for slab and disc. Work required for forging, Hand, Power, Drop Forging, Impact forging, Swaging, Upsetting and Roll Forging. Defects of forging process and remedies

Unit-II
Metal Forming Processes (continued):
Analysis of Wire/strip drawing and maximum-reduction, Tube drawing, Extrusion and its application.
Condition for rolling forces and power estimation in rolling processes. Rolling mills and rolled-sections reduction calculations.
Design, lubrication and defects in metal forming processes

Unit-III
Sheet Metal Forming Process:
Analysis of forming process like cup/deep drawing. Bending & spring-back
Unit-IV

Unconventional Metal Forming Processes:
Need, classification, comparison with conventional processes, Unconventional metal forming processes such as explosive forming, electromagnetic, electro-hydraulic forming, Advantages Disadvantages and Limitations.

Powder Metallurgy:
Powder metallurgy processes, Powder preparation, Compaction methods, detail of sintering process, Secondary operation, the need, advantage and application of Powder metallurgy processes.

Manufacturing of Plastic Components:

Unit-V

Casting (Foundry)
Die Casting, Centrifugal casting. Investment casting, CO2 casting and Stir casting, Evaporative pattern casting.

Books and References:
4. ‘Production Technology’, P.N Rao, Vol 1, McGraw Hill,
7. ‘Manufacturing Science’, Ghosh and Mallik,
8. ‘Production Technology’, RK Jain,
Lab. ME-402P
Minimum 8 experiments out of following:

1. Pattern design for a desired casting (containing hole) considering all types of allowances
2. Preparation of wooden pattern for a given casting
3. Preparation of a sand mould (with core) for a given casting and metal casting.
4. Sand testing (at least one such as grain fineness number determination, compression test, Permeability tests etc.)
5. Preparation of a plastic component by Injection moulding machine
6. Forging calculations and shape conversion of a raw material into other by hand forging processes
7. Study of power hammer and its operations
8. Calculation of parameters of tube bending using tube bending machine.
9. Preparation of washer on press working machine
10. To perform wire drawing/extrusion on soft material.
11. Calculation of roll draft and Rolling of strip on rolling machine
12. Bending of wire/sheet and calculation of spring back
13. Experiment on powder metallurgy process
Unit-I


Unit-II


Condenser: Classification of condenser, Air leakage, Condenser performance parameters 2

Unit-III


Steam & Gas Nozzles: Flow through nozzle, Variation of velocity, Area and specific volume, Choked flow, Throat area, Nozzle efficiency, Off design operation of nozzle, Effect of friction on nozzle, Super saturated flow.

Unit-IV

Vapour Power cycles: Carnot vapour power cycle, Effect of pressure & temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Feed water heaters, Binary vapour cycle, Combined cycles, Cogeneration.

Steam Turbines: Classification of steam turbine, Impulse and reaction turbines, Staging, Stage and overall efficiency, Reheat factor, Bleeding, Velocity diagram of simple & compound multistage impulse & reaction turbines & related calculations work done efficiencies of reaction, Impulse reaction Turbines, state point locus, Comparison with steam engines, Losses in steam turbines, Governing of turbines.
Unit-V

**Gas Turbine:** Gas turbine classification, Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles

**Jet Propulsion:** Introduction to the principles of jet propulsion, Turbojet and turboprop engines & their processes, Principle of rocket propulsion, Introduction to Rocket Engine.

**Books and References:**

4. ‘Thermal Engineering’, PL Ballaney, Khanna Publisher
5. ‘Theory of Steam Turbine’, W J Kearton
6. ‘Steam & Gas Turbine’, R.adav, CPH Allahabad
7. ‘Thermal Engineering’, RK Rajput, Laxmi Publication

Lab. ME-403P

**MACHINE DRAWING – II**

**Review of Orthographic Projections:**
Orthographic Projection of solids in First angle of projection, missing lines views, interpretation of views

**Part and Assembly Drawing:**
Assembly drawing of eccentric, lathe tail stock, air valve, screw jack, connecting rod, safety valve etc.

**Specification of Materials:**
Engineering materials, representation, Code designation of steel, copper, aluminium etc.

**Limits, Tolerance and Fits:**
Limit system, Tolerances, Method of placing limit dimensions, Fits-types

**Surface Roughness:**
Introduction, nomenclature, machining symbols, indication of surface roughness

**Production Drawing:**
Types, Examples of simple machine elements like helical gear, bevel gear, crank, connecting rod, belt pulley, piston etc.

**Computer Aided Drafting:**
Introduction, input, output devices, introduction to software like AutoCAD, Pro-E, basic commands and development of 2D and 3D drawings of simple parts
Books and References:
2. ‘Machine Drawing’, K R Gopalakrishna, Shubash Publications, Bangalore, India