

**B. TECH. MECHANICAL ENGINEERING (MECHATRONICS)****I YEAR**

Code	Subject	L	T/P/D	C
A10001	English	2	-	4
A10002	Mathematics – I	3	1	6
A10302	Engineering Mechanics	3	-	6
A10004	Engineering Physics	3	-	6
A10005	Engineering Chemistry	3	-	6
A10501	Computer Programming	3	-	6
A10301	Engineering Drawing	2	3	6
A10581	Computer Programming Lab.	-	3	4
A10081	Engineering Physics & Engineering Chemistry Lab.	-	3	4
A10083	English Language Communication Skills Lab.	-	3	4
A10082	IT Workshop / Engineering Workshop	-	3	4
	<b>Total</b>	<b>19</b>	<b>16</b>	<b>56</b>

**II YEAR I SEMESTER**

Code	Subject	L	T/P/D	C
A30008	Probability and Statistics	4	-	4
A30205	Electrical Engineering	4	-	4
A30104	Mechanics of Solids	4	-	4
A30404	Electronic Devices & Circuits	4	-	4
A30305	Thermal Science	4	-	4
A31803	Metallurgy and Material Science	4	-	4
A30085	Metallurgy & Mechanics of Solids Lab	-	3	2
A30482	Electronic Devices and Circuits Lab	-	3	2
	<b>Total</b>	<b>24</b>	<b>6</b>	<b>28</b>

**II YEAR II SEMESTER**

Code	Subject	L	T/P/D	C
A40312	Production Technology	4	-	4
A40309	Kinematics of Machinery	4	-	4
A40009	Environmental Studies	4	-	4
A40006	Mathematics-II	4	-	4
A40310	Machine Drawing	-	6	4
A40110	Fluid Mechanics and Heat Transfer	4	-	4
A40282	Electrical Engineering Lab	-	3	2
A41481	Fluid Mechanics and Thermal Engineering Lab	-	3	2
	<b>Total</b>	<b>20</b>	<b>12</b>	<b>28</b>

**III YEAR I SEMESTER**

Code	Subject	L	T/P/D	C
A50010	Managerial Economics and Financial Analysis	4	-	4
A50317	Dynamics of Machinery	4	-	4
A50319	Finite Element Techniques	4	-	4
A50428	Switching Theory and Logic Design	4	-	4
A50321	Machine Tools	4	-	4
A50323	Principles of Machine Design	4	-	4
A50385	Machine Tools Lab	-	3	2
A51482	Heat Transfer and Production Technology Lab	-	3	2
	<b>Total</b>	<b>24</b>	<b>6</b>	<b>28</b>

**III YEAR II SEMESTER**

Code	Subject	L	T/P/D	C
A60332	Industrial Management	4	-	4
A60328	CAD/CAM	4	-	4
A61401	Mechanical Measurements and Control Systems	4	-	4
A60409	Analog and Digital I.C. Applications	4	-	4
	<b>Open Elective</b>			
A60117	Disaster Management			
A60018	Human Values & Professional Ethics			
A60017	Intellectual Property Rights	4	-	4
A62405	Automobile Engineering	4	-	4
A61483	CAD / CAM and Instrumentation & control Systems Lab	-	3	2
A60080	Advanced Communication Skills Lab	-	3	2
	<b>Total</b>	<b>24</b>	<b>6</b>	<b>28</b>

**IV YEAR I SEMESTER**

Code	Subject	L	T/P/D	C
A70352	Operations Research	4	-	4
A70430	Microprocessors and Micro Controllers	4	-	4
A70356	Robotics & its applications	4	-	4
A71404	Motion Control Design	4	-	4
	<b>Elective-I</b>	4	-	4
A71405	Product Design and Assembly Automation			
A70324	Renewable Energy Sources			
A70338	Computational Fluid Dynamics			
A70502	Data Structures			
	<b>Elective-II</b>	4	-	4
A70353	Power Plant Engineering			
A70506	Computer Organization			
A70341	Flexible Manufacturing System			
A70335	Advanced Kinematics and Dynamics of Machinery			
A70494	Microprocessors and Micro Controllers Lab	-	3	2
A71484	Motion Control Design and CNC & Robotics Lab	-	3	2
	<b>Total</b>	24	6	28

**IV YEAR II SEMESTER**

Code	Subject	L	T/P/D	C
A80336	Automation in manufacturing	4	-	4
	<b>Elective-III</b>			
A82914	MEMS Design			
A80366	Production Planning and Control			
A81406	Concurrent Engineering			
A80364	Plant Engineering & Maintenance	4	-	4
	<b>Elective-IV</b>			
A80527	Artificial Neural Networks			
A80019	Mathematical Modeling and Simulation			
A80129	Principles of Entrepreneurship			
A81407	MATLAB Applications	4	-	4
A80087	Industry Oriented Mini Project	-	-	2
A80089	Seminar	-	6	2
A80088	Project Work	-	15	10
A80090	Comprehensive Viva	-	-	2
	<b>Total</b>	12	21	28

**Note:** All End Examinations (Theory and Practical) are of three hours duration.

**T-Tutorial L - Theory P - Practical D-Drawing C - Credits**

## ENGLISH

### Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competencies of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks.

In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

The text for non-detailed study is for extensive reading/reading for pleasure. Hence, it is suggested that they read it on their own the topics selected for discussion in the class. The time should be utilized for working out the exercises given after each section, as also for supplementing the exercises with authentic materials of a similar kind for example, from newspaper articles, advertisements, promotional material etc.. *However, the stress in this syllabus is on skill development, fostering ideas and practice of language skills.*

### Objectives:

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To equip the students to study academic subjects more effectively using the theoretical and practical components of the English syllabus.
- To develop the study skills and communication skills in formal and informal situations.

### SYLLABUS:

#### Listening Skills:

##### Objectives

- To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
- To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

*Students should be given practice in listening to the sounds of the language to be able to recognise them, to distinguish between them to mark stress and recognise and use the right intonation in sentences.*

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

#### Speaking Skills:

##### Objectives

- To make students aware of the role of speaking in English and its contribution to their success.
  - To enable students to express themselves fluently and appropriately in social and professional contexts.
- Oral practice
  - Describing objects/situations/people
  - Role play – Individual/Group activities (Using exercises from the five units of the prescribed text: **Skills Annexe - Functional English for Success**)
  - Just A Minute(JAM) Sessions.

#### Reading Skills:

##### Objectives

- To develop an awareness in the students about the significance of silent reading and comprehension.
  - To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.
- Skimming the text
  - Understanding the gist of an argument
  - Identifying the topic sentence
  - Inferring lexical and contextual meaning
  - Understanding discourse features
  - Scanning

- Recognizing coherence/sequencing of sentences

**NOTE :** *The students will be trained in reading skills using the prescribed text for detailed study. They will be examined in reading and answering questions using ‘unseen’ passages which may be taken from authentic texts, such as magazines/newspaper articles.*

**Writing Skills :**

Objectives

1. To develop an awareness in the students about writing as an exact and formal skill
2. To equip them with the components of different forms of writing, beginning with the lower order ones.

- Writing sentences
- Use of appropriate vocabulary
- Paragraph writing
- Coherence and cohesiveness
- Narration / description
- Note Making
- Formal and informal letter writing
- Describing graphs using expressions of comparison

**TEXTBOOKS PRESCRIBED:**

**In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content, divided into Five Units, are prescribed:**

**For Detailed study: First Textbook: “Skills Annexe -Functional English for Success”,** Published by Orient Black Swan, Hyderabad

**For Non-detailed study**

1. **Second text book “Epitome of Wisdom”,** Published by Maruthi Publications, Guntur

The course content and study material is divided into **Five Units**.

**Unit –I:**

1. Chapter entitled ‘**Wit and Humour**’ from ‘**Skills Annexe**’ -**Functional English for Success**, Published by Orient Black Swan, Hyderabad
2. Chapter entitled ‘**Mokshagundam Visvesvaraya**’ from “**Epitome of Wisdom**”, Published by Maruthi Publications, Hyderabad.

L-Listening For Sounds, Stress and Intonation

S-Greeting and Taking Leave, Introducing Oneself and Others (Formal and Informal Situations)

R- Reading for Subject/ Theme

W- Writing Paragraphs

G-Types of Nouns and Pronouns

V- Homonyms, homophones synonyms, antonyms

**Unit –II**

1. Chapter entitled “**Cyber Age**” from “**Skills Annexe -Functional English for Success**” Published by Orient Black Swan, Hyderabad.

2 Chapter entitled ‘**Three Days To See**’ from “**Epitome of Wisdom**”, Published by Maruthi Publications, Hyderabad.

L – Listening for themes and facts

S – Apologizing, interrupting, requesting and making polite conversation

R- for theme and gist

W- Describing people, places, objects, events

G- Verb forms

V- noun, verb, adjective and adverb

**Unit –III**

1. Chapter entitled ‘**Risk Management**’ from “**Skills Annexe -Functional English for Success**” Published by Orient Black Swan, Hyderabad

2. Chapter entitled ‘**Leela’s Friend**’ by R.K. Narayan from “**Epitome of Wisdom**”, Published by Maruthi Publications, Hyderabad

L – for main points and sub-points for note taking

S – giving instructions and directions; Speaking of hypothetical situations

R – reading for details

W – note-making, information transfer, punctuation

G – present tense

V – synonyms and antonyms

#### Unit –IV

1. Chapter entitled '*Human Values and Professional Ethics*' from "*Skills Annexe -Functional English for Success*" Published by Orient Black Swan, Hyderabad

2. Chapter entitled '*The Last Leaf*' from "*Epitome of Wisdom*", Published by Maruthi Publications, Hyderabad

L -Listening for specific details and information

S- narrating, expressing opinions and telephone interactions

R -Reading for specific details and information

W- Writing formal letters and CVs

G- Past and future tenses

V- Vocabulary - idioms and Phrasal verbs

#### Unit –V

1. Chapter entitled '*Sports and Health*' from "*Skills Annexe -Functional English for Success*" Published by Orient Black Swan, Hyderabad

2. Chapter entitled '*The Convocation Speech*' by N.R. Narayanmurthy' from "*Epitome of Wisdom*", Published by Maruthi Publications, Hyderabad

L- Critical Listening and Listening for speaker's tone/ attitude

S- Group discussion and Making presentations

R- Critical reading, reading for reference

W-Project proposals; Technical reports, Project Reports and Research Papers

G- Adjectives, prepositions and concord

V- Collocations and Technical vocabulary

Using words appropriately

\* Exercises from the texts not prescribed shall also be used for classroom tasks.

#### REFERENCES :

1. Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi. 2010.
2. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.
3. English Grammar Practice, Raj N Bakshi, Orient Longman.
4. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.
5. Effective English, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson
6. Handbook of English Grammar & Usage, Mark Lester and Larry Beason, Tata Mc Graw –Hill.
7. Spoken English, R.K. Bansal & JB Harrison, Orient Longman.
8. Technical Communication, Meenakshi Raman, Oxford University Press
9. Objective English Edgar Thorpe & Showick Thorpe, Pearson Education
10. Grammar Games, Renuvolcuri Mario, Cambridge University Press.
11. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
12. Everyday Dialogues in English, Robert J. Dixson, Prentice Hall India Pvt Ltd.,
13. ABC of Common Errors Nigel D Turton, Mac Millan Publishers.
14. Basic Vocabulary Edgar Thorpe & Showick Thorpe, Pearson Education
15. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw –Hill.
16. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO
17. A Communicative Grammar of English, Geoffrey Leech, Jan Svartvik, Pearson Education
18. Enrich your English, Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,
19. A Grammar Book for You And I, C. Edward Good, MacMillan Publishers

#### Learning Outcomes:

1. Usage of English Language, written and spoken.
2. Enrichment of comprehension and fluency
3. Gaining confidence in using language in verbal situations.

**MATHEMATICS -I**

**Objectives:** To learn

- ❖ The types of Matrices and their properties
- ❖ Concept of rank of a matrix and applying the concept of rank to know the consistency of linear equations and to find all possible solutions, if exist.
- ❖ The concept of eigenvalues and eigenvectors of a matrix is to reduce a quadratic form into a canonical form through a linear transformation.
- ❖ The mean value theorems and to understand the concepts geometrically
- ❖ The functions of several variables and optimization of these functions.
- ❖ The evaluation of improper integrals, Beta and Gamma functions
- ❖ Multiple integration and its applications.
- ❖ Methods of Solving the differential equations of 1<sup>st</sup> and higher order
- ❖ The applications of the differential equations to Newton's law of cooling, Natural growth and decay, Bending of beams etc
- ❖ The definition of integral transforms and Laplace Transform
- ❖ Properties of Laplace transform
- ❖ Inverse Laplace Transform
- ❖ Convolution theorem
- ❖ Solution of Differential equations using Laplace transform

**UNIT-I**

**Theory of Matrices:** Real matrices – Symmetric, skew – symmetric, orthogonal. Complex matrices: Hermitian, Skew-Hermitian and Unitary Matrices. Idempotent matrix,

Elementary row and column transformations- Elementary matrix, Finding rank of a matrix by reducing to Echelon and normal forms. Finding the inverse of a non-singular square matrix using row/ column transformations (Gauss- Jordan method). Consistency of system of linear equations (homogeneous and non- homogeneous) using the rank of a matrix. Solving  $m \times n$  and  $n \times n$  linear system of equations by Gauss elimination.

Cayley-Hamilton Theorem (without proof) – Verification. Finding inverse of a matrix and powers of a matrix by Cayley-Hamilton theorem, Linear dependence and Independence of Vectors. Linear Transformation – Orthogonal Transformation. Eigen values and eigen vectors of a matrix. Properties of eigen values and eigen vectors of real and complex matrices. Finding linearly independent eigen vectors of a matrix when the eigen values of the matrix are repeated.

Diagonalization of matrix – Quadratic forms up to three variables. Rank – Positive definite, negative definite, semi definite, index, signature of quadratic forms. Reduction of a quadratic form to canonical form.

**UNIT – II**

**Differential calculus methods.** Rolle's Mean value Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – (all theorems without proof but with geometrical interpretations), verification of the Theorems and testing the applicability of these theorem to the given function.

Functions of several variables: Functional dependence- Jacobian- Maxima and Minima of functions of two variables without constraints and with constraints-Method of Lagrange multipliers.

**UNIT – III**

**Improper integration, Multiple integration & applications:** Gamma and Beta Functions –Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions

Multiple integrals – double and triple integrals – change of order of integration- change of variables (polar, cylindrical and spherical) Finding the area of a region using double integration and volume of a region using triple integration.

**UNIT – IV**

**Differential equations and applications** Overview of differential equations- exact, linear and Bernoulli (NOT TO BE EXAMINED). Applications of first order differential equations – Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories.

Linear differential equations of second and higher order with constant coefficients, Non-homogeneous term of the type  $f(x) = e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , and  $x^n$ ,  $e^{ax} V(x)$ ,  $x^n V(x)$ , method of variation of parameters. Applications to bending of beams, Electrical circuits and simple harmonic motion.

## UNIT – V

**Laplace transform and its applications to Ordinary differential equations** Definition of Integral transform, Domain of the function and Kernel for the Laplace transforms. Existence of Laplace transform. Laplace transform of standard functions, first shifting Theorem, Laplace transform of functions when they are multiplied or divided by “t”. Laplace transforms of derivatives and integrals of functions. – Unit step function – second shifting theorem – Dirac’s delta function, Periodic function – Inverse Laplace transform by Partial fractions( Heaviside method) Inverse Laplace transforms of functions when they are multiplied or divided by “s”, Inverse Laplace Transforms of derivatives and integrals of functions, Convolution theorem — Solving ordinary differential equations by Laplace transforms.

### TEXT BOOKS:

1. Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.
2. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.

### REFERENCES:

1. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3<sup>rd</sup> edition, Narosa Publishing House, Delhi.
2. Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Others, S. Chand.
3. Engineering Mathematics – I by D. S. Chandrasekhar, Prison Books Pvt. Ltd.
4. Engineering Mathematics – I by G. Shanker Rao & Others I.K. International Publications.
5. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3<sup>rd</sup> Edi, CRC Press Taylor & Francis Group.
6. Mathematics for Engineers and Scientists, Alan Jeffrey, 6th Edi, 2013, Chapman & Hall/ CRC
7. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education.

### Outcome:

- ❖ After learning the contents of this Unit the student is able to write the matrix representation of a set of linear equations and to analyze solutions of system of equations.
- ❖ The student will be able to understand the methods of differential calculus to optimize single and multivariable functions.
- ❖ The student is able to evaluate the multiple integrals and can apply the concepts to find the Areas, Volumes, Moment of Inertia etc., of regions on a plane or in space.
- ❖ The student is able to identify the type of differential equation and uses the right method to solve the differential equation. Also able to apply the theory of differential equations to the real world problems.
- ❖ The student is able to solve certain differential equations using Laplace Transform. Also able to transform functions on time domain to frequency domain using Laplace transforms.



**ENGINEERING MECHANICS**

**UNIT – I**

Introduction to Engineering Mechanics – Basic Concepts. **Resultants of Force System:** Parallelogram law – Forces and components- Resultant of coplanar Concurrent Forces – Components of forces in Space – Moment of Force - principle of moments – Coplanar Applications – Couples - Resultant of any Force System.

**Equilibrium of Force Systems :** Free Body Diagrams, Equations of Equilibrium - Equilibrium of planar Systems - Equilibrium of Spatial Systems.

**UNIT – II**

**FRICTION:** Introduction – Theory of Friction – Angle of friction - Laws of Friction – Static and Dynamic Frictions – Motion of Bodies: Wedge, Screw, Screw-jack, and Differential Screw-jack.

**Transmission of Power:** Flat Belt Drives - Types of Flat Belt Drives – Length of Belt, tensions, Tight side, Slack Side, Initial and Centrifugal – Power Transmitted and Condition for Max. Power.

**UNIT – III**

**CENTROIDS AND CENTERS OF GRAVITY:** Introduction – Centroids and Centre of gravity of simple figures (from basic principles ) – Centroids of Composite Figures - Theorem of Pappus – Center of gravity of bodies and centroids of volumes.

**Moments of Inertia :** Definition – Polar Moment of Inertia –Radius of gyration - Transfer formula for moment of inertia - Moments of Inertia for Composite areas - Products of Inertia, Transfer Formula for Product of Inertia.

**Mass Moment of Inertia :** Moment of Inertia of Masses- Transfer Formula for Mass Moments of Inertia - mass moment of inertia of composite bodies.

**UNIT – IV**

**KINEMATICS OF A PARTICLE:** Motion of a particle – Rectilinear motion – motion curves – Rectangular components of curvilinear motion– Kinematics of Rigid Body - Types of rigid body motion -Angular motion - Fixed Axis Rotation

**Kinetics of particles:** Translation -Analysis as a Particle and Analysis as a Rigid Body in Translation – Equations of plane motion - Angular motion - Fixed Axis Rotation – Rolling Bodies.

**UNIT – V**

**WORK – ENERGY METHOD:** Work energy Equations for Translation - Work-Energy Applications to Particle Motion – Work energy applied to Connected Systems - Work energy applied to Fixed Axis Rotation and Plane Motion. Impulse and momentum.

**Mechanical Vibrations :** Definitions and Concepts – Simple Harmonic Motion – Free vibrations, simple and Compound Pendulums – Torsion Pendulum – Free vibrations without damping: General cases.

**TEXT BOOKS:**

1. Engineering Mechanics - Statics and Dynamics by Ferdinand.L. Singer / Harper International Edition.
2. Engineering Mechanics/ S. Timoshenko and D.H. Young, Mc Graw Hill Book Compan.

**REFERENCES:**

1. Engineering Mechanics / Irving Shames / Prentice Hall
2. A text of Engineering Mechanics /YVD Rao/ K. Govinda Rajulu/ M. Manzoor Hussain, Academic Publishing Company
3. Engg. Mechanics / M.V. Seshagiri Rao & D Rama Durgaiyah/ Universities Press
4. Engineering Mechanics, Umesh Regl / Tayal.
5. Engg. Mechanics / KL Kumar / Tata McGraw Hill.
6. Engg. Mechanics / S.S. Bhavikati & K.G. Rajasekharappa

### ENGINEERING PHYSICS

#### Objectives:

It gives

- to the students basic understanding of bonding in solids, crystal structures and technique to characterize crystals
- to understand the behavior of electron in a solid and thereby one can determine the conductivity and specific heat values of the solids
- to study applications in Engineering like memory devices, transformer core and Electromagnetic machinery
- to help the student to design powerful light sources for various Engineering Applications and also enable them to develop communication systems using Fiber Technology
- to understand the working of Electronic devices, how to design acoustic proof halls and understand the behavior of the materials at Nano scale

#### UNIT-I

**Crystallography:** Ionic Bond, Covalent Bond, Metallic Bond, Hydrogen Bond, Vander-Waal's Bond, Calculation of Cohesive Energy of diatomic molecule- Space Lattice, Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Miller Indices, Crystal Planes and Directions, Inter Planar Spacing of Orthogonal Crystal Systems, Structure of Diamond and NaCl.

**X-ray Diffraction & Defects in Crystals:** Bragg's Law, X-Ray diffraction method: Laue Method, Powder Method: Point Defects: Vacancies, Substitutional, Interstitial, Frenkel and Schottky Defects, line defects (Qualitative) & Burger's Vector.

