

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
KAKINADA

B.TECH. MECHANICAL ENGINEERING

I YEAR COURSE STRUCTURE

CODE	SUBJECT	T	P/D	C
	English	2 +1*	0	4
	Mathematics-I	3 +1*	0	6
	Mathematical Methods	3 +1*	0	6
	Engineering Physics	2 +1*	0	4
	Engineering Chemistry	2	0	4
	Classical Mechanics	2+1*	0	4
	Computer Programming	2+1*	0	4
	Engineering Graphics	0	6	8
	Engineering Physics and Fuels and Lubricants Lab	0	3	4
	English Language Communication Skills Lab	0	3	4
	Computer Programming Lab	0	3	4
	Engineering Work Shop Practice	0	3	4
<b>Total</b>		<b>22</b>	<b>18</b>	<b>56</b>

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<b>II YEAR</b>		<b>COURSE STRUCTURE</b>			<b>SEMESTER I</b>	
<b>CODE</b>	<b>SUBJECT</b>	<b>T</b>	<b>P/D</b>	<b>C</b>		
	Production Technology	4+1*	0	4		
	Object Oriented Programming	4 +1*	0	4		
	Electrical and Electronics Engineering	4 +1*	0	4		
	Mechanics of Solids	4 +1*	0	4		
	Thermodynamics	4 +1*	0	4		
	Metallurgy and Materials Science	4+1*	0	4		
	Electrical and Electronics Engineering Lab	0	3	2		
	Object Oriented Programming Lab	0	3	2		
<b>Total</b>		<b>30</b>	<b>6</b>	<b>28</b>		

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<b>II Year</b>		<b>COURSE STRUCTURE</b>			<b>Semester II</b>	
<b>CODE</b>	<b>SUBJECT</b>	<b>T</b>	<b>P/D</b>	<b>C</b>		
	Probability and Statistics	4+1*	0	4		
	Kinematics of Machinery	4+1*	0	4		
	Thermal Engineering -I	4+1*	0	4		
	Fluid Mechanics and