#### UNIT-II

**Principles of Quantum Mechanics:** Waves and Particles, de Broglie Hypothesis, Matter Waves, Davisson and Germer' Experiment, Heisenberg's Uncertainty Principle, Schrödinger's Time Independent Wave Equation - Physical Significance of the Wave Function – Infinite square well potential, extension to three dimensions

**Elements of Statistical Mechanics & Electron theory of Solids:** Phase space, Ensembles, Micro Canonical, Canonical and Grand Canonical Ensembles - Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics (Qualitative Treatment), Concept of Electron Gas, Density of States, Fermi Energy- Electron in a periodic Potential, Bloch Theorem, Kronig-Penny Model (Qualitative Treatment), E-K curve, Origin of Energy Band Formation in Solids, Concept of Effective Mass of an Electron, Classification of Materials into Conductors, Semi Conductors & Insulators.

#### UNIT-III

**Dielectric Properties:** Electric Dipole, Dipole Moment, Dielectric Constant, Polarizability, Electric Susceptibility, Displacement Vector, Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities: Ionic and Electronic - Internal Fields in Solids, Clausius - Mossotti Equation, Piezo -electricity and Ferro- electricity.

**Magnetic Properties & Superconducting Properties:** Permeability, Field Intensity, Magnetic Field Induction, Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magneton, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Domain Theory of Ferro Magnetism on the basis of Hysteresis Curve, Soft and Hard Magnetic Materials, Properties of Anti-Ferro and Ferri Magnetic Materials and their Applications, Superconductivity, Meissner Effect, Effect of Magnetic field, Type-I & Type-II Superconductors, Applications of Superconductors

#### UNIT-IV

**Optics:** Interference-Interference in thin films(Reflected light), Newton rings experiment- Fraunhofer diffraction due to single slit, N-slits, Diffraction grating experiment, Double refraction-construction and working of Nicol's Prism

**Lasers & Fiber Optics:** Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Einstein's Coefficients and Relation between them, Population Inversion, Lasing Action, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers- Principle of Optical Fiber, Construction of fiber, Acceptance Angle and Acceptance Cone, Numerical Aperture, Types of Optical Fibers: Step Index and Graded Index Fibers, Attenuation in Optical Fibers, Application of Optical Fiber in communication systems.

#### UNIT-V:

**Semiconductor Physics:** Fermi Level in Intrinsic and Extrinsic Semiconductors, Calculation of carrier concentration in Intrinsic &, Extrinsic Semiconductors, Direct and Indirect Band gap semiconductors, Hall Effect-Formation of PN

Junction, Open Circuit PN Junction, Energy Diagram of PN Diode, Diode Equation, I-V Characteristics of PN Junction diode, Solar cell, LED & Photo Diodes. **Acoustics of Buildings &** Acoustic Quieting;, Reverberation and Time of Reverberation, Sabine's Formula for Reverberation Time, Measurement of Absorption Coefficient of a Material, Factors Affecting The Architectural Acoustics and their Remedies

**Nanotechnology:** Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-gel, Top-down Fabrication: Chemical Vapour Deposition, Characterization by TEM.

**TEXT BOOKS:**

1. Engineering Physics, K. Malik, A. K. Singh, Tata Mc Graw Hill Book Publishers
2. Engineering Physics, V. Rajendran, Tata Mc Graw Hill Book Publishers

**REFERENCES:**

1. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker by John Wiley & Sons
2. Sears and Zemansky's University Physics (10th Edition) by Hugh D. Young Roger A. Freedman, T. R. Sandin, A. Lewis Ford Addison-Wesley Publishers;
3. Applied Physics for Engineers – P. Madhusudana Rao (Academic Publishing company, 2013)
4. Solid State Physics – M. Armugam (Anuradha Publications).
5. Modern Physics – R. Murugesan & K. Siva Prasath – S. Chand & Co. (for Statistical Mechanics).
6. A Text Book of Engg Physics – M. N. Avadhanulu & P. G. Khsirsagar– S. Chand & Co. (for acoustics).
7. Modern Physics by K. Vijaya Kumar, S. Chandralingam: S. Chand & Co.Ltd
8. Nanotechnology – M. Ratner & D. Ratner (Pearson Ed.).
9. Introduction to Solid State Physics – C. Kittel (Wiley Eastern).
10. Solid State Physics – A.J. Dekker (Macmillan).
11. Applied Physics – Mani Naidu Pearson Education

**Outcomes:**

- The student would be able to learn the fundamental concepts on behavior of crystalline solids.
- The knowledge on Fundamentals of Quantum Mechanics, Statistical Mechanics enables the student to apply to various systems like Communications Solar Cells, Photo Cells and so on.
- Design, Characterization and study of properties of materials help the student to prepare new materials for various Engineering applications.
- This course also helps the student exposed to non destructive testing methods.
- Finally, Engineering Physics Course helps the student to develop problem solving skills and analytical skills

**ENGINEERING CHEMISTRY**

**Objectives:**

An engineer is as someone who uses scientific, natural and physical principles to design something of use for people or other living creatures. Much of what any engineer does involves chemistry because everything in our environment has a molecular make up. Engineering requires the concepts of applied chemistry and the more chemistry an engineer understands, the more beneficial it is. In the future, global problems and issues will require an in-depth understanding of chemistry to have a global solution. This syllabus aims at bridging the concepts and theory of chemistry with examples from fields of practical application, thus reinforcing the connection between science and engineering. It deals with the basic principles of various branches of chemistry which are fundamental tools necessary for an accomplished engineer.

**UNIT I:**

**Electrochemistry & Corrosion:** Electro Chemistry – Conductance - Specific, Equivalent and Molar conductance and their Units; Applications of Conductance (Conductometric titrations). **EMF:** Galvanic Cells, types of Electrodes – (Calomel, Quinhydrone and glass electrodes); Nernst equation and its applications ; concept of concentration cells, electro chemical series, Potentiometric titrations, determination of  $P^H$  using glass electrode-Numerical problems.

**Batteries:** Primary cells (dry cells) and secondary cells (lead-Acid cell, Ni-Cd cell, Lithium cells). Applications of batteries. **Fuel cells** – Hydrogen – Oxygen fuel cell; methanol – oxygen fuel cell ; Advantages and Applications.

**Corrosion and its control:** Causes and effects of corrosion; Theories of corrosion – Chemical & Electrochemical corrosion; Types of corrosion ( Galvanic, Water line, Pitting and Intergranular); Factors affecting rate of corrosion – Nature of metal and Nature of Environment – Corrosion control methods – Cathodic protection (sacrificial anodic and impressed current). Surface coatings: Metallic coatings & methods of application of metallic coatings - hot dipping (galvanization & tinning), Cementation, cladding, electroplating ( copper plating ) Electroless plating ( Ni plating) - Organic coatings – Paints - constituents and their functions.

**UNIT II:**

**Engineering Materials: Polymers:** Types of Polymerization (Chain & Step growth).**Plastics:** Thermoplastic & Thermo setting resins; Compounding & fabrication of plastics (Compression and injection moulding ).Preparation, properties, engineering applications of PVC, Teflon and Bakelite.

**Fibers-** Characteristics of fibers – preparation, properties and uses of Nylon – 6,6 and Dacron – Fiber Reinforced Plastics (FRP) – applications. **Rubbers** – Natural rubber and its vulcanization. Elastomers – Buna-s, Butyl rubber and Thiokol rubber.

**Conducting polymers:** Polyacetylene, Polyaniline, Mechanism of Conduction, doping; applications of Conducting polymers. **Bio-degradable Polymers-** preparation and Applications of Poly vinyl acetate and Poly lactic acid -

**Cement:** composition of Portland cement, setting & hardening of cement (reactions), **Lubricants:** Classification with examples- Characteristics of a good lubricant & mechanism of lubrication (thick film , thin film and extreme pressure) – properties of lubricants: viscosity , Cloud point, flash and fire points. **Refractories:** Classification, characteristics of a good refractory and applications.

**Nanomaterials:** Introduction, preparation by sol-gel & chemical vapour deposition methods. Applications of nanomaterials.

**UNIT III:**

**Water and its Treatment:** Hardness of Water: Causes of hardness, expression of hardness – units – types of hardness, estimation of temporary & permanent hardness of water by EDTA method - numerical problems. Boiler troubles – Scale & sludges, Priming and foaming, caustic embrittlement and boiler corrosion; Treatment of boiler feed water – Internal treatment ( Phosphate, Colloidal and calgon conditioning) – External treatment – Lime Soda process, Zeolite process and ion exchange process. Numerical Problems. **Potable Water-** Its Specifications – Steps involved in treatment of potable water – Disinfection of water by chlorination and ozonisation. Reverse osmosis & its significance.

**Unit – IV :**

**Fuels & Combustion: Fuels** – Classification – solid fuels : coal – analysis of coal - proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining – cracking – types – fixed bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol, Bergius and Fischer-Tropsch's process: Gaseous fuels - constituents and applications of natural gas, LPG and CNG. Analysis of flue gas by Orsat's apparatus – Numerical Problems.

**Combustion** – Definition, Calorific value of fuel – HCV , LCV; Determination of calorific value by Junker's gas calorimeter – theoretical calculation of Calorific value by Dulong's formula – Numerical problems on combustion.

**UNIT V:**

**Phase Rule & Surface Chemistry : Phase Rule:** Definition of terms : Phase, component, degree of freedom, phase rule equation. Phase diagrams – one component system- water system. Two component system Lead- Silver, cooling curves, heat treatment based on iron-carbon phase diagram - hardening, annealing and normalization.

**Surface Chemistry: Adsorption** – Types of Adsorption, Isotherms – Freundlich and Langmuir adsorption isotherm, applications of adsorption; **Colloids:** Classification of Colloids; Electrical & optical properties, micelles, applications of colloids in industry.

**TEXT BOOKS:**

1. Engineering Chemistry by R.P. Mani, K.N. Mishra, B. Rama Devi /CENGAGE learning.
2. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company (2008).

**REFERENCE BOOKS**

1. Engineering Chemistry by B. Siva Shankar Mc.Graw Hill Publishing Company Limited, New Delhi (2006)
2. Engineering Chemistry J.C. Kuriacase & J. Rajaram, Tata McGraw Hills Publishing Company Limited, New Delhi (2004).
3. Text Book of Engineering Chemistry by S.S. Dara & Mukkati S. Chand & Co Publishers, New Delhi(2006)
4. Chemistry of Engineering Materials by CV Agarwal, C.P Murthy, A.Naidu, BS Publications.

**Outcomes:**

- Students will demonstrate a depth of knowledge and apply the methods of inquiry in a discipline of their choosing, and they will demonstrate a breadth of knowledge across their choice of varied disciplines.
- Students will demonstrate the ability to access and interpret information, respond and adapt to changing situations, make complex decisions, solve problems, and evaluate actions.
- Students will demonstrate awareness and understanding of the skills necessary to live and work in a diverse engineering world.

### COMPUTER PROGRAMMING

#### Objectives:

- To understand the various steps in Program development.
- To understand the basic concepts in C Programming Language.
- To learn how to write modular and readable C Programs.
- To learn to write programs (using structured programming approach) in C to solve problems.
- To introduce the students to basic data structures such as lists, stacks and queues.
- To make the student understand simple sorting and searching methods.

#### UNIT - I

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Program Development.

Introduction to the C Language – Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output, Operators(Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements- Selection Statements(making decisions) – if and switch statements, Repetition statements ( loops)-while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Simple C Program examples.

#### UNIT - II

Functions-Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Limitations of recursion, example C programs, Preprocessor commands.

Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples.

#### UNIT - III

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, Pointer Applications-Arrays and Pointers, Pointer Arithmetic and arrays, Passing an array to a function, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions.

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

#### UNIT - IV

Enumerated, Structure ,and Union Types– The Type Definition(typedef), Enumerated types, Structures –Declaration, initialization, accessing structures, operations on structures, Complex structures, structures and functions, Passing structures through pointers, self referential structures, unions, bit fields, C programming examples, command –line arguments,

Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling), Positioning functions, C program examples.

#### UNIT – V

Searching and Sorting – Sorting- selection sort, bubble sort, Searching-linear and binary search methods.

Lists- Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks- Push and Pop Operations, Queues- Enqueue and Dequeue operations.

#### TEXT BOOKS:

1. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Programming in C. P. Dey and M Ghosh , Oxford University Press.

#### REFERENCE BOOKS:

1. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.
2. C for All, S. Thamarai Selvi, R.Murugesan, Anuradha Publications.
3. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7<sup>th</sup> Edition, Pearson education.
4. Programming in C, Ajay Mittal, Pearson.
5. Programming with C, B.Gottfried, 3<sup>rd</sup> edition, Schaum's outlines, TMH.

6. Problem solving with C, M.T.Somasekhara, PHI
7. Programming with C, R.S.Bickar, Universities Press.
8. Computer Programming & Data Structures, E.Balagurusamy, 4<sup>th</sup> edition, TMH.
9. Programming in C – Stephen G. Kochan, III Edition, Pearson Education.
10. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI.
11. C Programming with problem solving, J.A. Jones & K. Harrow,Dreamtech Press.

**Outcomes:**

- Demonstrate the basic knowledge of computer hardware and software.
- Ability to apply solving and logical skills to programming in C language and also in other languages.

**ENGINEERING DRAWING**

**UNIT – I**

**Introduction to Engineering Drawing:** Principles of Engineering Drawing/Graphics – Various Drawing Instruments – Conventions in Drawing – **Lettering practice** – BIS Conventions.

**Curves:** Constructions of Curves used in Engineering Practice:

- Conic Sections including the Rectangular Hyperbola – General method only.
- Cycloid, Epicycloid and Hypocycloid
- Involute.

**Scales:** Construction of different types of Scales, Plain, Diagonal, Vernier scale.

**UNIT – II**

**Orthographic Projections in First Angle**

**Projection:** Principles of Orthographic Projections – Conventions – First and Third Angle projections.

**Projections of Points.** including Points in all four quadrants.

**Projections of Lines** - Parallel, perpendicular, inclined to one plan and inclined to both planes. True length and true angle of a line. Traces of a line.

**Projections of Planes:** Plane parallel, perpendicular and inclined to one reference plane. Plane inclined to both the reference planes.

**UNIT – III**

**Projections of Solids:** Projections of regular solids, cube, prisms, pyramids, tetrahedron, cylinder and cone, axis inclined to both planes.

**Sections and Sectional Views:** Right Regular Solids – Prism, Cylinder, Pyramid, Cone – use of Auxiliary views.

**UNIT – IV**

**Development of Surfaces:** Development of Surfaces of Right, Regular Solids – Prisms, Cylinder, Pyramids, Cone and their parts. frustum of solids.

**Intersection of Solids:-** Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

**UNIT – V**

**Isometric Projections :** Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions – Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of parts with Spherical surface.

**Transformation of Projections :** Conversion of Isometric Views to Orthographic Views. Conversion of orthographic views to isometric views – simple objects.

**Perspective Projections :** Perspective View : Points, Lines and Plane Figures, Vanishing Point Methods (General Method only).

**TEXT BOOKS**

- Engineering Drawing – Basant, Agrawal, TMH
- Engineering Drawing, N.D. Bhatt

**REFERENCES :**

- Engineering Graphics. P I Varghese Tata McGraw Hill Education Pvt. Ltd.
- Engineering drawing – P.J. Shah .S.Chand Publishers.
- Engineering Drawing- Johle/Tata Macgraw Hill Book Publishers.
- Engineering Drawing – M.B. Shah and B.C. Rana, Pearson.
- Engineering Drawing by K.Venu Gopal& V.Prabu Raja New Age Publications.
- Engineering Drawing By John. PHI Learning Publisher.



**COMPUTER PROGRAMMING LAB**

**Objectives:**

- To write programs in C to solve the problems.
- To implement linear data structures such as lists, stacks, queues.
- To implement simple searching and sorting methods.

**Recommended Systems/Software Requirements:**

- Intel based desktop PC
- ANSI C Compiler with Supporting Editors

**Week 1**

- a) Write a C program to find the sum of individual digits of a positive integer.
- b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
- c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

**Week 2**

- a) Write a C program to calculate the following Sum:  
 $Sum = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$
- b) Write a C program to find the roots of a quadratic equation.

**Week 3**

- a) The total distance travelled by vehicle in 't' seconds is given by distance  $s = ut + 1/2at^2$  where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec<sup>2</sup>). Write C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.
- b) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, \*, /, % and use Switch Statement)

**Week 4**

- a) Write C programs that use both recursive and non-recursive functions
- i) To find the factorial of a given integer.
  - ii) To find the GCD (greatest common divisor) of two given integers.

**Week 5**

- a) Write a C program to find the largest integer in a list of integers.
- b) Write a C program that uses functions to perform the following:
- i) Addition of Two Matrices
  - ii) Multiplication of Two Matrices

**Week 6**

- a) Write a C program that uses functions to perform the following operations:
- i) To insert a sub-string in to a given main string from a given position.
  - ii) To delete n Characters from a given position in a given string.
- b) Write a C program to determine if the given string is a palindrome or not

**Week 7**

- a) Write a C program that displays the position or index in the string S where the string T begins, or - 1 if S doesn't contain T.
- b) Write a C program to count the lines, words and characters in a given text.

**Week 8**

- a) Write a C program to generate Pascal's triangle.
- b) Write a C program to construct a pyramid of numbers.

**Week 9**

Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:

$$1 + x + x^2 + x^3 + \dots + x^n$$

For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Print x, n, the sum

Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.

**Week 10**

- a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
- b) Write a C program to convert a Roman numeral to its decimal equivalent.

#### **Week 11**

Write a C program that uses functions to perform the following operations:

- i) Reading a complex number
- ii) Writing a complex number
- iii) Addition of two complex numbers
- iv) Multiplication of two complex numbers

(Note: represent complex number using a structure.)

#### **Week 12**

a) Write a C program which copies one file to another.

b) Write a C program to reverse the first n characters in a file.

(Note: The file name and n are specified on the command line.)

#### **Week 13**

a) Write a C program to display the contents of a file.

b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

#### **Week 14**

a) Write a C program that uses non recursive function to search for a Key value in a given list of integers using Linear search.

b) Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers using Binary search.

#### **Week 15**

a) Write a C program that implements the Selection sort method to sort a given array of integers in ascending order.

b) Write a C program that implements the Bubble sort method to sort a given list of names in ascending order.

#### **Week 16**

Write a C program that uses functions to perform the following operations:

- i) Create a singly linked list of integer elements.
- ii) Traverse the above list and display the elements.

#### **Week 17**

Write a C program that implements stack (its operations) using a singly linked list to display a given list of integers in reverse order. Ex. input: 10 23 4 6 output: 6 4 23 10

#### **Week 18**

Write a C program that implements Queue (its operations) using a singly linked list to display a given list of integers in the same order. Ex. input: 10 23 4 6 output: 10 23 4 6

#### **Week 19**

Write a C program to implement the linear regression algorithm.

#### **Week 20**

Write a C program to implement the polynomial regression algorithm.

#### **Week 21**

Write a C program to implement the Lagrange interpolation.

#### **Week 22**

Write C program to implement the Newton- Gregory forward interpolation.

#### **Week 23**

Write a C program to implement Trapezoidal method.

#### **Week 24**

Write a C program to implement Simpson method.

#### **TEXT BOOKS:**

1. **C programming and Data Structures, P. Padmanabham, Third Edition, BS Publications**
2. Computer Programming in C, V. Rajaraman, PHI Publishers.
3. C Programming, E.Balagurusamy, 3<sup>rd</sup> edition, TMH Publishers.
4. C Programming, M.V.S.S.N.Prasad, ACME Learning Pvt. Ltd.
5. C and Data Structures, N.B.Venkateswarlu and E.V.Prasad,S.Chand Publishers
6. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publishers.

**ENGINEERING PHYSICS / ENGINEERING CHEMISTRY LAB**

**ENGINEERING PHYSICS LAB  
(Any TEN experiments compulsory)**

**Objectives**

This course on Physics lab is designed with 13 experiments in an academic year. It is common to all branches of Engineering in B.Tech Ist year.

The objective of the course is that the student will have exposure to various experimental skills which is very essential for an Engineering student.

The experiments are selected from various area of Physics like Physical Optics, Lasers, Fiber Optics, Sound, Mechanics, Electricity & Magnetism and Basic Electronics.

Also the student is exposed to various tools like Screw gauge, Vernier Callipers, Physics Balance , Spectrometer and Microscope.

1. Dispersive power of the material of a prism – Spectrometer
2. Determination of wavelength of a source – Diffraction Grating.
3. Newton's Rings - Radius of curvature of plano convex lens.
4. Melde's experiment – Transverse and longitudinal modes.
5. Time constant of an R-C circuit.
6. L-C-R circuit.
7. Magnetic field along the axis of current carrying coil – Stewart and Gees method.
8. Study the characteristics of LED and LASER sources.
9. Bending losses of fibres & Evaluation of numerical aperture of a given fibre.
10. Energy gap of a material of p-n junction.
11. Torsional pendulum.
12. Wavelength of light –diffraction grating - using laser.
13. Characteristics of a solar cell

**LABORATORY MANUAL:**

1. Laboratory Manual of Engineering Physics by Dr.Y.Aparna & Dr.K.Venkateswara Rao (V.G.S Publishers)

**Outcomes**

The student is expected to learn from this laboratory course the concept of error and its analysis. It also allows the student to develop experimental skills to design new experiments in Engineering.

With the exposure to these experiments the student can compare the theory and correlate with experiment.

**ENGINEERING CHEMISTRY LAB**

List of Experiments ( Any 12 of the following) :

**Titrimetry:**

1. Estimation of ferrous iron by dichrometry.
2. Estimation of hardness of water by EDTA method.

**Mineral analysis:**

3. Determination of percentage of copper in brass.
4. Estimation of manganese dioxide in pyrolusite.

**Instrumental Methods:**

**Colorimetry:**

5. Determination of ferrous iron in cement by colorimetric method
6. Estimation of copper by colorimetric method.

**Conductometry:**

7. Conductometric titration of strong acid vs strong base.
8. Conductometric titration of mixture of acids vs strong base.

**Potentiometry:**

9. Titration of strong acid vs strong base by potentiometry.
10. Titration of weak acid vs strong base by potentiometry.

**Physical properties:**

11. Determination of viscosity of sample oil by redwood / oswald's viscometer.

12. Determination of Surface tension of lubricants.

**Preparations:**

13. Preparation of Aspirin
14. Preparation of Thiokol rubber

**Adsorption:**

15. Adsorption of acetic acid on charcoal.

**TEXT BOOKS:**

1. Practical Engineering Chemistry by K. Mukkanti, et al, B.S. Publications, Hyderabad.
2. Inorganic quantitative analysis, Vogel.

**REFERENCE BOOKS:**

1. Text Book of engineering chemistry by R. N. Goyal and Harmendra Goel, Ane Books Private Ltd.,
2. A text book on experiments and calculation Engg. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year B.Tech. MC

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ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

The **Language Lab** focuses on the production and practice of sounds of language and familiarises the students with the use of English in everyday situations and contexts.

**Objectives**

- ☒ To facilitate computer-aided multi-media instruction enabling individualized and independent language learning
- ☒ To sensitise the students to the nuances of English speech sounds, word accent, intonation and rhythm
- ☒ To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking
- ☒ To improve the fluency in spoken English and neutralize mother tongue influence
- ☒ To train students to use language appropriately for interviews, group discussion and public speaking

**Syllabus: English Language Communication Skills Lab shall have two parts:**

- a. **Computer Assisted Language Learning (CALL) Lab**
- b. **Interactive Communication Skills (ICS) Lab**

The following course content is prescribed for the **English Language Communication Skills Lab**

**Exercise – I**

**CALL Lab:** Introduction to Phonetics – Speech Sounds – Vowels and Consonants

**ICS Lab:** Ice-Breaking activity and JAM session

Articles, Prepositions, Word formation- Prefixes & Suffixes, Synonyms & Antonyms

**Exercise – II**

**CALL Lab:** Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.

**ICS Lab:** Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing Others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette.

Concord (Subject in agreement with verb) and Words often misspelt- confused/misused

**Exercise - III**

**CALL Lab:** Minimal Pairs- Word accent and Stress Shifts- Listening Comprehension.

**ICS Lab:** Descriptions- Narrations- Giving Directions and guidelines.

Sequence of Tenses, Question Tags and One word substitutes.

**Exercise – IV**

**CALL Lab:** Intonation and Common errors in Pronunciation.

**ICS Lab:** Extempore- Public Speaking

Active and Passive Voice, –Common Errors in English, Idioms and Phrases

**Exercise – V**

**CALL Lab:** Neutralization of Mother Tongue Influence and Conversation Practice

**ICS Lab:** Information Transfer- Oral Presentation Skills

Reading Comprehension and Job Application with Resume preparation.

**Minimum Requirement of infra structural facilities for ELCS Lab:**

1. **Computer Assisted Language Learning (CALL) Lab:**

**The Computer aided Language Lab** for 40 students with 40 systems, one master console, LAN facility and English language software for self- study by learners.

**System Requirement (Hardware component):**

*Computer network with Lan with minimum 60 multimedia systems with the following specifications:*

- i) P – IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB

ii) Headphones of High quality

**2. Interactive Communication Skills (ICS) Lab :**

**The Interactive Communication Skills Lab:** A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digital stereo –audio & video system and camcorder etc.

**Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):**

1. Suresh Kumar, E. & Sreehari, P. 2009. *A Handbook for English Language Laboratories*. New Delhi: Foundation
2. *Speaking English Effectively 2<sup>nd</sup>* Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
3. Sasi Kumar, V & Dhamija, P.V. *How to Prepare for Group Discussion and Interviews*. Tata McGraw Hill
4. Hancock, M. 2009. *English Pronunciation in Use. Intermediate*. Cambridge: CUP
5. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad.
6. Hewings, M. 2009. *English Pronunciation in Use. Advanced*. Cambridge: CUP
7. Marks, J. 2009. *English Pronunciation in Use. Elementary*. Cambridge: CUP
8. Nambiar, K.C. 2011. *Speaking Accurately. A Course in International Communication*. New Delhi : Foundation
9. Soundararaj, Francis. 2012. *Basics of Communication in English*. New Delhi: Macmillan
10. **Spoken English** (CIEFL) in 3 volumes with 6 cassettes, OUP.
11. **English Pronouncing Dictionary** Daniel Jones Current Edition with CD.
12. **A textbook of English Phonetics for Indian Students** by T. Balasubramanian (Macmillan)
13. **Prescribed Lab Manual:** A Manual entitled "**English Language Communication Skills (ELCS) Lab Manual- cum- Work Book**", published by Cengage Learning India Pvt. Ltd, New Delhi. 2013

**DISTRIBUTION AND WEIGHTAGE OF MARKS**

**English Language Laboratory Practical Examination:**

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional marks and 50 year-end Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The year- end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

**Learning Outcomes:**

1. Better Understanding of nuances of language through audio- visual experience and group activities
2. Neutralization of accent for intelligibility
3. Speaking with clarity and confidence thereby enhancing employability skills of the students

**IT WORKSHOP / ENGINEERING WORKSHOP**

**Objectives:**

The IT Workshop for engineers is a training lab course spread over 54 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel and Power Point.

**PC Hardware** introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. **The students should work on working PC to disassemble and assemble to working condition and install Windows and Linux on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.**

**Internet & World Wide Web** module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.

**Productivity tools** module would enable the students in crafting professional word documents, excel spread sheets and power point presentations using the Microsoft suite of office tools and LaTeX. **(Recommended to use Microsoft office 2007 in place of MS Office 2003)**

**PC Hardware**

**Week 1 – Task 1 :** Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

**Week 2 – Task 2 :** Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

**Week 3 – Task 3 :** Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

**Week 4 – Task 4 :** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

**Week 5 – Task 5: Hardware Troubleshooting:** Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

**Week 6 – Task 6 : Software Troubleshooting :** Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

**Internet & World Wide Web**

**Week 7 - Task 1 : Orientation & Connectivity Boot Camp :** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

**Week 8 - Task 2 : Web Browsers, Surfing the Web :** Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

**Week 9 - Task 3 : Search Engines & Netiquette** : Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

**Week 10 - Task 4: Cyber Hygiene:** Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

**Week 11- Task 5:** Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

## **Productivity tools**

### **LaTeX and Word**

**Week 12 – Word Orientation:** The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007/ equivalent (FOSS) tool word: Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the three tasks and features that would be covered in each, using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

**Task 1 : Using LaTeX and Word** to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

**Week 13 - Task 2: Creating project abstract** Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

**Week 14 - Task 3 : Creating a Newsletter** : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

### **Excel**

**Week 15 - Excel Orientation:** The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the two tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

**Task 1: Creating a Scheduler** - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

**Week 16 - Task 2 : Calculating GPA** - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting

### **LaTeX and MS/equivalent (FOSS) tool Power Point**

**Week 17 - Task1:** Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Power point. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

**Week 18- Task 2:** Second week helps students in making their presentations interactive. Topic covered during this week includes: Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

**Week 19 - Task 3:** Concentrating on the in and out of Microsoft power point and presentations in LaTeX. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.

### **REFERENCE BOOKS:**

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.



2. LaTeX Companion – Leslie Lamport, PHI/Pearson.
3. Introduction to Computers, Peter Norton, 6/e Mc Graw Hill Publishers.
4. Upgrading and Repairing, PC's 18<sup>th</sup> e, Scott Muller QUE, Pearson Education
5. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
7. PC Hardware and A+Handbook – Kate J. Chase PHI (Microsoft)

**Outcomes:**

- Apply knowledge for computer assembling and software installation.
- Ability how to solve the trouble shooting problems.
- Apply the tools for preparation of PPT, Documentation and budget sheet etc.

**ENGINEERING WORKSHOP**

**1. TRADES FOR EXERCISES:**

**At least two exercises from each trade:**

1. Carpentry
2. Fitting
3. Tin-Smithy and Development of jobs carried out and soldering.
4. Black Smithy
5. House-wiring
6. Foundry
7. Welding
8. Power tools in construction, wood working, electrical engineering and mechanical Engineering.

**2. TRADES FOR DEMONSTRATION & EXPOSURE:**

1. Plumbing
2. Machine Shop
3. Metal Cutting (Water Plasma)

**TEXT BOOK:**

1. Work shop Manual - P.Kannaiah/ K.L.Narayana/ Scitech Publishers.
2. Workshop Manual / Venkat Reddy/ BS Publications/Sixth Edition

**PROBABILITY AND STATISTICS**

**Objectives: To learn**

- Understand a random variable that describes randomness or an uncertainty in certain realistic situation. It can be of either discrete or continuous type.
- In the discrete case, study of the binomial and the Poisson random variables and the Normal random variable for the continuous case predominantly describe important probability distributions. Important statistical properties for these random variables provide very good insight and are essential for industrial applications.
- Most of the random situations are described as functions of many single random variables. In this unit, the objective is to learn functions of many random variables through joint distributions.
- The types of sampling, Sampling distribution of means, Sampling distribution of variance, Estimations of statistical parameters, Testing of hypothesis of few unknown statistical parameters.
- The mechanism of queuing system, The characteristics of queue, The mean arrival and service rates
- The expected queue length, The waiting line
- The random processes, The classification of random processes, Markov chain, Classification of states
- Stochastic matrix ( transition probability matrix ), Limiting probabilities, Applications of Markov chains

**UNIT-I**

**Single Random variables and probability distributions:** Random variables – Discrete and continuous. Probability distributions, mass function/ density function of a probability distribution. Mathematical Expectation, Moment about origin, Central moments Moment generating function of probability distribution. Binomial, Poisson & normal distributions and their properties. Moment generating functions of the above three distributions, and hence finding the mean and variance.

**UNIT-II**

**Multiple Random variables, Correlation & Regression:** Joint probability distributions- Joint probability mass / density function, Marginal probability mass / density functions, Covariance of two random variables, Correlation - Coefficient of correlation, The rank correlation. Regression- Regression Coefficient, The lines of regression and multiple correlation & regression.

**UNIT-III**

**Sampling Distributions and Testing of Hypothesis**

**Sampling:** Definitions of population, sampling, statistic, parameter. Types of sampling, Expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance.

**Parameter estimations** – likelihood estimate, interval estimations.

**Testing of hypothesis:** Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, Level of significance. One sided test, two sided test,

**Large sample tests:**

- Test of Equality of means of two samples equality of sample mean and population mean (cases of known variance & unknown variance, equal and unequal variances)
- Tests of significance of difference between sample S.D and population S.D.
- Tests of significance difference between sample proportion and population proportion & difference between two sample proportions.

**Small sample tests:**

Student t-distribution, its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples

Snedecor's F- distribution and its properties. Test of equality of two population variances

Chi-square distribution, its properties, Chi-square test of goodness of fit

**UNIT-IV**

**Queuing Theory:** Structure of a queuing system, Operating Characteristics of queuing system, Transient and steady states, Terminology of Queuing systems, Arrival and service processes- Pure Birth-Death process Deterministic queuing models- M/M/1 Model of infinite queue, M/M/1 model of finite queue.

## UNIT-V

**Stochastic processes:** Introduction to Stochastic Processes –Classification of Random processes, Methods of description of random processes, Stationary and non-stationary random process, Average values of single random process and two or more random processes. Markov process, Markov chain, classification of states – Examples of Markov Chains, Stochastic Matrix.

### TEXT BOOKS:

- 1) Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers
- 2) Probability and Statistics for Engineers and Scientists by Sheldon M.Ross, Academic Press
- 3) Operations Research by S.D. Sarma,

### REFERENCE BOOKS:

1. Mathematics for Engineers by K.B.Datta and M.A S.Srinivas,Cengage Publications
2. Probability and Statistics by T.K.V.Iyengar & B.Krishna Gandhi Et
3. Fundamentals of Mathematical Statistics by S C Gupta and V.K.Kapoor
4. Probability and Statistics for Engineers and Scientists by Jay I.Devore.

### Outcomes:

- Students would be able to identify distribution in certain realistic situation. It is mainly useful for circuit as well as non-circuit branches of engineering. Also able to differentiate among many random variable involved in the probability models. It is quite useful for all branches of engineering.
- The student would be able to calculate mean and proportions (small and large sample) and to make important decisions from few samples which are taken out of unmanageably huge populations .It is Mainly useful for non-circuit branches of engineering.
- The students would be able to find the expected queue length, the ideal time, the traffic intensity and the waiting time. These are very useful tools in many engineering and data management problems in the industry. It is useful for all branches of engineering.
- The student would able to understand about the random process, Markov process and Markov chains which are essentially models of many time dependent processes such as signals in communications, time series analysis, queuing systems. The student would be able to find the limiting probabilities and the probabilities in  $n^{\text{th}}$  state. It is quite useful for all branches of engineering

II Year B.Tech. MC I sem

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4	-/-/-	4

**ELECTRICAL ENGINEERING**

**Objective:**

This course introduces the concepts of electrical DC and AC circuits, basic law's of electricity, instruments to measure the electrical quantities, different methods to solve the electrical networks, construction operational features of energy conversion devices i.e. DC machines, transformers, induction motors and synchronous machines.

**UNIT I**

**Introduction:** SI Unit's ohm's law, series, and parallel circuits, Kirchoff's laws, Star-delta transformation (Simple Problems)– Force on a current carrying conductor in magnetic field– electromagnetic induction, Faraday's law, Lenz's law – Self and mutual inductances.

**Electrical Instruments:** Basic principles of indicating instruments – moving coil and moving iron instruments (Ammeters and voltmeters).

**UNIT II**

**Single Phase AC Circuits:** Generation of an alternating EMF – average and RMS values of alternating quantity – representation of alternating quantities by phasors – single phase series and parallel circuits (simple problems)– series and parallel resonance – three phase balanced systems – single and three phase power calculations.

**UNIT III**

**DC Generators:** Principle of operation of DC machines – EMF equation – types of generators – Magnetization and Load characteristics of DC generators

**DC Motors:** Principle of operation of DC Motor, Types of Motors, Back EMF Equation, Characteristics of DC motor, Torque Equation, DC Motor Starter (Three Point starter), Efficiency Calculation, Swinburne's Test and speed control.

**UNIT IV**

**Transformers:** Construction and principle of operation of single phase transformer –EMF equation O.C. & S.C. tests – efficiency and regulation.

**Induction Motors:** Principle and operation of three phase induction motors – types of motors, Squirrel cage and slip ring motor – slip torque characteristics.

**UNIT V**

**Alternators:** Principle and operation of alternators – O.C. & S.C. tests – regulation by synchronous impedance method.

**TEXT BOOKS:**

1. Basic concepts of Electrical Engineering, PS Subramanyam, BS Publications.
2. Basic Electrical Engineering, S.N. Singh, PHI.

**REFERENCE BOOKS:**

1. Basic Electrical Engineering, Abhijit Chakrabarathi, Sudipta nath, Chandrakumar Chanda, Tata-McGraw-Hill.
2. Principles of Electrical Engineering, V.K Mehta, Rohit Mehta, S.Chand Publications.
3. Basic Electrical Engineering, T.K.Nagasarkar and M.S. Sukhija, Oxford University Press.
4. Fundamentals of Electrical Engineering, RajendraPrasad, PHI.
5. Basic Electrical Engineering by D.P.Kothari , I.J. Nagrath, McGraw-Hill.

**Outcome:**

After going through this course the student gets a thorough knowledge on basic electrical circuits, parameters, and operation of the transformers in the energy conversion process, electromechanical energy conversion, construction operation characteristics different types applications of DC and AC machines and the constructional features and operation of measuring instruments like voltmeter, ammeter, wattmeter etc..., With which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.

**MECHANICS OF SOLIDS**

**UNIT – I**

**Simple Stresses & Strains** : Elasticity and plasticity – Types of stresses & strains–Hooke’s law– stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson’s ratio & volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

**UNIT – II**

**Shear Force and Bending Moment** : Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

**UNIT – III**

**Flexural Stresses** : Theory of simple bending – Assumptions – Derivation of bending equation:  $M/I = f/y = E/R$  Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T,Angle and Channel sections – Design of simple beam sections.

**Shear Stresses**: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

**UNIT-IV**

**Principal Stresses and Strains**: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr’s circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

**Theories of Failure**: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

**UNIT – V**

**Torsion of Circular Shafts** : Theory of pure torsion – Derivation of Torsion equations :  $T/J = q/r = N\theta/L$  – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

**Thin Cylinders** : Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders– Thin spherical shells.

**TEXT BOOKS :**

1. Strength of materials – R.S. Kurmi and Gupta.
2. Solid Mechanics, by Popov
3. Strength of Materials – Ryder. G.H.; Macmillan Long Man Pub.
4. Strength of Materials – W.A. Nash, TMH

**REFERENCES :**

1. Strength of Materials -By Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol –I by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
4. Strength of Materials by D.S Prakash Rao, Universities Press Pvt. Ltd.
5. Strength of Materials by S.S.Rattan, Tata McGraw Hill Education Pvt. Ltd.
6. Fundamentals of Solid Mechancis by M.L.Gambhir, PHI Learning Pvt. Ltd
7. Strength of Materials by R.K Rajput, S.Chand & Company Ltd.

### ELECTRONIC DEVICES AND CIRCUITS

#### Objectives:

This is a fundamental course, basic knowledge of which is required by all the circuit branch engineers. This course focuses:

- To familiarize the student with the principle of operation, analysis and design of Junction diode, BJT and FET transistors and amplifier circuits.
- To understand diode as rectifier.
- To study basic principle of filter circuits and various types.

#### UNIT -I:

**P-N Junction Diode** Qualitative Theory of P-N Junction, P-N Junction as a Diode, Diode Equation, Volt-Ampere Characteristics, Temperature dependence of VI characteristic, Ideal versus Practical – Resistance levels (Static and Dynamic), Transition and Diffusion Capacitances, Diode Equivalent Circuits, Load Line Analysis, Breakdown Mechanisms in Semiconductor Diodes, Zener Diode Characteristics.

**Special Purpose Electronic Devices:** Principle of Operation and Characteristics of Tunnel Diode (with the help of Energy Band Diagram), Varactor Diode, SCR and Semiconductor Photo Diode.

#### UNIT -II:

**Rectifiers and Filters :** The P-N junction as a Rectifier, Half wave Rectifier, Full wave Rectifier, Bridge Rectifier, Harmonic components in a Rectifier Circuit, Inductor Filters, Capacitor Filters, L- Section Filters,  $\pi$ - Section Filters, Comparison of Filters, Voltage Regulation using Zener Diode.

#### UNIT -III:

**Bipolar Junction Transistor and UJT:** The Junction Transistor, Transistor Current Components, Transistor as an Amplifier, Transistor Construction, BJT Operation, BJT Symbol, Common Base, Common Emitter and Common Collector Configurations, Limits of Operation, BJT Specifications, BJT Hybrid Model, Determination of h-parameters from Transistor Characteristics, Comparison of CB, CE, and CC Amplifier Configurations, UJT and Characteristics.

#### UNIT -IV:

**Transistor Biasing and Stabilization:** Operating Point, The DC and AC Load lines, Need for Biasing, Fixed Bias, Collector Feedback Bias, Emitter Feedback Bias, Collector - Emitter Feedback Bias, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against variations in  $V_{BE}$  and  $\beta$ , Bias Compensation using Diodes and Transistors, Thermal Runaway, Thermal Stability, Analysis of a Transistor Amplifier Circuit using h-Parameters.

#### UNIT -V:

##### Field Effect Transistor and FET Amplifiers

**Field Effect Transistor:** The Junction Field Effect Transistor (Construction, principle of operation, symbol) – Pinch-off Voltage - Volt-Ampere characteristics, The JFET Small Signal Model, MOSFET (Construction, principle of operation, symbol), MOSFET Characteristics in Enhancement and Depletion modes.

**FET Amplifiers:** FET Common Source Amplifier, Common Drain Amplifier, Generalized FET Amplifier, Biasing FET, FET as Voltage Variable Resistor, Comparison of BJT and FET.

#### TEXT BOOKS:

1. Millman's Electronic Devices and Circuits – J. Millman, C.C.Halkias, and Satyabrata Jit, 2 Ed.,1998, TMH.
2. Electronic Devices and Circuits – Mohammad Rashid, Cengage Learning, 2013
3. Electronic Devices and Circuits – David A. Bell, 5 Ed, Oxford

#### REFERENCE BOOKS:

1. Integrated Electronics – J. Millman and Christos C. Halkias, 1991 Ed., 2008, TMH.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, 9 Ed., 2006, PEI/PHI.
3. Electronic Devices and Circuits – B. P. Singh, Rekha Singh, Pearson, 2 Ed, 2013.
4. Electronic Devices and Circuits - K. Lal Kishore, 2 Ed., 2005, BSP.
5. Electronic Devices and Circuits – Anil K. Maini, Varsha Agarwal, 1 Ed., 2009, Wiley India Pvt. Ltd.
6. Electronic Devices and Circuits – S.Salivahanan, N.Suresh Kumar, A.Vallavaraj, 2 Ed., 2008, TMH.

**Course Outcomes:**

At the end of the course, the student will be able to:

- Understand and Analyse the different types of diodes, operation and its characteristics
- Design and analyse the DC bias circuitry of BJT and FET
- Design biasing circuits using diodes and transistors.
- To analyze and design diode application circuits, amplifier circuits and oscillators employing BJT, FET devices.

**THERMAL SCIENCE**

**UNIT-I**

**Introduction: Basic Concepts:** System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State Property, Process, Cycle – Reversibility – Quasi – static Process, Irreversible Process Work and Heat, Point and Path function.

**UNIT II**

**Zerth Law of Thermodynamics:** Concept of quality of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale – PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation. Limitations of the First Law

**UNIT – III**

**Second Law of Thermodynamics :** Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Statement of Third Law of Thermodynamics.

**UNIT- IV**

**Power Cycles :** Otto, Diesel, Dual Combustion cycles, – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison with Ideal and Actual Cycles.

**UNIT- V**

**I.C. Engines:**

Classification – Two & Four Stroke Engines , Working principles, Valve and Port Timing Diagrams, - Types Engine arrangement systems. Fuels used , Modes of fuel Admission to engine cylinder, carburetor, Fuel Injector, Ignition , Cooling and Lubrication systems

**TEXT BOOKS :**

1. Thermal Engineering / Rajput / Lakshmi Publications
2. Engineering Thermodynamics – P.K Nag, TMH
3. I.C. Engines – V. Ganesan, TMH
4. Thermal Sciences – Merle C. Potter, Elaine P. Scott, Cengage Learning

**REFERENCE BOOKS:**

1. Engineering Thermodynamics – Jones & Dugan
2. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles /TMH
3. Thermodynamics – J.P.Holman / McGrawHill
4. An introduction to Thermodynamics / YVC Rao / University Press



**METALLURGY AND MATERIALS SCIENCE**

**UNIT – I**

**Structure of Metals:** Crystallography, Miller's indices, Packing Efficiency, Density calculations. Grains and Grain Boundaries. Effect of grain size on the properties. Determination of grain size by different methods.

**Constitution of Alloys:** Necessity of alloying, Types of solid solutions, Hume - Rothery rules, Intermediate alloy phases.

**UNIT –II**

**Phase Diagrams:** Construction and interpretation of phase diagrams, Phase rule. Lever rule. Binary phase Diagrams, Isomorphous, Eutectic and Eutectoid transformations with examples.

**UNIT –III**

**Engineering Materials –I Steels:**

**Iron-Carbon Phase Diagram and Heat Treatment:** Study of Fe-Fe<sub>3</sub>C phase diagram. Construction of TTT diagrams. Annealing, Normalizing, Hardening and Tempering of steels, Hardenability. Alloy steels.

**UNIT –IV**

**Engineering Materials –II: Cast Irons:** Structure and properties of White Cast iron, Malleable Cast iron, Grey cast iron.  
**Engineering Materials-III: Non-ferrous Metals and Alloys:** Structure and properties of copper and its alloys, Aluminium and its alloys, Al-Cu phase diagram, Titanium and its alloys.

**UNIT – V**

**Engineering Materials –IV:**

**Ceramics, Polymers and Composites:** Crystalline ceramics, glasses, cermets: structure, properties and applications. Classification, properties and applications of composites. Classification, Properties and applications of Polymers.

**TEXT BOOKS:**

1. Material Science and Metallurgy/ Kodgire
2. Essentials of Materials Science and engineering / Donald R.Askeland / Thomson.

**REFERENCES:**

1. Introduction to Physical Metallurgy / Sidney H. Avner.
2. Materials Science and engineering / William and callister.
3. Elements of Material science / V. Rahghavan
4. Engineering Material and Metallurgy – Er Amandeep Singh Wadhva
5. Materials Science for Engineering Students- Traugott Fischer 2009 Edition.

**METALLURGY AND MECHANICS OF SOLIDS LAB**

**(A) METALLURGY LAB :**

1. Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
3. Study of the Micro Structures of Cast Irons.
4. Study of the Micro Structures of Non-Ferrous alloys.
5. Study of the Micro structures of Heat treated steels.
6. Hardeneability of steels by Jominy End Quench Test.
7. To find out the hardness of various treated and untreated steels.

**(B) MECHNICS OF SOLIDS LAB :**

1. Direct tension test
2. Bending test on
  - a) Simple supported
  - b) Cantilever beam
3. Torsion test
4. Hardness test
  - a) Brinells hardness test
  - b) Rockwell hardness test
5. Test on springs
6. Compression test on cube
7. Impact test
8. Punch shear test

NOTE : Any 10 experiments from the above are to be conducted taking atleast 4 from each section.

**ELECTRONIC DEVICES AND CIRCUITS LAB**

**PART A: (Only for Viva-voce Examination)**

**Electronic Workshop Practice (In 3 Lab Sessions):**

1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB's
2. Identification, Specifications and Testing of Active Devices, Diodes, BJT's, Low power JFET's, MOSFET's, Power Transistors, LED's, LCD's, SCR, UJT.
3. Study and operation of
  - i. Multimeters (Analog and Digital)
  - ii. Function Generator
  - iii. Regulated Power Supplies
  - iv. CRO.

**PART B: (For Laboratory Examination – Minimum of 10 experiments)**

1. Forward & Reverse Bias Characteristics of PN Junction Diode.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Input & Output Characteristics of Transistor in CB Configuration and h-parameter calculations.
4. Input & Output Characteristics of Transistor in CE Configuration and h-parameter calculations.
5. Half Wave Rectifier with & without filters.
6. Full Wave Rectifier with & without filters.
7. FET characteristics.
8. Design of Self-bias circuit.
9. Frequency Response of CC Amplifier.
10. Frequency Response of CE Amplifier.
11. Frequency Response of Common Source FET amplifier .
12. SCR characteristics.
13. UJT Characteristics

**PART C: Equipment required for Laboratories:**

- |                                      |   |
|--------------------------------------|---|
| 1. Regulated Power supplies (RPS)    | -0-30 V   |
| 2. CRO's                             | -0-20 MHz.  |
| 3. Function Generators               | -0-1 MHz.   |
| 4. Multimeters                       |   |
| 5. Decade Resistance Boxes/Rheostats |   |
| 6. Decade Capacitance Boxes          |   |
| 7. Ammeters (Analog or Digital)      | -0-20 $\mu$ A, 0-50 $\mu$ A, 0-100 $\mu$ A, 0-200 $\mu$ A, 0-10 mA.   |
| 8. Voltmeters (Analog or Digital)    | -0-50V, 0-100V, 0-250V  |
| 9. Electronic Components             | -Resistors, Capacitors, BJTs, LCDs, SCRs, UJTs, FETs, LEDs, MOSFETs, Diodes- Ge & Si type, Transistors – NPN, PNP type) |

**PRODUCTION TECHNOLOGY**

**UNIT – I**

**Casting:** Steps involved in making a casting - Its applications - Patterns and Types of patterns – Pattern allowances and their construction. Types of casting processes –Solidification of casting.

**UNIT – II**

**Welding:** welding Types - Oxy-fuel gas cutting – standard time and cost calculations. Arc welding, forge welding – Resistance welding, Thermit welding.

**UNIT – III**

Inert Gas Welding, TIG Welding, MIG welding, Friction welding, induction welding, explosive welding, Laser Welding, Laser Welding Soldering and Brazing, Heat affected zone in welding. Welding defects – causes and remedies – destructive and non- destructive testing of welds.

**UNIT – IV**

Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth, Comparison of properties of Cold and Hot worked parts, Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements

Stamping, forming and other cold working processes : Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning – Types of presses and press tools. Forces and power requirement for the above operations.

**UNIT – V**

**Extrusion of Metals:** Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion

**Forging Processes:** Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging. **Forging hammers:** Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

**TEXT BOOKS :**

1. Manufacturing Technology (Vol.1) / P.N. Rao/TMH/2<sup>nd</sup> Edition
2. Workshop Technology (Vol.1) /Hajra Chowdary/Asia Publishing House/2<sup>nd</sup> Edition

**REFERENCE BOOKS:**

1. Production Technology /Sarma P C /S.Chand
2. Production Technology / R.K. Jain/Khanna Publishers
3. Metal Casting / T.V Ramana Rao / New Age
4. Principles of Metal Castings / Rosenthal/TMH
5. A Course in Workshop Technology/B.S. Raghuvamshi /Dhanpat rai & Sons
6. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson Edu.

### KINEMATICS OF MACHINERY

#### UNIT – I

**Mechanisms:** Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematics pairs – Types of constrained motion-kinetic chain-. Mechanism-machine-Structure - inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains, Mechanical Advantage-Grubler's Criterion.

#### UNIT – II

**Kinematics:** Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method.

**Plane Motion of Body:** Instantaneous center of rotation- centrodes and axodes – Three centers in line theorem – Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method.

Kliens construction - Coriolis acceleration - determination of Coriolis component of acceleration

**Analysis of Mechanisms:** Analysis of slider crank chain for displacement- velocity and acceleration of slider – Acceleration diagram for a given mechanism.

#### UNIT – III

**Straight-Line Motion Mechanisms:** Exact and approximate copied and generated types – Peaucellier - Hart - Scott Russel – Grasshopper – Watt -Tchebicheff's and Robert Mechanism - Pantographs

**Steering Gears:** Conditions for correct steering – Davis Steering gear, Ackerman's steering gear.

**Hooke's Joint:** Single and double Hooke's joint –velocity ratio – application – problems.

#### UNIT – IV

**CAMS:** Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion - Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

**Analysis of Motion Of Followers:** Tangent cam with Roller follower – circular arc cam with straight, concave and convex flanks.

#### UNIT – V

**Higher Pair:** Friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion – velocity of sliding

Forms of teeth, cycloidal and involutes profiles – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference – expressions for arc of contact and path of contact of Pinion & Gear and Pinion & Rack Arrangements– Introduction to Helical – Bevel and worm gearing

**Gear Trains:** Introduction – Types – Simple – compound and reverted gear trains – Epicyclic gear train. Methods of finding train value or velocity ratio of Epicyclic gear trains. Selection of gear box - Differential gear for an automobile

#### TEXT BOOKS:

1. Theory of Machines and Mechanisms/JOSEPH E. SHIGLEY/Oxford/3<sup>rd</sup> Edition/International Edition
2. Theory of Machines / Thomas Bevan/Pearson/3<sup>rd</sup> Edition

#### REFERENCE BOOKS:

1. Theory of Mechanism and Machines /Jagdish Lal/Metropolitan Book Company
2. Theory of Machines /S.S.Rattan / Tata McGraw Hill Publishers.
3. Kinematics & Dynamics Of machinery/Norton/TMH
4. Theory of Machines / Sadhu Singh / Pearson.
5. Mechanism and Machine Theory / JS Rao and RV Duggipati / New Age
6. Theory of Machines by / R.K. Bansal (Lakshmi Publications).

**ENVIRONMENTAL STUDIES**

**Objectives:**

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures.
3. Understanding the environmental policies and regulations

**UNIT-I :**

**Ecosystems:** Definition, Scope and Importance of ecosystem. Classification, structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

**UNIT-II:**

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

**UNIT-III:**

**Biodiversity And Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

**UNIT-IV:**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

**UNIT-V:**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

**SUGGESTED TEXT BOOKS:**

- 1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
- 2 Environmental Studies by R. Rajagopalan, Oxford University Press.

**REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T.Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M.Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B.Botkin & Edward A.Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4<sup>th</sup> Edition, New age international publishers.

5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

**Outcomes:**

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which inturn helps in sustainable development

**MATHEMATICS - II**

**Objectives:**

- The objective is to find the relation between the variables x and y out of the given data (x,y).
- This unit also aims to find such relationships which exactly pass through data or approximately satisfy the data under the condition of least sum of squares of errors.
- The aim of numerical methods is to provide systematic methods for solving problems in a numerical form using the given initial data.
- This topic deals with methods to find roots of an equation and solving a differential equation.
- The numerical methods are important because finding an analytical procedure to solve an equation may not be always available.
- In the diverse fields like electrical circuits, electronic communication, mechanical vibration and structural engineering, periodic functions naturally occur and hence their properties are very much required.
- Indeed, any periodic and non-periodic function can be best analyzed in one way by Fourier series and transforms methods.
- The unit aims at forming a partial differential equation (PDE) for a function with many variables and their solution methods. Two important methods for first order PDE's are learnt. While separation of variables technique is learnt for typical second order PDE's such as Wave, Heat and Laplace equations.
- In many Engineering fields the physical quantities involved are vector-valued functions.
- Hence the unit aims at the basic properties of vector-valued functions and their applications to line integrals, surface integrals and volume integrals.

**UNIT – I**

**Vector Calculus:** Vector Calculus: Scalar point function and vector point function, Gradient- Divergence- Curl and their related properties. Solenoidal and irrotational vectors – finding the Potential function. Laplacian operator. Line integral – work done – Surface integrals -Volume integral. Green's Theorem, Stoke's theorem and Gauss's Divergence Theorems (Statement & their Verification).

**UNIT – II:**

**Fourier series and Fourier Transforms:** Definition of periodic function. Fourier expansion of periodic functions in a given interval of length  $2\pi$  . Determination of Fourier coefficients – Fourier series of even and odd functions – Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions. Fourier integral theorem - Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

**UNIT – III:**

**Interpolation and Curve fitting**

**Interpolation:** Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences –Central differences – Symbolic relations of symbols. Difference expressions – Differences of a polynomial-Newton's formulae for interpolation - Gauss Central Difference Formulae –Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

**Curve fitting:** Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares.

**UNIT – IV : Numerical techniques**

**Solution of Algebraic and Transcendental Equations and Linear system of equations:** Introduction – Graphical interpretation of solution of equations .The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method .

Solving system of non-homogeneous equations by L-U Decomposition method (Crout's Method). Jacobi's and Gauss-Seidel iteration methods.

**UNIT – V**

**Numerical Integration and Numerical solutions of differential equations:**

Numerical integration - Trapezoidal rule, Simpson's  $1/3^{rd}$  and  $3/8$  Rule , Gauss-Legendre one point, two point and three point formulas.



Numerical solution of Ordinary Differential equations: Picard's Method of successive approximations. Solution by Taylor's series method – Single step methods-Euler's Method-Euler's modified method, Runge-Kutta (second and classical fourth order) Methods.

**Boundary values & Eigen value problems:** Shooting method, Finite difference method and solving eigen values problems, power method

**TEXT BOOKS:**

1. Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.

**REFERENCES:**

1. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi & Others, S. Chand.
2. Introductory Methods by Numerical Analysis by S.S. Sastry, PHI Learning Pvt. Ltd.
3. Mathematical Methods by G.Shankar Rao, I.K. International Publications, N.Delhi
4. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3<sup>rd</sup> Edi, 2013, CRC Press Taylor & Francis Group.
5. Mathematics for Engineers and Scientists, Alan Jeffrey, 6th Edi, 2013, Chapman & Hall/ CRC
6. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Person Education
7. Mathematics For Engineers By K.B.Datta And M.A S.Srinivas,Cengage Publications

**Outcomes:** From a given discrete data, one will be able to predict the value of the data at an intermediate point and by curve fitting, can find the most appropriate formula for a guessed relation of the data variables. This method of analysis data helps engineers to understand the system for better interpretation and decision making

- After studying this unit one will be able to find a root of a given equation and will be able to find a numerical solution for a given differential equation.
- Helps in describing the system by an ODE, if possible. Also, suggests to find the solution as a first approximation.
- One will be able to find the expansion of a given function by Fourier series and Fourier Transform of the function.
- Helps in phase transformation, Phase change and attenuation of coefficients in acoustics.
- After studying this unit, one will be able to find a corresponding Partial Differential Equation for an unknown function with many independent variables and to find their solution.
- Most of the problems in physical and engineering applications, problems are highly non-linear and hence expressing them as PDEs'. Hence understanding the nature of the equation and finding a suitable solution is very much essential.
- After studying this unit, one will be able to evaluate multiple integrals (line, surface, volume integrals) and convert line integrals to area integrals and surface integrals to volume integrals.
- It is an essential requirement for an engineer to understand the behavior of the physical system.

**MACHINE DRAWING**

**PART-A**

**MACHINE DRAWING CONVENTIONS:**

Need for drawing conventions – introduction to ISI conventions - Conventional representation of materials, common machine elements such as screws, nuts, bolts, keys, gears, webs, ribs. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features. Title boxes, their size, location and details - common abbreviations and their liberal usage. Types of Drawings – working drawings for machine parts.

**DRAWING OF MACHINE ELEMENT:**

Simple parts - Selection of Views, additional views for the following machine elements and parts with every drawing proportions. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws. Keys, cottered joints and knuckle joint. Rivetted joints for plates. Shaft coupling, spigot and socket pipe joint. Journal, pivot and collar and foot step bearings.

**PART- B**

**ASSEMBLY DRAWINGS:**

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions. Engine parts – stuffing boxes, cross heads, Eccentrics - Connecting Rod – Piston Assembly. Machine tool parts: Tail stock, Tool Post, Machine Vices - Screws jacks- Plummer block. **VALVES:** Spring loaded safety valve, feed check valve and air cock.

**NOTE:** First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

***QUESTION PAPER:** Should have 25% for Part A - 3 out of 4 Questions and  
75% for Part B- No choice one assembly figure*

**TEXT BOOK :**

1. Machine Drawing /K.L.Narayana/ New Age International Publishers
2. Textbook of Machine Drawing/K.C. John/PHI/Eastern Economy Edition

**REFERENCE BOOKS:**

1. Machine Drawing / P.S.Gill.
  2. Machine Drawing / Junnarkar N.D./ Pearson Edu.
  3. Machine Drawing/Bhattacharya/Oxford University Press
  4. Machine Drawing/N.D. Bhat/ Charotar
- A Textbook of Machine Drawing/R. K. Dhawan/ S. Chand

**FLUID MECHANICS AND HEAT TRANSFER**

**UNIT I**

Properties of fluids, Measurement of pressure. fluid kinematics - Streamline, path line and streak lines and stream tube, classification of flows, steady, unsteady, uniform, non-uniform, laminar, turbulent. Rotational and irrotational flows – Equation of continuity for one dimensional flows – Stream and velocity potential functions

**Unit-II :**

Fluid Dynamics: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line. Bernoulli's equations for real fluids, Flow measurement by Venturimeter and orifice meter.

**Unit-III**

Conduction: Modes of Heat Transfer, Fourier heat conduction equation, general heat condition equation, conduction through homogeneous slab, cylinder and sphere, Heat Transfer through Composite structures as plane wall, cylinder.

**Unit-IV**

Convection: Dimensional analysis, Rayleigh and Buckingham methods applied to heat transfer, Non- dimensional members in heat transfer. Thermal and velocity boundary layer, Mean temperature for evaluation of fluid properties. Forced convection of laminar flow inside ducts and over bodies. Local and average heat transfer coefficients.

**Unit-V**

Radiation: Emission characteristics and laws of Black body radiation, Incident radiation, total and Monochromatic quantities. Laws of black, Kirchoff, Lambert, Stephan and Boltzman. concept of shape factor, Emissivity. Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods

**TEXT BOOKS**

1. Heat Transfer – Sachdev - TMH
2. Heat Transfer - PK Nag – TMH
3. Fluid Mechanics and Hydraulics Machines by Dr.R.K.Bansal

**REFERENCE TEXT BOOKS:**

1. Heat Transfer / Sukhatme.
2. Heat Transfer – A Practical Approach – Yunus Cengel, Boles / TMH.
3. Fundamentals of Engineering Thermodynamics / Michael J Moran / John Wiley & Sons
4. Engineering Fluid Mechanics by K.L.Kumar, S.Chand & Co.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. MC II sem

L	T/P/D	C
-	-/3/-	2

### ELECTRICAL ENGINEERING LAB

1. Verification of KVL and KCL.
2. Serial and Parallel Resonance.
3. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.
4. Verification of Superposition theorem.
5. Verification of Reciprocity theorem.
6. Verification of maximum power transfer theorem.
7. Verification of Thevenin's theorem.
8. Verification of compensation theorem.
9. Verification of Milliman's theorem.
10. Verification of Norton's theorem.
11. Magnetization characteristics of D.C. Shunt generator.
12. Swinburne's Test on DC shunt machine.
13. Brake test on DC shunt motor.
14. OC & SC tests on Single-phase transformer.
15. Load Test on Single Phase Transformer.

**Note:** Any 12 of the above experiments are to be conducted.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. MC II sem

L	T/P/D	C
-	-/3/-	2

### FLUID MECHANICS AND THERMAL ENGINEERING LAB

**Any five experiments from each Lab.**

#### (A) FLUID MECHANICS LAB

1. Study of Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine
5. Verification of Bernoulli's theorem
6. Study and Calibration of Venturimeter.
7. Study and Calibration of Orifice meter.
8. Determination of friction factor for a given pipe.
9. Study and Calibration of V-Notch and rectangular notches

#### (B) THERMAL ENGINEERING LAB

1. I.C. Engines Performance Test of 4 -S single cylinder Diesel Engine
2. Heat Balance test on 4-S single cylinder Diesel Engine
3. I.C. Engines Performance Test of 4 -S double cylinder Diesel Engine
4. I.C. Engines - Determination of A/F Ratio and Volumetric Efficiency
5. Performance Test on Variable Compression Ratio Engines.
6. Performance Test on Reciprocating Air Compressor
7. Study of I.C. Engines Valve / Port Timing Diagrams
8. Performance test of Air-Conditioning Unit
9. Dis-Assembly and Assembly of a automobile vehicle

**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

**Objectives:**

To enable the student to understand and appreciate, with a practical insight, the importance of certain basic issues governing the business operations namely: demand and supply, production function, cost analysis, markets, forms of business organisations, capital budgeting and financial accounting and financial analysis.

**Unit I**

**Introduction & Demand Analysis:** Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. *Elasticity of Demand:* Definition, Types, Measurement and Significance of Elasticity of Demand. *Demand Forecasting,* Factors governing demand forecasting, methods of demand forecasting.

**Unit II**

**Production & Cost Analysis:** *Production Function* – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. *Cost Analysis:* Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

**Unit III**

**Markets & New Economic Environment:** Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. *Pricing:* Objectives and Policies of Pricing. Methods of Pricing. *Business:* Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, *New Economic Environment:* Changing Business Environment in Post-liberalization scenario.

**Unit IV**

**Capital Budgeting:** Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital - Trading Forecast, Capital Budget, Cash Budget. Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems).

**Unit V**

**Introduction to Financial Accounting & Financial Analysis:** Accounting concepts and Conventions - Introduction IFRS - Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). *Financial Analysis:* Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios. Du Pont Chart.

**TEXT BOOKS:**

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.
2. S.A. Siddiqui & A.S. Siddiqui, Managerial Economics and Financial Analysis, New Age international Publishers, Hyderabad 2013.
3. M. Kasi Reddy & Saraswathi, Managerial Economics and Financial Analysis, PHI New Delhi, 2012.

**REFERENCES:**

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2012.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson, 2012.
3. Lipsey & Chrystel, Economics, Oxford University Press, 2012
4. Domnick Salvatore: Managerial Economics in a Global Economy, Thomson, 2012.
5. Narayanaswamy: Financial Accounting—A Managerial Perspective, Pearson, 2012.
6. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2012.
7. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2012.
8. Dwivedi: Managerial Economics, Vikas, 2012.
9. Shailaja & Usha : MEFA, University Press, 2012.
10. Aryasri: Managerial Economics and Financial Analysis, TMH, 2012.
11. Vijay Kumar & Appa Rao, Managerial Economics & Financial Analysis, Cengage 2011.
12. J. V. Prabhakar Rao & P.V. Rao, Managerial Economics & Financial Analysis, Maruthi Publishers, 2011.

**Outcomes:**

At the end of the course, the student will

- understand the market dynamics namely, demand and supply, demand forecasting , elasticity of demand and supply, pricing methods and pricing in different market structures.
- Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis
- Develop an understanding of
- Analyse how capital budgeting decisions are carried out
- Understand the framework for both manual and computerised accounting process
- Know how to analyse and interpret the financial statements through ratio analysis.

**DYNAMICS OF MACHINERY**

**UNIT – I**

**Angular Motion:** Gyroscopes – effect of precession – motion on the stability of moving vehicles such as motorcycle – motorcar – aero planes and ships. Static and Dynamic Force Analysis of planar mechanisms.

**UNIT – II**

**Friction:** Inclined plane – Friction of screw and nuts - Pivots and collars – uniform pressure, uniform wear – friction circle and friction axis: lubricated surfaces – boundary friction – film lubrication. Clutches. Single plate, mutli plate, cone clutch, centrifugal clutches.

**Brakes And Dynamometers:** Simple block brake - Internal expanding brake- band brake of vehicle. Dynamometers – absorpton and transmission types. General description and methods of operation.

**UNIT – III**

**Turning Moment Diagram and Flywheels:** Turning moment- Inertia torque-connecting rod angular velocity and acceleration-crank effort and torque diagrams-fluctuation of energy – flywheels and their

**Governors:** Watt, Porter and Proell governors- Spring loaded governors – Hartnell and Hartung with auxiliary springs- Sensitiveness, isochronisms and hunting– effort and power of the governors.

**UNIT – IV**

**Balancing:** Balancing of rotating masses- Primary, Secondary, and higher balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples. Examination of “V” and multi cylinder in-line and radial engines for primary and secondary balancing- locomotive balancing – Hammer blow – Swaying couple – variation of tractive effort.

**UNIT – V**

**Vibrations:** Free Vibration of mass attached to vertical spring –oscillation of pendulums- Transverse loads – vibrations of beams with concentrated and distributed loads. Dunkerly’s method – Raleigh’s method. Whirling of shafts – critical speed – torsional vibrations – one, two and three rotor systems.

**TEXT BOOKS:**

1. Theory of Machines/ S.S.Rattan/McGraw Hill.
2. Theory of Mechanism and Machines /Jagdish Lal/Metropolitan Book Company

**REFERENCE BOOKS:**

1. Theory of Machines/ Shigley/ Mc Graw Hill Publishers
2. Theory of Machines/ Thomas Bevan/Pearson
3. Theory of Machines/ R.K.Bansal/Lakshmi publications/5<sup>th</sup> Edition
4. Mechanism and Machine Theory/ JS Rao and RV Duggipati/ New Age
5. Theory of Machines/Sadhu Singh/Pearson/3<sup>rd</sup> Edition
6. Mechanism and Machine Theory/Ashok G. Ambekar/PHI/Eastern Economy Edition

**FINITE ELEMENT TECHNIQUES**

**UNIT I**

Basic Concepts, applications of FEM, Basic equations in FEM, Methods in FEM. One Dimensional problems- Stiffness equations for a axial bar element in local co-ordinates using potential energy approach and virtual energy principle – properties of stiffness matrix. Familiarization of ANSYS software for solving Finite element problems Finite element analysis of uniform, stepped and tapered bars subjected to mechanical and thermal loads- Assembly of global stiffness matrix and load vector-Quadratic shape functions-Problems.

**UNIT – II**

Stiffness equations for a truss bar element oriented in 2D plane-Finite element analysis of trusses-Plane truss and space truss elements-methods of assembly-problems  
Analysis of beams: Hermite shape functions-Element stiffness matrix- Load vector-Problems.

**UNIT – III**

2-D Problems:- CST element-Stiffness matrix and load vector – Isoparametric element representation – Shape functions – Convergence requirements-Solving of problems

**UNIT-IV**

Two dimensional four noded isoparametric elements - numerical integration – finite element modeling of Axisymmetric solids subjected to Axisymmetric loading with triangular elements.  
3-D problems: Tetrahedron element. Shape functions.

**UNIT-V**

Heat Transfer :-1-D Heat conduction — Composite slabs – 1D fin problems -2D Heat conduction – analysis of thin plates.

Dynamic Analysis : Dynamic equations-Lumped and consistent mass matrices-Eigen values and Eigen vectors – mode shapes – modal analysis for stepped bar and beams.

**TEXT BOOK :**

1. The Finite Element Methods in Engineering - SS Rao – Elsevier – 4<sup>th</sup> Edition
2. Introduction to Finite Elements in Engineering-Tirupathi K. Chandragupta and Ashok D. Belagundu.

**REFERENCES :**

1. An introduction to Finite Element Method - JN Reddy - Mc Graw Hill
2. The Finite Element Method in engineering science – O.C.Zienkowitz, Mc. Graw hill
3. Finite Element Methods/ Alavala/TMH
4. Concepts and applications of finite element analysis-Robert Cook -wiley



**SWITCHING THEORY AND LOGIC DESIGN**

**Course Objectives:**

This course provides in-depth knowledge of switching theory and the design techniques of digital circuits, which is the basis for design of any digital circuit. The main objectives are:

- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
- To implement simple logical operations using combinational logic circuits
- To design combinational logic circuits, sequential logic circuits.
- To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.
- To implement synchronous state machines using flip-flops.

**UNIT -I:**

**Number System and Boolean Algebra And Switching Functions:** Number Systems, Base Conversion Methods, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Unit Distance Codes, Alpha Numeric Codes, Error Detecting and Correcting Codes.

**Boolean Algebra:** Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.

**UNIT -II:**

**Minimization and Design of Combinational Circuits:** Introduction, The Minimization with theorem, The Karnaugh Map Method, Five and Six Variable Maps, Prime and Essential Implications, Don't Care Map Entries, Using the Maps for Simplifying, Tabular Method, Partially Specified Expressions, Multi-output Minimization, Minimization and Combinational Design, Arithmetic Circuits, Comparator, Multiplexers, Code Converters, Wired Logic, Tristate Bus System, Practical Aspects related to Combinational Logic Design, Hazards and Hazard Free Relations.

**UNIT -III:**

**Sequential Machines Fundamentals:** Introduction, Basic Architectural Distinctions between Combinational and Sequential circuits, The Binary Cell, Fundamentals of Sequential Machine Operation, The Flip-Flop, The D-Latch Flip-Flop, The "Clocked T" Flip-Flop, The "Clocked J-K" Flip-Flop, Design of a Clocked Flip-Flop, Conversion from one type of Flip-Flop to another, Timing and Triggering Consideration, Clock Skew.

**UNIT -IV:**

**Sequential Circuit Design and Analysis:** Introduction, State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Design Aspects, State Reduction, Design Steps, Realization using Flip-Flops

Counters - Design of Single mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter Using Shift Register.

**UNIT -V:**

**Sequential Circuits:** Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and Merger chart methods-concept of minimal cover table.

**Algorithmic State Machines:** Salient features of the ASM chart-Simple examples-System design using data path and control subsystems-control implementations-examples of Weighing machine and Binary multiplier.

**TEXT BOOKS:**

1. Switching and Finite Automata Theory- Zvi Kohavi & Niraj K. Jha, 3<sup>rd</sup> Edition, Cambridge.
2. Digital Design- Morris Mano, PHI, 3<sup>rd</sup> Edition.

**REFERENCE BOOKS:**

1. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3<sup>rd</sup> Ed, John Wiley & Sons Inc.
2. Digital Fundamentals – A Systems Approach – Thomas L. Floyd, Pearson, 2013.
3. Digital Logic Design - Ye Brian and HoldsWorth, Elsevier

4. Fundamentals of Logic Design- Charles H. Roth, Cengage LEarning, 5<sup>th</sup>, Edition, 2004.
5. Digital Logic Applications and Design- John M. Yarbrough, Thomson Publications, 2006.
6. Digital Logic and State Machine Design – Comer, 3<sup>rd</sup>, Oxford, 2013.

**Course Outcomes:**

Upon completion of the course, students should possess the following skills:

- Be able to manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.
- Be able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
- Be able to design and analyse small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
- Be able to design and analyse small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.

### MACHINE TOOLS

#### UNIT – I

Elementary treatment of metal cutting theory – Element of cutting process – Geometry of single point tool and angles chip formation and types of chips – built up edge and its effects, chip breakers. Mechanics of orthogonal cutting – Merchant's Force diagram, cutting forces – cutting speeds, feed, depth of cut, tool life, coolants, machinability – Tool materials.

#### UNIT – II :

Engine lathe – Principle of working, specification of lathe – types of lathe – work and tool holding devices, Taper turning, Thread turning – Lathe attachments. Turret and capstan lathe – Principal features of automatic lathes – classification: Single spindle and multi-spindle automatic lathes – tool layouts.

#### UNIT – III :

Shaping, slotting and planing machines – Principles of working – Principal parts – specification, classification, operations performed. Kinematic scheme of the shaping, slotting and planing machines, machining time calculations. Drilling and Boring Machines – Principles of working, specifications, types, operations performed – tool holding devices – twist drill – Boring machines – Fine boring machines – Jig boring machine. Deep hole drilling machine. Kinematics scheme of the drilling and boring machines

#### UNIT – IV

Milling machine – Principles of working – specifications – classifications of milling machines – Principal features of horizontal, vertical and universal milling machines – machining operations Geometry of milling cutters – methods of indexing – Accessories to milling machines, kinematic scheme of milling machines. Lapping, honing and broaching machines – comparison of grinding, lapping and honing. Kinematics scheme of Lapping, Honing and Broaching machines. Constructional features speed and feed Units, machining time calculations

#### UNIT –V

**Finishing Processes:** Grinding – fundamentals – theory of grinding – classification of grinding machines – cylindrical and surface grinding machine-Tool and cutter grinding machine – special types of grinding machines, Different types of abrasives – bonds specification of a grinding wheel and selection of a grinding wheel, Kinematic. Scheme of grinding machines.

#### TEXT BOOKS:

1. Production Technology/HMT/Tata McGraw Hill
2. Production Technology / R.K. Jain and S.C. Gupta/Khanna Publishers.

#### REFERENCE BOOKS:

1. Principles of Machine Tools/ Bhattacharya A and Sen.G.C/ New Central Book Agency.
2. Workshop Technology – Vol.-II/ B.S. Raghuvamsi
3. Elements of Work Shop Technology – Vol. II/Hajra Choudry/ Media Promoters.
4. Fundamentals of Metal Machining and Machine Tools/ Geofrey Boothroyd/ McGraw Hill
5. Manufacturing Processes/JP Kaushish/Prentice Hall/2<sup>nd</sup> Edition
6. Machine Tools/C Elanchezian & M. Vijayan/Anuradha Publications

**PRINCIPLES OF MACHINE DESIGN**

**UNIT I**

**Introduction:** General considerations in the design of Engineering Materials and their properties –selection – Manufacturing consideration in design. Tolerances and fits –BIS codes of steels.

**Stresses in Machine Members :** Simple stresses – Complex Stresses – impact stress strain relations – Static theories of failure – factors of safety – Design for strength and rigidity – preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations.

**Fatigue Loading:** Stress concentration – Theoretical stress Concentration factor – Fatigue stress concentration factor notch sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Fatigue theories of failure Goodman and Soderberg's lines.

**UNIT – II**

**Riveted and Welded Joints:** Riveted Joints: Modes of failure f riveted joints-Strength equations –efficiency of riveted joints-Design of boiler joints – eccentricity loaded riveted joints. Welding Joints: Design of fillet welds- axial loads – Circular fillet welds-bending and torsion-eccentricity loaded joints.

**Axially Loaded Joints and Shafts:** Keys, cotters and knuckle joints: Design of Keys stresses in key- cottered joints-spigot and socket, sleeve and cotter, jib and cotter joints-knuckle joints. Design of shafts: Design of solid and hollow shafts for strength and rigidity – Design of shafts of complex loads- Shaft sizes – BIS code. Design of shafts for gear and belt drives

**UNIT – III**

**Power Transmissions Systems, Pulleys :** Transmission of power by Belt and Rope drives , Transmission efficiencies, Belts – Flat and V types – Ropes - pulleys for belt and rope drives, Materials, Chain drives

**UNIT – IV**

**Spur & Helical Gear Drives:** Spur gears& Helical gears – Load concentration factor – Dynamic load factor. Surface compressive strength – Bending strength – Design analysis of spur and helical gears – Estimation of centre distance, module and face width, check for plastic deformation. Check for dynamic and wear considerations.

**UNIT-V**

**Bearings :** Types of bearings – Basic modes of Lubrication – Bearing construction-Bearing design- bearing materials- Selection of Lubricants. Rolling contact bearings: Types of rolling contact bearings-Selection of bearing type-Selection of bearing life-Design for cyclic loads and speeds-static and dynamic loading of ball & roller bearings

**TEXT BOOKS :**

1. Mechanical Engineering Design by Bahl and Goel, Standard Publications
2. Design of Machine Elements by kulakarni-Mc Graw Hill-3<sup>rd</sup>

**REFERENCE BOOKS :**

1. Machine design by timothy H.Wenzell PE, Cengage
2. Machine design by r.L. Norton, Mc GRaw hill
3. Machine design by V.Bandari, TMH Publishers
4. Machine design – Pandya & shah.
5. Machine Desin, S MD Kakakuddin, Anuradha Publisher

\*Note: Use of design data book is permitted in the examination

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. MC I sem

L T/P/D C  
- -/3/- 2

MACHINE TOOLS LAB

**Note: Any TEN from the following experiments**

1. Study of general purpose machines
2. Step turning and taper turning on lathe machine
3. Thread cutting and knurling on lathe machine

Experiments using following machines

1. Drilling
2. Shaping
3. Planing
4. Slotting
5. Milling
6. Cylindrical / Surface Grinding
7. Grinding of Tool angles-Tool and cutter grinder.
8. Electro Discharge Machining

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III Year B.Tech. MC I sem

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HEAT TRANSFER AND PRODUCTION TECHNOLOGY LAB

**(A) HEAT TRANSFER LAB**

**Note: Any FIVE of the following experiments to be conducted**

1. Overall heat transfer co-efficient-using Composite Slab Apparatus
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Thermal Conductivity of given metal rod.
5. Heat transfer in pin-fin
6. Experiment on Transient Heat Conduction
7. Emissivity apparatus.
8. Stefan Boltzman Apparatus.

**(B) PRODUCTION TECHNOLOGY LAB**

**Note: Any TWO experiments each from the following trades to be conducted**

**I. METAL CASTING LAB**

1. Pattern Design and making- for one casting drawing.
2. Sand properties testing . - for strengths, and permeability – 1 Exercise
3. Moulding Melting and Casting - 1 Exercise

**II WELDING LAB**

1. ARC Welding - 2 Exercises
2. Lap & Butt Joint - 1 Exercise
3. Spot Welding - 1 Exercise
4. TIG Welding - 1 Exercise
5. Brazing - 1 Exercises

**III MECHANICAL PRESS WORKING**

1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
2. Hydraulic Press : Deep drawing and extrusion operation.
3. Bending and other operations

**IV PROCESSING OF PLASTICS**

1. Injection Moulding
2. Blow Moulding

### INDUSTRIAL MANAGEMENT

#### UNIT I:

**Introduction to Management:** Entrepreneurship and organization - Nature and Importance of Management, Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management

#### UNIT II:

**Designing Organizational Structures:** Departmentation and Decentralization, Types of Organization structures - Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

#### UNIT III:

**Operations Management:** Objectives- product design process- Process selection-Types of production system(Job, batch and Mass Production),-Plant location-factors- Urban-Rural sites comparison- Types of Plant Layouts-Design of product layout- Line balancing(RPW method)  
Value analysis-Definition-types of values- Objectives- Phases of value analysis- Fast diagram

#### UNIT IV:

**Work Study:** Introduction – definition – objectives – steps in work study – Method study – definition – objectives – steps of method study. Work Measurement – purpose – types of study – stop watch methods – steps – key rating – allowances – standard time calculations – work sampling.

**Statistical Quality Control:** variables-attributes, Shewart control charts for variables-  $\bar{X}$  chart, R chart, - Attributes-Defective-Defect- Charts for attributes-p-chart -c chart (simple Problems), Acceptance Sampling- Single sampling-Double sampling plans-OC curves.

#### UNIT V:

**Job Evaluation :** methods of job evaluation – simple routing objective systems – classification method – factor comparison method – point method – benefits of job evaluation and limitations.

**Project Management (PERT/CPM):** Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (simple problems)

#### TEXT BOOKS:

1. Industrial Engineering and Management/O.P. Khanna/Khanna Publishers
2. Industrial Engineering and Management Science/T.R. Banga and S.C.Sarma/Khanna Publishers

#### REFERENCE BOOKS:

1. Motion and Time Study by Ralph M Barnes/ John Willey & Sons/Work Study by ILO
2. Human factors in Engineering & Design/Ernest J McCormick / TMH
3. Production & Operation Management /Paneer Selvam /PHI
4. Industrial Engineering Management/NVS Raju/Cengage Learning
5. Industrial Engineering Hand Book /Maynard
6. Industrial Engineering Management / RaviShankar/ Galgotia

### CAD / CAM

#### UNIT – I

Fundamentals of CAD/CAM, Automation , design process, Application of computers for design, Benefits of CAD, Computer configuration for CAD applications, Computer peripherals for CAD ,Design workstation, Graphic terminal, CAD software- definition of system software and application software ,CAD database and structure.

**Geometric Modeling:** 3-D wire frame modeling, wire frame entities and their definitions, Interpolation and approximation of curves, Concept of parametric and non-parametric representation of curves, Curve fitting techniques, definitions of cubic spline, Bezier, and B-spline.

#### UNIT-II

**Surface modeling:** Algebraic and geometric form, Parametric space of surface, Blending functions,parametrization of surface patch, Subdividing, Cylindrical surface, Ruled surface, Surface of revolution Spherical surface, Composite surface, Bezier surface. B-spline surface, Regenerative surface and pathological conditions.

**Solid Modelling:** Definition of cell composition and spatial occupancy enumeration, Sweep representation, Constructive solid geometry, Boundary representations.

#### UNIT – III

**NC Control Production Systems :** Numerical control, Elements of NC system, NC part programming : Methods of NC part programming, Manual part programming, Computer assisted part programming, Post Processor, Computerized part program, SPPL (A Simple Programming Language). CNC, DNC and Adaptive Control Systems.

#### UNIT – IV

**Group Technology:** Part families, Parts classification and coding. Production flow analysis, Machine cell design.

**Computer aided process planning:** Difficulties in traditional process planning, Computer aided process planning: retrieval type and generative type, Machinability data systems.

**Computer aided manufacturing resource planning:** Material resource planning, inputs to MRP, MRP output records, Benefits of MRP, Enterprise resource planning, Capacity requirements planning.

#### UNIT – V

**Flexible manufacturing system:** F.M.S equipment, FMS layouts, Analysis methods for FMS benefits of FMS.

**Computer aided quality control:** Automated inspection- Off-line, On-line, contact, Non-contact; Coordinate measuring machines, Machine vision.

**Computer Integrated Manufacturing:** CIM system, Benefits of CIM , Benefits of CIM

#### TEXT BOOKS:

1. CAD/CAM /Groover M.P./ Pearson education
2. CAD / CAM Theory and Practice/ Ibrahim Zeid/TMH

#### REFERENCE BOOKS :

1. CAD/CAM Principles and Applications/P.N.Rao/ TMH
2. CAD/CAM Concepts and Applications/ Alavala/ PHI
3. CAD / CAM / CIM/Radhakrishnan and Subramanian/ New Age
4. Principles of Computer Aided Design and Manufacturing/ Farid Amirouche/ Pearson
5. Computer Numerical Control Concepts and programming/Warren S Seames/ Thomson.

**MECHANICAL MEASUREMENTS AND CONTROL SYSTEMS**

**UNIT I**

Definition – Basic principles of measurement – Measurement systems, generalized configuration and functional descriptions of measuring instruments – examples. Dynamic performance characteristics – sources of error, Classification and elimination of error.

**Measurement of Displacement:** Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

**Measurement Of Temperature:** Classification – Ranges – Various Principles of measurement – Expansion, Electrical Resistance – Thermistor – Thermocouple – Pyrometers – Temperature Indicators.

**UNIT – II**

**Measurement Of Pressure:** Units – classification – different principles used. Manometers, Piston, Bourdon pressure gauges, Bellows – Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges – ionization pressure gauges, Mcleod pressure gauge.

**Measurement Of Level:** Direct method – Indirect methods – capacitative, ultrasonic, magnetic, cryogenic fuel level indicators – Bubbler level indicators.

**Flow Measurement:** Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot – wire anemometer, Laser Doppler Anemometer (LDA).

**UNIT – III**

**Measurement Of Speed:** Mechanical Tachometers – Electrical tachometers – Stroboscope, Non- contact type of tachometer

**Measurement of Acceleration and Vibration:** Different simple instruments-Principles of Seismic instruments – Vibrometers and accelerometers.

**Stress Strain Measurements:** Various types of stress and strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – usage for measuring torque, Strain gauge Rosettes.

**UNIT – IV**

**Measurement Of Humidity** – Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter

**Measurement of Force, Torque and Power-** Elastic force meters, load cells, Torsion meters, Dynamometers.

**UNIT – V**

**Elements Of Control Systems:** Introduction, Importance – Classification – Open and closed systems Servomechanisms – Examples with block diagrams – Temperature, speed and position control systems.

**TEXT BOOKS:**

1. Measurement Systems: Applications & design by Ernest O. Doebelin, TMH.
2. Measurement systems: Applications & design by D.S Kumar

**REFERENCE BOOKS :**

1. Instrumentation, measurement & analysis by B.C.Nakra & K.K.Choudhary, TMH
2. Experimental Methods for Engineers / Holman
3. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.
4. Mechanical Measurements / Sirohi and Radhakrishna / New Age
5. Instrumentation & mechanical Measurements by A.K. Tayal ,Galgotia Publications.



**ANALOG AND DIGITAL IC APPLICATIONS**

**UNIT I**

**Integrated Circuits** : Classification, chip size and circuit complexity, basic information of Opamp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC characteristics, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

**OP-AMP Applications** : Basic application of Op-amp, instrumentation amplifier, ac amplifier, V to I and I to V converters, sample & hold circuits, multipliers and dividers, Differentiators and Integrators, Comparators.

**UNIT II**

Schmitt trigger, Multivibrators, introduction to voltage regulators, features of 723.

**Active Filters & Oscillators** : Introduction, 1st order LPF, HPF filters. Band pass, Band reject and all pass filters. Oscillator types and principle of operation – RC, Wien and quadrature type, waveform generators – triangular, sawtooth, square wave and VCO.

**UNIT III**

**Timers & Phase Locked Loops**: Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.

**D-A AND A- D Converters** : Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC specifications.

**UNIT IV**

Classification of Integrated circuits, comparison of various logic families, standard TTL NAND Gate- Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tristate outputs, CMOS transmission gate, IC interfacing- TTL driving CMOS & CMOS driving TTL.

Design using TTL-74XX & CMOS 40XX series, code converters, decoders, Demultiplexers, decoders & drives for LED & LCD display. Encoder, priority Encoder, multiplexers & their applications, priority generators/checker circuits. Digital arithmetic circuits-parallel binary adder/subtractor circuits using 2's, Complement system. Digital comparator circuits.

**UNIT V**

**Sequential Circuits**: Flip-flops & their conversions. Design of synchronous counters. Decade counter, shift registers & applications, familiarities with commonly available 74XX & CMOS 40XX series of IC counters.

**Memories**: ROM architecture, types & applications, RAM architecture, Static & Dynamic RAMs, synchronous DRAMs.

**TEXT BOOKS:**

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
2. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 1987.

**REFERENCES:**

1. Operational Amplifiers & Linear Integrated Circuits – R.F. Coughlin & Fredrick F. Driscoll, PHI, 1977.
2. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications –Denton J. Daibey, TMH.
3. Design with Operational Amplifiers&Analog Integrated Circuits-Sergio Franco,McGraw Hill,3rd Ed.,2002.
4. Digital Fundamentals – Floyd and Jain, Pearson Education,8th Edition, 2005.

**DISASTER MANAGEMENT  
(Open Elective)**

**Unit-I**

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

**Unit –II**

Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards –

**Unit –III**

Endogenous Hazards - Volcanic Eruption – Earthquakes – Landslides - Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - - Earthquake Hazards in India - - Human adjustment, perception & mitigation of earthquake.

**Unit –IV**

Exogenous hazards/ disasters - Infrequent events- Cumulative atmospheric hazards/ disasters

Infrequent events: Cyclones – Lightning – Hailstorms

Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes , distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/ disasters : - Floods- Droughts- Cold waves- Heat waves Floods:- Causes of floods- Flood hazards India- Flood control measures (Human adjustment, perception & mitigation) Droughts:- Impacts of droughts- Drought hazards in India- Drought control measures- Extra Planetary Hazards/ Disasters- Man induced Hazards /Disasters- Physical hazards/ Disasters-Soil Erosion

Soil Erosion:-- Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion

Chemical hazards/ disasters:-- Release of toxic chemicals, nuclear explosion- Sedimentation processes Sedimentation processes:- Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation

Biological hazards/ disasters:- Population Explosion.

**Unit –V**

Emerging approaches in Disaster Management- Three Stages

1. Pre- disaster stage (preparedness)
2. Emergency Stage
3. Post Disaster stage-Rehabilitation

**TEXT BOOKS:**

1. Disaster Mitigation: Experiences And Reflections by [Pardeep Sahni](#)
2. Natural Hazards & Disasters by Donald Hyndman & David Hyndman – Cengage Learning

**REFERENCES**

1. R.B.Singh (Ed) Environmental Geography, Heritage Publishers New Delhi,1990
2. Savinder Singh Environmental Geography, Prayag Pustak Bhawan, 1997
3. Kates,B.I & White, G.F The Environment as Hazards, oxford, New York, 1978
4. R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000
5. H.K. Gupta (Ed) Disaster Management, Universiters Press, India, 2003
6. R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo, 1994
7. Dr. Satender , Disaster Management t in Hills, Concept Publishing Co., New Delhi, 2003
8. A.S. Arya Action Plan For Earthquake,Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994
9. R.K. Bhandani An overview on Natural & Man made Disaster & their Reduction,CSIR, New Delhi
10. M.C. Gupta Manuals on Natural Disaster management in India, National Centre for Disaster Management, IIPA, New Delhi, 2001

III B.Tech. MC -II sem

L	T/P/D	C
4	-/-	4

**HUMAN VALUES AND PROFESSIONAL ETHICS**  
(Open Elective)

**Objectives :** This introductory course input is intended

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- 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.
- 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.

**Unit I:**

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self Exploration—what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. 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! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvridha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

**Unit III:**

Understanding Harmony in the Family and Society- Harmony in Human - Human Relationship : Understanding harmony in the Family- the basic unit of human interaction. 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.** Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha )- from family to world family!

**Unit IV:**

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence : Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

**Unit V:**

Implications of the above Holistic Understanding of Harmony on Professional Ethics : Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

- Ability to utilize the professional competence for augmenting universal human order,
- Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
- Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order:

- At the level of individual: as socially and ecologically responsible engineers, technologists and managers
- At the level of society: as mutually enriching institutions and organizations

### **TEXT BOOK**

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. KV Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3<sup>rd</sup> Edition.

### **REFERENCE BOOKS**

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
5. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
6. A.N. Tripathy, 2003, Human Values, New Age International Publishers.
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethichs (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

### **Relevant CDs, Movies, Documentaries & Other Literature:**

1. Value Education website, <http://www.uptu.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
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

III B.Tech. MC -II sem

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**INTELLECTUAL PROPERTY RIGHTS  
(Open Elective)**

**UNIT – I**

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT – II**

Trade Marks : Purpose and function of trade marks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

**UNIT – III**

Law of copy rights : Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents : Foundation of patent law, patent searching process, ownership rights and transfer

**UNIT – IV**

Trade Secrets : Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition : Misappropriation right of publicity, False advertising.

**UNIT – V**

New development of intellectual property: new developments in trade mark law ; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, international development in trade secrets law.

**TEXT BOOKS & REFERENCES:**

1. Intellectual property right, Deborah. E. Bouchoux, cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tate Mc Graw Hill Publishing company ltd.,

**AUTOMOBILE ENGINEERING**

**UNIT – I**

**Introduction : Layout of** automobile – introduction chassis and body components . types of Automobile engines. – power unit – Introduction to engine lubrication – engine servicing

**Fuel System** :S.I. Engine : Fuel supply systems, Mechanical and electrical fuel pump – filters – carburetor – types – air filters – petrol injection. Introduction to MPFI and GDI Systems.

**C.I. Engines** :Requirements of diesel injection systems, types of injection systems, DI Systems IDI systems. fuel pump, nozzle, spray formation, injection timing, testing of fuel pumps. Introduction CRDI and TDI Systems.

**UNIT – II**

**Cooling System** : Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporative cooling – pressure sealed cooling – antifreeze solutions.

**Ignition System** :Function of an ignition system, battery ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

**Electrical System** : Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

**UNIT – III**

**Transmission System** :Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – gear boxes, types, sliding mesh, constantt mesh, synchro mesh gear boxes, epicyclic gear box , over drive torque converter. Propeller shaft – Hotch – Kiss drive, Torque tube drive, universal joint, differential rear axles – types – wheels and tyres.

**Suspension System** :Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

**UNIT – IV**

**Braking System** :Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.

**Steering System** :Steering geometry – camber, castor, king pin rake, combined angle toein, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

**UNIT – V**

Emissions from Automobiles – Pollution standards National and international – Pollution Control – Techniques – Multipoint fuel injection for SI Engines. Common rail diesel injection Energy alternatives – Solar, Photo-voltaic, hydrogen, Biomass, alcohols, LPG,CNG, liquid Fuels and gaseous fuels, Hydrogen as a fuel for IC Engines. - their merits and demerits.

Standard Vehicle maintenance practice.

**TEXT BOOKS :**

- 1.Automobile Engineering / William H Crouse
- 2.A Text Book Automobile Engineering–Manzoor, .Nawazish Mehdi & .Yosuf Ali, Frontline Publications.

**REFERENCES :**

1. **A Text Book of Automobile Engineering by R K Rajput. Laxmi Publications.**
2. Automotive Mechanics / Heitner
2. Automotive Engineering / Newton Steeds & Garrett
3. Automotive Engines / Srinivasan
4. A Text Book of Automobile Engineering By Khalil U Siddiqui New Age International

**CAD / CAM AND INSTRUMENTATION & CONTROL SYSTEMS LAB**

**(A) CAD / CAM LAB :**

1. **Drafting** : Development of part drawings for various components
2. **Part Modeling** : Generation of various 2D and 3D Models through Protrusion, revolve, shell sweep. Creation of various features. Design of simple components.
3. **Analysis** : Determination of deflection and stresses in 1D and 2D trusses and beams. Determination of deflections component, principal and Von-mises stresses in plane stress, plane strain and Axisymmetric components.

**Use of any following relevant Software Packages**

Use of Auto CAD, Cadian Mechanical, CATIA, ANSYS, Edge CAM, Solid Works, Gibbs CAM, Pro-E

**(B) MECHANICAL MEASUREMENTS AND CONTROL SYSTEMS LAB**

Any five experiments from the following

1. Measurement and control of Pressure of a process using SCADA system
2. Study and calibration of LVDT transducer for displacement measurement.
3. Calibration of strain gauge for load measurement.
4. Measurement and control of level in a tank using capacitive transducer with SCADA.
5. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
6. Measurement and control of temperature of a process using resistance temperature detector with SCADA
7. Measurement and control of flow of a process using SCADA systems.
8. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
9. Measurement and control of temperature of a furnace using different temperature sensors

**ADVANCED COMMUNICATION SKILLS (ACS) LAB**

**Introduction**

The introduction of the Advanced Communication Skills Lab is considered essential at 3<sup>rd</sup> year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

**Objectives:**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

**Syllabus:**

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing* – planning for writing – improving one's writing.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

**Minimum Requirement:**

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 35 students in the lab:

- **Spacious room with appropriate acoustics.**
- **Round Tables with movable chairs**
- **Audio-visual aids**
- **LCD Projector**
- **Public Address system**
- **P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ**
- **T. V, a digital stereo & Camcorder**



- **Headphones of High quality**

**Prescribed Lab Manual:** A book titled **A Course Book of Advanced Communication Skills (ACS) Lab** published by Universities Press, Hyderabad.

**Suggested Software:**

The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner's Compass**, 7<sup>th</sup> Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE**( KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **The following software from 'train2success.com'**
  - **Preparing for being Interviewed**
  - **Positive Thinking**
  - **Interviewing Skills**
  - **Telephone Skills**
  - **Time Management**

**Books Recommended:**

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.
3. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
4. Business and Professional Communication: Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.
5. The Basics of Communication: A Relational Perspective. Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications. 2012.
6. English Vocabulary in Use series, Cambridge University Press 2008.
7. Management Shapers Series by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
8. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
9. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
10. Handbook for Technical Writing by David A McMurrey & Joanne Buckley CENGAGE Learning 2008.
11. Job Hunting by Colm Downes, Cambridge University Press 2008.
12. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.
13. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.
14. Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron's/DELTA/ Cambridge University Press.
15. International English for Call Centres by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

**Learning Outcomes**

Accomplishment of sound vocabulary and its proper use contextually.  
 Flair in Writing and felicity in written expression.  
 Enhanced job prospects.  
 Effective Speaking Abilities

**DISTRIBUTION AND WEIGHTAGE OF MARKS:**

**Advanced Communication Skills Lab Practicals:**

1. The practical examinations for the ACS Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the English Language lab sessions, there shall be continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

**Mini Project: As a part of Internal Evaluation**

**1. Seminar/ Professional Presentation**

**2. A Report on the same has to be prepared and presented.**

**\* Teachers may use their discretion to choose topics relevant and suitable to the needs of students.**

**\* Not more than two students to work on each mini project.**

**\* Students may be assessed by their performance both in oral presentation and written report.**

**OPERATIONS RESEARCH**

**UNIT – I**

Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.

**Allocation:** Linear Programming Problem Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method.

**UNIT – II**

**Transportation Problem** – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.

**Assignment problem** – Formulation – Optimal solution - Variants of Assignment Problem- Traveling Salesman problem.

**UNIT – III**

**Sequencing** – Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through ‘m’ machines

**Replacement:** Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

**UNIT – IV**

**Theory of Games:** Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games – dominance principle – m x 2 & 2 x n games -graphical method.

**Inventory:** Introduction – Single item, Deterministic models – Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand may be discrete variable or continuous variable – Single Period model and no setup cost.

**UNIT – V**

**Waiting Lines:** Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

**Dynamic Programming:**

Introduction – Terminology- Bellman’s Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

**Simulation:** Introduction, Definition, types of simulation models, Steps involved in the simulation process- Advantages and disadvantages- applications of simulation to queuing and inventory.

**TEXT BOOK :**

1. Operations Research /J.K.Sharma 4e. /MacMilan
2. Introduction to O.R/Hillier & Libermann/TMH

**REFERENCE BOOKS :**

1. Introduction to O.R /Taha/PHI
2. Operations Research/ NVS Raju/ SMS Education/3<sup>rd</sup> Revised Edition
3. Operations Research /A.M.Natarajan, P.Balasubramaniam, A. Tamilarasi/Pearson Education.
4. Operations Research / Wagner/ PHI Publications.
5. Operations Research/M.V. Durga Prasad, K, Vijaya Kumar Reddy, J. Suresh Kumar/ Cengage Learning.

### MICROPROCESSORS AND MICROCONTROLLERS

**Course Objective:**

- To develop an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques.

**UNIT -I:**

**8086 Architecture:** 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086- Common Function Signals, Timing diagrams, Interrupts of 8086.

**UNIT -II:**

**Instruction Set and Assembly Language Programming of 8086:** Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, Simple Programs involving Logical, Branch and Call Instructions, Sorting, Evaluating Arithmetic Expressions, String Manipulations.

**UNIT -III:**

**I/O Interface:** 8255 PPI, Various Modes of Operation and Interfacing to 8086, Interfacing Keyboard, Display, D/A and A/D Converter.

**Interfacing with advanced devices:** Memory Interfacing to 8086, Interrupt Structure of 8086, Vector Interrupt Table, Interrupt Service Routine.

**Communication Interface:** Serial Communication Standards, Serial Data Transfer Schemes, 8251 USART Architecture and Interfacing.

**UNIT -IV:**

**Introduction to Microcontrollers:** Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051, Simple Programs

**UNIT -V:**

**8051 Real Time Control:** Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

**TEXT BOOKS:**

- D. V. Hall, Microprocessors and Interfacing, TMGH, 2<sup>nd</sup> Edition 2006.
- Kenneth. J. Ayala, The 8051 Microcontroller , 3<sup>rd</sup> Ed., Cengage Learning.

**REFERENCE BOOKS:**

- Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, TMH, 2<sup>nd</sup> Edition 2006.
- The 8051Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.
- Micro Computer System 8086/8088 Family Architecture, Programming and Design - Liu and GA Gibson, PHI, 2<sup>nd</sup> Ed.
- Microcontrollers and Application - Ajay. V. Deshmukh, TMGH, 2005.
- The 8085 Microprocessor: Architecture, programming and Interfacing – K.Uday Kumar, B.S.Umashankar, 2008, Pearson

**Course Outcome:**

- The student will learn the internal organization of popular 8086/8051 microprocessors/microcontrollers.
- The student will learn hardware and software interaction and integration.
- The students will learn the design of microprocessors/microcontrollers-based systems.

**ROBOTICS AND ITS APPLICATIONS**

**UNIT – I**

**Introduction:** Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system.

**Components of the Industrial Robotics:** End effectors- types, mechanical grippers, and other types of grippers, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

**UNIT – II**

**Motion Analysis:** Homogeneous transformations as applicable to rotation and translation – problems.

**Manipulator Kinematics:** Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

**UNIT – III**

**Manipulator jacobians:** Differential transformation and manipulators, Jacobians – problems.

**Dynamics:** Lagrange – Euler and Newton– Euler formations – Problems.

**UNIT IV**

**Trajectory planning:** path planning and avoidance of obstacles, , Slew motion, joint interpolated motion – straight line motion.

**Programming Languages:** Robot programming, languages and software packages.

**UNIT V**

**Robot actuators and Feed-back components:** Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors.

**Robot Application in Manufacturing:** Material Transfer - Material handling, loading and unloading - Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

**TEXT BOOKS :**

1. Robo Technology Fundamentals, James G. Keramas, CENGAGE Publications
2. Industrial Robotics / Groover M P /Pearson Edu.
3. Robotics and Control/ Nagrath and Mittal.

**REFERENCES :**

1. Introduction to Robotics / John J Craig / Pearson Edu
2. Applied Robotics / Edwin Wise / Cengage Publications
3. Robotics / Fu K S / McGraw Hill.
4. Robotic Engineering / Richard D. Klafter, Prentice Hall
5. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science.
6. Robot Dynamics & Control – Mark W. Spang and M. Vidyasagar / John Wiley & Sons (ASIA) Pte Ltd.

**MOTION CONTROL DESIGN**

**UNIT – I**

Introduction to Mechatronics, Mechatronics key elements, Graphical representation, Mechatronics design process, approaches in Mechatronics, Objectives of Mechatronics, Examples of Mechatronic Systems.

**UNIT t – II**

Transmission mechanics – linear power transmission, lead screw, timing belt, conveyors, Rotary transmission - spur gears and planetary transmission. Motors – DC servo motors with encoded feedback – Brushless DC servo motors with Hall- effect sensor, Stepper motors – full step, half step, and microstep. AC induction motors and their applications.

**UNIT t – III**

Control system in Motion control: programmable motion control, closed loop PID control – feed forward control – velocity, acceleration – fundamental concept for adaptive control and fuzzy logic. Programmable Logic Controller: Basic PLC Structures, Input / Output Processing, Ladder Programming, Latching and Internal relays, Sequencing, Timers and counters, Shift registers, Master and Jump controls.

**UNIT – IV**

INDUSTRIAL HYDRAULICS: Introduction, Merits of Fluid power and its utility for increase in productivity, symbolic representation of hydraulic elements – Hydraulic control valves, Hydraulic cylinders, Hydraulic accessories, and various pumps used in hydraulic system, Hydraulic fluids, Hydraulic circuits using Hydraulic cylinders and other elements. Applications of Hydraulic systems.

**UNIT – V**

INDUSTRIAL PNEUMATICS: Introduction, Symbolic representations of Pneumatic elements, Compressors and air installation, Pneumatic control valves, Pneumatic actuators, Pneumatic circuits using Pneumatic cylinders and other elements. Fluidics and fluid logic systems. Applications of Pneumatic systems.

**TEXT BOOKS :**

1. Introduction to Mechatronics and measurement Systems, Alciatore, 2009, 3e, TMH
2. Pneumatic systems - Principles and maintenance, SR Majumdar, TMH
3. Hydraulic systems – Principles and Maintenance, SR MAjumdar, TMH

**REFERENCE BOOKS :**

1. Mechatronics system design – Devdas shetty & Richard A. Kolk, Thomson, 2007
2. Mechatronics – W. Bolten, Pearson, 2010
3. Principles of Machine Tools – Sen & Bhattacharya
4. Introduction to Mechatronics, Appu Kuttan KK, Oxford Universities Press
5. Mechatronic systems: Fundamentals, Isermann, Springer

**PRODUCT DESIGN AND ASSEMBLY AUTOMATION  
(Elective – I)**

**UNIT –I**

**Automatic Feeding And Orienting Devices:** Vibrator feeders, Mechanics of vibratory conveying, load sensitivity, solutions to load sensitivity, spiral elevators, balanced feeders. Types of oriental systems, effect of active orienting devices on feed rate, natural resting aspects of parts for automatic handing, out-of-bowl tooling, Reciprocating - tube hopper feeder

**UNIT-II**

**Automatic Assembly Transfer Systems:** Assembly machines classification, Continuous transfer, intermittent transfer, indexing mechanisms, and operator - paced free – transfer machine, choice of assemble method, advantages and disadvantages of automation.

**UNIT-III**

**Product design for High speed Automatic Assembly and Robot Assembly :** Introduction, design of parts for: high speed, feeding and orienting, example, additional feeding difficulties, high speed automatic insertion, example, analysis of an assembly, general rules for product design for automation, product design for robot assembly.

**UNIT - IV**

**Design for Manual Assembly :** General design guidelines for manual assembly, development of the systematic DFA methodology, assembly efficiency, classification system for manual handling, classification system for manual insertion and fastening, effect of part symmetry on handling time, effect of part thickness and size on handling time, effect of weight on handling time, parts requiring two hands for manipulation, effect of symmetry effect of chamfer design on insertion operations, estimation of insertion time, reducing disk assembly problems.

**UNIT - V**

**Performance and Economics of Assembly Systems:** Indexing machines-effects of parts quality on down time and production time, free transfer machines- performance of free transfer machine, comparison of indexing and free - transfer machines.

**TEXT BOOKS:**

1. Geoffrey Boothroyd, "Assembly Automation and Product Design", Marcel Dekker Inc., NY, 1992.
2. Geoffrey Boothroyd, Peter Dewhurst, Winston Knight, "Product design for Manufacture and assembly", 2e, CRC Press

**REFERENCE BOOKS:**

1. A.K. Chitale, RC Gupta, "Product design and Manufacturing", PHI
2. Geoffrey Boothroyd, "Hand Book of Product Design" Marcel and Dekken, N.Y. 1990.
3. A Delbainbre "Computer Aided Assembly London, 1992.

**RENEWABLE ENERGY SOURCES  
(Elective – I)**

**UNIT – I**

**Principles of Solar Radiation:** Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power - Physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, Solar radiation on tilted surface, Instruments for measuring solar radiation and sun shine, solar radiation data.

**UNIT – II**

**Solar Energy Collection:** Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

**Solar Energy Storage and Applications:** Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications - solar heating/cooling techniques, solar distillation and drying, Photovoltaic energy conversion.

**UNIT – III**

**Wind Energy:** Sources and potentials, horizontal and vertical axis windmills, performance characteristics.

**Bio-Mass:** Principles of Bio-Conversion, Anaerobic /aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation, and economic aspects.

**UNIT – IV**

**Geothermal Energy:** Resources, types of wells, methods of harnessing the energy, potential in India.

**OTEC :** Principles, utilization, setting of OTEC plants, thermodynamic cycles.

**Tidal and Wave Energy:** Potential and conversion techniques, mini-hydel power plants, their economics.

**UNIT –V**

**Direct Energy Conversion:** Need for DEC, Carnot cycle, limitations, Principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thompson effects, figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principle, faraday's laws, thermodynamic aspects, selection of fuels and operating conditions.

**TEXT BOOKS:**

1. Renewable Energy Sources / Twidell & Weir / Taylor and Francis / 2<sup>nd</sup> Special Indian Edition
2. Non- conventional Energy Sources / G.D. Rai / Dhanpat Rai and Sons

**REFERENCE BOOKS:**

1. Energy Resources Utilization and Technologies / Anjaneyulu & Francis / BS Publications/2012
2. Principles of Solar Energy / Frank Krieth & John F Kreider / Hemisphere Publications
3. Non-Conventional Energy / Ashok V Desai / Wiley Eastern
4. Non-Conventional Energy Systems / K Mittal / Wheeler
5. Renewable Energy Technologies / Ramesh & Kumar / Narosa
6. Renewable Energy Resources / Tiwari and Ghosal / Narosa

**COMPUTATIONAL FLUID DYNAMICS  
(Elective – I)**

**UNIT-I**

Elementary details in numerical techniques: Number system and errors, representation of integers, fractions, floating point arithmetic, loss of significance and error propagation, condition for instability, computational methods for error estimation, convergence of sequences.

Applied Numerical Methods: Solution of a system of simultaneous Linear Algebraic Equations, iterative schemes of Matrix Inversion, Direct Methods for Matrix inversion, Direct Methods for banded matrices.

**UNIT - II**

Finite Difference Applications in Heat conduction and Convection – Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

Finite Differences, discretization, consistency, stability, and Fundamentals of fluid flow modeling: Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

**UNIT - III**

Introduction to first order wave equation; Stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme.

**UNIT - IV**

Review of Equations Governing Fluid Flow and Heat Transfer: Introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier-stokes equations.

**UNIT-V**

Finite volume method: Approximation of surface integrals, volume integrals, interpolation and differentiation practices, upwind interpolation, linear interpolation and quadratic interpolation.

**TEXT BOOKS:**

1. Numerical heat transfer and fluid flow / Suhas V. Patankar/ Hema shava Publishers corporation & Mc Graw Hill.
2. Computational Fluid Flow and Heat Transfer/ Muralidaran/ Narosa Publications

**REFERENCES:**

1. Computational Fluid Dynamics: Basics with applications/John D. Anderson/ Mc Graw Hill.
2. Fundamentals of Computational Fluid Dynamics/Tapan K. Sengupta / Universities Press.
3. Introduction to Theoretical and Computational Fluid Dynamics/C. Pozrikidis/Oxford University Press/2<sup>nd</sup> Edition



**DATA STRUCTURES  
(Elective – I)**

**Objectives:**

- To understand the basic concepts such as Abstract Data Types, Linear and Non Linear Data structures.
- To understand the notations used to analyze the Performance of algorithms.
- To understand the behavior of data structures such as stacks, queues, trees, hash tables, search trees, Graphs and their representations.
- To choose the appropriate data structure for a specified application.
- To understand and analyze various searching and sorting algorithms.
- To write programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables, search trees.

**UNIT- I**

Basic concepts- Algorithm Specification-Introduction, Recursive algorithms, Data Abstraction Performance analysis- time complexity and space complexity, Asymptotic Notation-Big O, Omega and Theta notations, Introduction to Linear and Non Linear data structures.

Singly Linked Lists-Operations-Insertion, Deletion, Concatenating singly linked lists, Circularly linked lists-Operations for Circularly linked lists, Doubly Linked Lists- Operations- Insertion, Deletion.

Representation of single, two dimensional arrays, sparse matrices-array and linked representations.

**UNIT- II**

Stack ADT, definition, operations, array and linked implementations in C, applications-infix to postfix conversion, Postfix expression evaluation, recursion implementation, Queue ADT, definition and operations ,array and linked Implementations in C, Circular queues-Insertion and deletion operations, Deque (Double ended queue)ADT, array and linked implementations in C.

**UNIT- III**

Trees – Terminology, Representation of Trees, Binary tree ADT, Properties of Binary Trees, Binary Tree Representations-array and linked representations, Binary Tree traversals, Threaded binary trees, Max Priority Queue ADT-implementation-Max Heap-Definition, Insertion into a Max Heap, Deletion from a Max Heap.

Graphs – Introduction, Definition, Terminology, Graph ADT, Graph Representations- Adjacency matrix, Adjacency lists, Graph traversals- DFS and BFS.

**UNIT- IV**

Searching- Linear Search, Binary Search, Static Hashing-Introduction, hash tables, hash functions, Overflow Handling.

Sorting-Insertion Sort, Selection Sort, Radix Sort, Quick sort, Heap Sort, Comparison of Sorting methods.

**UNIT- V**

Search Trees-Binary Search Trees, Definition, Operations- Searching, Insertion and Deletion, AVL Trees-Definition and Examples, Insertion into an AVL Tree ,B-Trees, Definition, B-Tree of order m, operations-Insertion and Searching, Introduction to Red-Black and Splay Trees(Elementary treatment-only Definitions and Examples), Comparison of Search Trees.

Pattern matching algorithm- The Knuth-Morris-Pratt algorithm, Tries (examples only).

**TEXT BOOKS:**

1. Fundamentals of Data structures in C, 2<sup>nd</sup> Edition, E.Horowitz, S.Sahni and Susan Anderson-Freed, Universities Press.
2. Data structures A Programming Approach with C, D.S.Kushwaha and A.K.Misra, PHI.

**REFERENCE BOOKS:**

1. Data structures: A Pseudocode Approach with C, 2<sup>nd</sup> edition, R.F.Gilberg And B.A.Forouzan, Cengage Learning.
2. Data structures and Algorithm Analysis in C, 2<sup>nd</sup> edition, M.A.Weiss, Pearson.
3. Data Structures using C, A.M.Tanenbaum,Y. Langsam, M.J.Augenstein, Pearson.

4. Data structures and Program Design in C, 2<sup>nd</sup> edition, R.Kruse, C.L.Tondo and B.Leung,Pearson.
5. Data Structures and Algorithms made easy in JAVA, 2<sup>nd</sup> Edition, Narsimha Karumanchi, CareerMonk Publications.
6. Data Structures using C, R.Thareja, Oxford University Press.
7. Data Structures, S.Lipscutz,Schaum's Outlines, TMH.
8. Data structures using C, A.K.Sharma, 2<sup>nd</sup> edition, Pearson..
9. Data Structures using C &C++, R.Shukla, Wiley India.
10. Classic Data Structures, D.Samanta, 2<sup>nd</sup> edition, PHI.
11. Advanced Data structures, Peter Brass, Cambridge.

**Outcomes:**

- Learn how to use data structure concepts for realistic problems.
- Ability to identify appropriate data structure for solving computing problems in respective language.
- Ability to solve problems independently and think critically.

**POWER PLANT ENGINEERING**  
(Elective – II)

**UNIT – I**

Introduction to the Sources of Energy – Resources and Development of Power in India. **Steam Power Plant** : Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.

**Combustion Process:** Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

**UNIT – II**

**Internal Combustion Engine Plant:**

**DIESEL POWER PLANT:** Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging. **Gas Turbine Plant:** Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison. **Direct Energy Conversion:** Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.

**UNIT – III**

**Hydro Electric Power Plant:** Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pondage – classification of dams and spill ways. **Hydro Projects And Plant:** Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants. **Power From Non-Conventional Sources:** Utilization of Solar- Collectors- Principle of Working, Wind Energy – types – HAWT, VAWT - Tidal Energy.

**UNIT – IV**

**Nuclear Power Station:** Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation. **Types of Reactors:** Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

**UNIT – V**

**Power Plant Economics And Environmental Considerations:** Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.

**TEXT BOOK :**

1. Power Plant Engineering/ P.C.Sharma / S.K.Kataria Pub
2. A Course in Power Plant Engineering: / Arora and S. Domkundwar.

**REFERENCES :**

1. A Text Book of Power Plant Engineering / Rajput / Laxmi Publications
2. Power Plant Engineering: P.K.Nag/ II Edition /TMH.
3. An Introduction to Power Plant Technology / G.D. Rai/Khanna Publishers
4. Power plant Engg / Elanchezhian/ I.K. International Pub
5. Power plant Engineering/ Ramalingam/ Scietech Publishers

IV B.Tech. MC -I sem

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**COMPUTER ORGANIZATION  
(Elective – II)**

**Objectives:**

- To understand basic components of computers.
- To explore the I/O organizations in depth.
- To explore the memory organization.
- To understand the basic chip design and organization of 8086 with assembly language programming.

**UNIT-I**

Basic Computer Organization – Functions of CPU, I/O Units, Memory: Instruction: Instruction Formats- One address, two addresses, zero addresses and three addresses and comparison; addressing modes with numeric examples: Program Control- Status bit conditions, conditional branch instructions, Program Interrupts: Types of Interrupts.

**UNIT-II**

Input-Output Organizations- I/O Interface, I/O Bus and Interface modules: I/O Vs memory Bus, Isolated Vs Memory-Mapped I/O, Asynchronous data Transfer- Strobe Control, Hand Shaking: Asynchronous Serial transfer- Asynchronous Communication interface, Modes of transfer- Programmed I/O, Interrupt Initiated I/O,DMA; DMA Controller, DMA Transfer, IOP-CPU-IOP Communication , Intel 8089 IOP.

**UNIT-III**

Memory Organizations

Memory hierarchy, Main Memory, RAM, ROM Chips, Memory Address Map, Memory Connection to CPU, associate memory , Cache Memory, Data Cache, Instruction cache, Miss and Hit ratio, Access time, associative, set associative, mapping , waiting into cache, Introduction to virtual memory.

**UNIT-IV**

8086 CPU Pin Diagram- Special functions of general purpose registers, Segment register, concept of pipelining, 8086 Flag register, Addressing modes of 8086.

**UNIT-V**

8086-Instruction formats: assembly Language Programs involving branch & Call instructions, sorting, evaluation of arithmetic expressions.

**TEXT BOOKS:**

- 1) Computer system Architecture: Morris Mano (UNIT-1,2,3).
- 2) Advanced Micro Processor and Peripherals- Hall/ A K Ray(UNIT-4,5).

**REFERENCE BOOKS:**

- 1) Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
- 2) Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson.
- 3) Fundamentals of Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition.
- 4) Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, Fourth Edition Elsevier.
- 5) Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication.

**Outcomes:**

After this course students understand in a better way the I/O and memory organization in depth. They should be in a position to write assembly language programs for various applications.

**FLEXIBLE MANUFACTURING SYSTEM  
(Elective – II)**

**UNIT – I**

Introduction: Types of production, characteristics, applications, need for FMS, where to apply FMS technology. Components of FMS, FMS layout configurations, planning the FMS, FMS's Work- stations. Flexible Manufacturing Cell: Characteristics, Flexible Machining systems, achieving flexibility in machining systems, Machine cell design, quantitative techniques

**UNIT – II**

Group Technology(GT) –Part classification and coding systems: Part families, Optiz system, structure, MULTICODE, differences between Optiz and MULTICODE systems, relative benefits. GT- production flow analysis: Composite part concept, numerical problems for parts clustering, advantages of GT in manufacturing and design.

**UNIT - III**

Material Handling systems, Automatic Guided vehicle systems, Automated storage and retrieval systems and Computer control systems.

**UNIT - IV**

Implementing FMS: FMS Layout configurations, Quantitative Analysis methods for FMS, Applications and benefits of FMS, problems in implementing FMS.

**UNIT – V**

Computer Aided Process planning: Importance, generative and retrieval systems, advantages and disadvantages, Generation of route sheets, selection of optimal machining parameters, methods.

Computer aided quality control and testing: Coordinate measuring machines, over view, contact and non contact inspection principles, Part programming coordinate measuring machines, In-cycle gauging

**TEXT BOOKS:**

1. Automation, Production systems and Computer Integrated Manufacturing System – Mikell P. Groover
2. The design and operation of FMS –Dr. Paul Ranky Nort –Holland Publishers

**REFERENCES:**

1. Flexible Manufacturing systems in practice by Joseph talvage and roger G. Hannam, Marcel Dekker Inc., New york
2. Hand book of FMS – Nand Jha .K.
3. FMS and control of machine tools - V. Ratmirov, MIR publications
4. Flexible Manufacturing – David J. Parrish

IV B.Tech. MC -I sem

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**ADVANCED KINEMATICS AND DYNAMICS OF MACHINERY  
(Elective – II)**

**UNIT-I:**

Geometry of motion-Grublers Criterion for plain and spatial mechanisms- Grashoff's law for planar and spatial mechanisms, Kutn Batch criterion for planar and spatial mechanisms  
Velocity and acceleration analysis,use of computers in analysis. Velocity and accelerations analysis of complex mechanisms.

**UNIT-II:**

Coupler curves, Robert's Chebychev spacing method. Cognate linkages. Path curvature- Polodes- Euler Savery equation -Bobiller and Hartman's Construction- Equivalent mechanisms.

**Space mechanisms and mobility equations:** Positional problems. Vector analysis of velocity and accelerations,

**UNIT-III:**

**Theorem of angular velocities and accelerations** –computer aided analysis.

**Static force analysis of plane and spatial mechanisms:** Inertia forces and torques. Dynamic force analysis, application of computer animation and simulation of motion studies.

**UNIT-IV:**

**Dynamic Motion Analysis:** Quinn's energy distribution method, the equivalent mass and force method. The rate of change of energy method, dynamic motion simulation.

**UNIT-V:**

**Synthesis of linkages:** Two position synthesis. Properties of rotopole, Chebychev spacing. Optimization of the transmission angles. The overlay method; Three-position synthesis; point position reduction; synthesis of dwell mechanisms;

**Codes / Tables:** No table/code books required for examination

**TEXTBOOKS:**

1. Kinematics and Dynamics and design of machinery, Waldron, Wiley Publishers.
2. Shigley : J.E. Kinematic Analysis of mechanism, McGraw 111.

**REFERECES:**

1. Hirschcom : J.K.. KinciBcs and Dynamics of Plane Mechanisms Mc.Graw Hill.
2. Holewenko, A.R. Dynamics of machinery, John Wiley & Sons.

**MICROPROCESSORS AND MICROCONTROLLERS LAB**

**Note:**

- Minimum of 12 experiments are to be conducted.
- The Following programs/experiments are to be written for assembler and to be executed the same with 8086 and 8051 kits.

**List of Experiments:**

1. Programs for 16 bit arithmetic operations for 8086 (using Various Addressing Modes).
2. Program for sorting an array for 8086.
3. Program for searching for a number or character in a string for 8086.
4. Program for string manipulations for 8086.
5. Program for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessors using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
10. Programming using arithmetic, logical and bit manipulation instructions of 8051.
11. Program and verify Timer/ Counter in 8051.
12. Program and verify Interrupt handling in 8051
13. UART Operation in 8051.
14. Communication between 8051 kit and PC.
15. Interfacing LCD to 8051.
16. Interfacing Matrix/ Keyboard to 8051.
17. Data Transfer from Peripheral to Memory through DMA controller 8237 / 8257.

**MOTION CONTROL DESIGN AND CNC &ROBOTICS LAB**

Note: Any Six from each Laboratory

**MOTION CONTROL ROBOTICS LAB**

1. Study of the following equipment :
  - a. Relief Valve,
  - b. Flow Control Valves
  - c. Directional Control Valves
  - d. Pressure Control Valves
2. Circuits for reciprocating motion of a single acting and double acting pneumatic cylinders.
3. Circuits for reciprocating motion of hydraulic cylinders.
4. Circuits for speed control of a
  - (a) double acting pneumatic cylinder.
  - (b) Double acting hydraulic Cylinder.
5. Circuits for semi automatic and automatic operation of a double acting Pneumatic cylinders.
6. Circuits for semi automatic and automatic operation of a double acting hydraulic cylinders.
7. Circuits for sequencing motion of two pneumatic cylinder
  - (a) by cascading
  - (b) by using a sequence valve
8. Circuits for Measurement of pressure of air/oil in fluid power system.
9. Design and simulation of pneumatic circuits using simulation software
10. Design and simulation of hydraulic circuits using simulation software

**CNC &ROBOTICS LAB**

1. Study and operation of CNC lathe
2. Study and operation of CNC milling machine
3. Preparation of typical part programs of CNC lathe
4. Preparation of typical part programs on CNC milling machine.
5. Exercises using CAM software.
6. Communication within Flexible Manufacturing Cell-cell computer to machine, cell computer to robot, Machine - to - machine Interfacing
7. Part program generation through G and M Codes for turning, contouring, drilling, and Milling.
8. Development of tool path simulation by setting tool offsets for multi operations.
9. Machining of various Components by generation of CNC code by CAM Software
10. Robot Programming



**AUTOMATION IN MANUFACTURING**

**UNIT – I**

Introduction: Types and strategies of automation, pneumatic and hydraulic components circuits, Automation in machine tools. Mechanical feeding and tool changing and machine tool control transfer the automaton.

**UNIT – II**

Automated flow lines : Methods or work part transport transfer Mechanical buffer storage control function, design and fabrication consideration.

Analysis of Automated flow lines: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines.

**UNIT – III**

Assembly system and line balancing : Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

**UNIT –IV**

Automated material handling : Types of equipment, functions, analysis and design of material handling systems conveyor systems, automated guided vehicle systems.

Automated storage systems, Automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.

**UNIT – V**

Fundamentals of Industrial controls: Review of control theory, logic controls, sensors and actuators, Data communication and LAN in Manufacturing

Business process Re-engineering: Introduction to BPE logistics, ERP, Software configuration of BPE.

**TEXT BOOK:**

1. Automation, Production Systems and Computer Integrated Manufacturing : M.P. Groover 3e./PE/PHI, 2009

**REFERENCES:**

1 Computer Aided Manufacturing, Tien-Chien Chang, Richard A. Wysk and Hsu-Pin Wang, Pearson, 2009  
2 Automation by W. Buekinsham.

**MEMS DESIGN  
(Elective-III)**

**UNIT – I**

Introduction, Integrated Circuits, MEMS, Micro sensors, Microactuators, Microelectronics Fabrication, Micromachining, Mechanical MEMS, Thermal MEMS, MOEMS, Magnetic MEMS, RF MEMS, Microfluid systems, Bio and Chemo-devices, Nanotechnology, Modeling and Simulation.

Micromachining: Introduction, Photolithography, Structural and sacrificial Materials, other Lithography methods, Thin film deposition, Impurity doping, Etching, Problems with bulk Micro machining, Surface Micromachining, Bulk Vs. Surface micromachining.

**UNIT – II**

System Modeling and Properties of Material: Introduction, Need for modeling, system types, Basic Modeling elements in mechanical systems, Electrical systems, Fluid systems and Thermal systems, Translational pure mechanical system with spring, damper and mass-Rotational pure mechanical system with spring, damper and mass

**Passive components and systems:** Introduction, System-on-a-chip, Passive electronic systems, Passive mechanical systems

**UNIT – III**

**Mechanical Sensors and Actuators:** Introduction, Principles of sensing and actuation, Beam and cantilever, Micro plates, Capacitive Effects, Piezo electric material as sensing and actuating elements, strain measurement, pressure measurement, Flow measurement using Integrated paddle-cantilever structure.

**Thermal Sensors and Actuators:** Introduction, Thermal energy basics and heat transfer processes, Thermistors, Thermo devices, Thermocouple, Micromachined thermocouple probe, Peltier effect heat pumps, Thermal flow sensors, Micro hot plate gas sensors, Shape memory Alloys, U-shaped horizontal and vertical Electrothermal Actuator, Thermally activated MEMS Relay.

**UNIT – IV**

Micro-opto-Electromechanical systems: Introduction, fundamental principle of MOEMS Technology, Review on properties of Light, Light modulators, Beam Splitter, Microlens, Micro mirrors, Digital micro mirror device, Light detectors, Grating Light valve, Optical switch, Waveguide and tuning, Shear – Stress measurement. Magnetic Sensors and Actuators

**UNIT – V**

Radio frequency MEMS: Introduction, Review of RF-based communication systems, RF, MEMS, MEMS Inductors, Varactors, Tuner / Filter, Resonator, Clarification of Tuner, Filter, Resonator, MEMS Switches, Phase Shifter, Microfluidic Systems, Introduction, Applications.

**TEXT BOOKS:**

1. MEMS, Nitaigour Premchand Mahalik, TMH
2. MEMS & MICRO SYSTEMS Design and Manufacture, Tai-Ran HSU, TMH, 2006

**REFERENCES:**

1. Mechatronics Systems Fundamentals – Rolf Isermann – Springer International Edition
2. The Science and Engineering of Micro electronic Fabrication, 2<sup>nd</sup> Ed. By S.A. Cambell, Published by Oxford University Press (2001)
3. Fundamentals of Micro Fabrication : The science of Miniaturization, 2<sup>nd</sup> Edition by M.J. Madou, published by CRC press (2002)
4. Introductory MEMS: Fabrication and Applications by Adams, Thomas M, Layton Richard A., 1<sup>st</sup> Edition 2010 IBNL 978-0-387-09510-3, Springer
5. Microsystems Design, Stephen D. Senturia, Springer International Edition

**PRODUCTION PLANNING AND CONTROL**  
(Elective – IV)

**UNIT-I**

Introduction: Definitions – objectives of production planning and control- functions of production planning and control- elements of production control- types of production- organization of production planning and control – internal organizations department

**UNIT-II**

Forecasting – Importance of forecasting – types of forecasting, their uses- general principles of forecasting techniques- Qualitative methods and quantitative methods.

**UNIT-III**

Inventory management – Functions inventory- Relevant inventory cost- ABC analysis- VED Analysis- EOQ model – Inventory control systems – P- Systems and Q – Systems  
Introduction to MRP And ERP, LOB( Line of balance ), JIT inventory, Japanese concepts.

**UNIT- IV**

Routing – Definition – routing procedure- Route sheets – Bill of material- factors affecting routing procedure.  
Schedule – definition – difference with loading.  
Scheduling polices – techniques, standard scheduling methods- job shop, flow shop,.  
Line balancing, aggregate planning- methods for aggregate planning- Chase planning, expediting, control aspects.

**UNIT-V**

Dispatching – Activities of dispatcher- Dispatching procedure - follow up – definition – reasons for existence of functions – types of follow up, applications of computer in production planning and control

**TEXT BOOKS:**

1. Production Planning and Control/ M.Mahajan/ Dhanpati rai & Co
2. Production Planning and Control/ Jain & Jain/ Khanna publications

**REFERENCE BOOKS :**

1. Production Planning and Control- Text & cases/ SK Mukhopadhyaya /PHI.
2. Production and operations Management/ R.Panneer Selvam/PHI
3. Operations Management/Chase/PHI
4. Operations management/ Heizer/Pearson
5. Production and Operations Management(Theory and Practice)/Dipak Kumar Bhattacharyya/University Press
6. Operations Management/S.N. Chary/TMH

**CONCURRENT ENGINEERING**  
(Elective – II)

**UNIT I**

**Introduction** : Development of Concurrent Engineering. The mean and activity concepts and principles. Examples.

**Concurrent Engineering Tools and Technologies:** Changes in to Technologies, Tasks, Talents and times into well managed resources product developments.

**UNIT – II**

**Research in Engineering design and manufacturing:** Theory applications using the concurrent Engineering concepts and Principles.

Simultaneous design and all related processes of a product.

**UNIT –III**

**The mission and vision of C.E:** Computer optimized manufacturing (COM).The next generation of computer integrated manufacturing (CIM).

Global competitiveness and development of high quality product. Offline reliability

**UNIT –IV**

**Managing the concurrent Engineering:** Contemporary Issues a modern Tools and methods Use of Computers and decision making. Reengineering concepts

**UNIT-V**

Automated Quality Control Application of CMM, Basic concepts, Zero defect, 6 sigma concept, Tolerancing, Examples, DFMA, Rapid Prototyping

**TEXT BOOK:**

1. Concurrent Engineering: Tools and Technologies for Mechanic Systems Design – Edward, J. Haug.

**REFERENCES :**

1. Research in Engineering Design : Theory, applications, and concurrent engineering : Vol. 7, No. 1, 1995.
2. Managing Concurrent Engineering. – Jon Turino

IV B.Tech. MC -II sem

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**PLANT ENGINEERING AND MAINTENANCE  
(Elective – II)**

**UNIT – I:**

Introduction: Need for maintenance, Facts and Figures, modern maintenance, problem and maintenance strategy for the 21<sup>st</sup> century, Engineering maintenance objectives and maintenance in equipment Life cycle, Terms and definitions.

Maintenance Management and control: Maintenance Manual, Maintenance, Facility evaluation, Functions of Effective Maintenance Management, Maintenance project control Methods, Maintenance Management control Indices.

**UNIT – II**

Types of maintenance: Preventive Maintenance, Elements of Preventive, Maintenance Program, Establishing Preventive Maintenance program, PM program Evaluation and Improvement, PM measures, PM models, Corrective Maintenance, Corrective Maintenance types, Corrective Maintenance steps and downtime components, Corrective Maintenance measures, Corrective Maintenance models.

Inventory control in Maintenance: Inventory control objectives and basic inventory decisions, ABC Inventory control method, Inventory control models Two bi Inventory control and safety stock, Spares determination factors, spares calculation methods.

**UNIT –III**

Quality and Safety in Maintenance: Needs for quality Maintenance processes, Maintenance work quality, use of quality control charts in Maintenance work sampling, post Maintenance testing, reasons for safety problems in Maintenance, guidelines to improve safety in Maintenance work, safety officer's role in Maintenance work, protection of Maintenance workers.

**UNIT -IV**

Maintenance costing: reasons for Maintenance costing, Maintenance budget preparation methods and steps, Maintenance labor cost estimation, material cost estimation, equipment life cycle Maintenance cost estimation, Maintenance cost estimation models.

**UNIT – V**

Reliability, Reliability centered Maintenance: RCM goals and principles, RCM process and Associated Questions, RCM Program components Effectiveness Measurement indicators, RCM benefits and Reasons for its failures, Reliability versus Maintenance and Reliability in support phase, Bathtub Hazard Rate Concept, Reliability Measures and Formulas, Reliability Networks, Reliability Analysis Techniques.

Maintainability: Maintainability Importance and objective, Maintainability in systems Life cycle, Maintainability Design characteristics, Maintainability functions and measures, common Maintainability design errors.

**TEXT BOOKS:**

1. Engineering Maintenance a modern approach B.S. Dhallon 2002 C.R.R. Publichers
2. Maintenance Engineering and management – K. Venkataraman - PHI

**REFERENCE BOOKS:**

1. Reliability Engineering – Balaguruswamy
2. Reliability Engineering – L.S. Srinath
3. Industrial Safety Management – L.M. Deshmukh – TMH

**ARTIFICIAL NEURAL NETWORKS**  
(Elective – IV)

**UNIT- I**

Introduction - what is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

**Learning Process** – Error Correction learning, Memory based learning, Hebbian learning, Competitive, Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process.

**UNIT- II**

**Back Propagation:** back propagation and differentiation, Hessian matrix, Generalization, Cross validation, Network pruning Techniques, Virtues and limitations of back propagation learning, Accelerated convergence, supervised learning.

**UNIT- III**

**Single Layer Perceptrons:** Adaptive filtering problem, Unconstrained Organization Techniques, Linear least square filters, least mean square algorithm, learning curves, Learning rate annealing techniques, perceptron – convergence theorem, Relation between perceptron and Bayes classifier for a Gaussian Environment

**Multilayer Perceptron** – Back propagation algorithm XOR problem, Heuristics, Output representation and decision rule, Computer experiment, feature detection.

**UNIT- IV**

**Self Organization Maps:** Two basic feature mapping models, Self organization map, SOM algorithm, properties of feature map, computer simulations, learning vector quantization, Adaptive patten classification.

**UNIT- V**

**Neuro Dynamics:** Dynamical systems, stability of equilibrium states, attractors, neuro dynamical models, manipulation of attractors as a recurrent network paradigm

**Hopfield Models** – Hopfield models, computer experiment

**TEXT BOOK:**

1. Neural networks: A comprehensive foundation/ Simon Hhaykin/ PHI.

**REFERENCES:**

1. Artificial neural networks/ B.Vegnanarayana/PHI
2. Neural networks in Computer intelligence/ Li Min Fu/ TMH/2003
3. Neural networks/ James A Freeman David M S kapura/ Pearson education/2004
4. Introduction to Artificial Neural Systems/Jacek M. Zurada/JAICO Publishing House Ed. 2006.

**MATHEMATICAL MODELING AND SIMULATION  
(Elective – IV)**

**UNIT I**

Art of Modeling, Types of models, mathematical models – solution methods – analytical, Numerical and Heuristic. L.P.P. – Formulation – Graphical Method, simplex method, dual simplex method and application. Transportation models – Assignment models, Integer programming, Non-linear programming.

**UNIT – II**

Deterministic Inventory models – General Inventory model, Static E.O.Q. Models, Dynamic Inventory model, Probabilistic Inventory models, continuous Review models, single period model and multiple period model. Selective Inventory control – ABC, VED, FSN Analysis. Inventory systems – Fixed order quantity system, two bin system, periodic review systems, Optional Replenishment system and M R P.

**UNIT –III**

Queuing Theory – Basic Structure of Queuing Models, Role of Exponential Distribution, Birth-and-Death Process, Queuing Models Based on the Birth-and- Death Process, Queuing Models involving Non-exponential Distributions, Priority-Discipline Queuing Models and Queuing Networks. Applications of Queuing Theory – Decision Making, Formulation of Waiting – Cost Function and Decision Models.

**UNIT – IV**

CPM and PERT – Network Representation, Critical path calculation, construction of Time schedule. Simulation – Introduction, General principles, Random-Number Generation, Random-Variate Generation, Simulation Software.

**UNIT – V**

Input modeling, verification and validation of simulation models, Output Analysis for a single model, Comparison and Evaluation of Alternative System Designs, Simulation of Computer Systems.

**TEXT BOOKS:**

1. Introduction to Operations Research, Frederick S Hiller and Gerald J Lieberman, 7<sup>th</sup> Edition, Tata McGrawHill, 2001 (Chapters 17 and 18 for Unit-III).
2. Discrete-Event System Simulation, Jerry Banks, John S Carson II, Barry L. Nelson and David M. Nicol, 3<sup>rd</sup> edition, PHI/Pearson Education (Chapters 1,3,4,7 and 8 for Unit-IV; Chapters 9,10,11,12 and 14 for Unit-V).
3. Operations Research – An Introduction, 7<sup>th</sup> edition, Prentice-Hall of India, 1999 (Chapter 1 to 5 for Unit-I and Chapters 11 and 16 for Unit II, Section 6.7 for Unit-IV).

**REFERENCE BOOKS:**

1. Operation Research – S.K.Jain and D. M. Mehta, Galgotia.
2. Introductory Operations Research: Theory & Applications, Kasana, Springer.
3. Applied Simulation Modelling – Seila, Ceric and Tadikamalla
4. Simulation Modeling and Analysis – Averil M Law – TMH
5. Operation Research – An Introduction 7<sup>th</sup> Edition, Prentice Hall of india, 1999 (Chapter 1 to 5 for Unit – I and Chapters 11 and 16 for Unit II, Section 6,7 for Unit – IV)

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**PRINCIPLES OF ENTREPRENEURSHIP  
(Elective-IV)**

**UNIT I:**

Introduction to Entrepreneurship: Definition of Entrepreneur Entrepreneurial Traits. Entrepreneur vs. Manager, Creating and Starting the venture: Sources of new ideas, methods of generating ideas, creative problem solving - Writing Business Plan, Evaluating Business Plans. Launching formalities.

**UNIT II:**

Financing and Managing the new venture: Sources of capital, Record keeping, recruitment, motivating and leading teams, financial controls. Marketing and sales controls. E-commerce and entrepreneurship, Internet advertising- New venture Expansion Strategies and Issues.

**UNIT III:**

Institutional/financial support: Schemes and functions of Directorate of Industries, District Industries Centres (DICs), Industrial Development Corporation (IDC), State Financial Corporation (SFCs), Small Scale Industries Development Corporations (SSIDCs), Khadi and Village Industries Commission (KVIC), Technical Consultancy Organisation (TCO), Small Industries Service Institute (SISI), National Small Industries Corporation (NSIC), Small Industries Development Bank of India (SIDBI).

**UNIT IV:**

Production and Marketing Management: Thrust areas of production management, Selection of production Techniques, Plant utilization and maintenance, Designing the work place, Inventory control , material handling and quality control. Marketing functions, market segmentation, market research and channels of distribution, Sales promotion and product pricing.

**UNIT V :**

Labour legislation, Salient Provisions of Health, Safety, and Welfare under Indian Factories Act, Industrial Disputes Act, Employees State Insurance Act, Workmen's Compensation Act and Payment of Bonus Act.

**TEXT BOOKS:**

1. Robert Hisrich, & Michael Peters: Entrepreneurship, TMH,2009.
2. Dollinger: Entrepreneurship, Pearson,2009.

**REFERENCE BOOKS:**

1. Vasant Desai, Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, 2009.
2. Harvard Business Review on Entrepreneurship, HBR Paper Back.
3. Robert J.Calvin: Entrepreneurial Management, TMH, 2009.
4. Gurmeet Naroola: The entrepreneurial Connection, TMH,2009
5. Bolton & Thompson: Entrepreneurs--Talent, Temperament and Techniques, Butterworth Heinemann, 2009.
6. Agarwal: Indian Economy, Wishwa Prakashan 2009.
7. Dutt & Sundaram: Indian Economy, S.Chand, 2009
8. B D Singh,;Industrial Relations & Labour Laws, Excel, 2009.
9. Aruna Kaulgud: Entrepreneurship Management by, Vikas publishing house, 2009.
10. Essential of entrepreneurship and small business management by Thomas W.Zimmerer & Norman M.Searborough, PHI-2009
11. ND Kapoor: Industrial Law, Sultan Chand & Sons, 2009.



**MATLAB APPLICATIONS**  
(Elective – IV)

**UNIT I:**

Starting with MATLAB: Command Window, Arithmetic Operations, Display Formats, Built-In Functions, Variables, Useful Commands, Script Files, Examples of MATLAB Applications

**UNIT II:**

Arrays and Mathematical Operations: One and two-dimensional Array, zero's ones and, eye Commands, Array Addressing, Vector Matrix, Strings and Strings as Variables  
Addition, Subtraction, Multiplication and Array Division, Built-in MATH Functions, Generation of Random Numbers, Script File operations, Examples

**UNIT III:**

Programming in MATLAB: Plot, line, hold on and hold off Commands, Formatting a Plot, Polar Plots  
Relational and Logical Operators, Conditional Statements, Nested Loops and Nested Conditional Statements, User-Defined Functions and Function Files, Comparison Between Script Files and Function Files, Anonymous and Inline Functions, Function Functions, Sub-functions, Nested Functions, Examples

**UNIT IV:**

Polynomials, Curve Fitting, and Interpolation: Polynomials, Value of Polynomial, Roots of Polynomial, Addition, Multiplication, Derivatives and Division of Polynomials, Curve Fitting Curve Fitting with Polynomials, The polyfit Function

**UNIT V:**

Applications in Numerical Analysis: One variable, Integration, Ordinary Differential Equations, Mesh, surface, special graphs, view commands, symbolic objects and expressions, algebraic equation, differentiation, integration, Examples

**TEXT BOOKS**

MATLAB An Introduction with Applications, 4<sup>th</sup> Edition, Amos Gilat, WILEY Publishers  
MATLAB Programming for Engineers, 4<sup>th</sup> Edition, Stephen J. Chapman, CENGAGE Publishers

**REFERENCES**

Essential-MATLAB for Engineers and Scientists, 4<sup>th</sup> Edition, Brian H. Hahan and Daniel T. Valentine, Elsevier Publications  
MATLAB-A practical Introduction to programming and problem solving, 2<sup>nd</sup> Edition, Stormy Attaway, Elsevier BH

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**IV B.Tech. MC -II sem**

**INDUSTRY ORIENTED MINI PROJECT**

<b>L</b>	<b>T/P/D</b>	<b>C</b>
-	-/-	2

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**SEMINAR**

<b>L</b>	<b>T/P/D</b>	<b>C</b>
-	-/6/-	2

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**PROJECT WORK**

<b>L</b>	<b>T/P/D</b>	<b>C</b>
-	-/15/-	10

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**IV B.Tech. MC -II sem**

**COMPREHENSIVE VIVA**

<b>L</b>	<b>T/P/D</b>	<b>C</b>
-	-/-	2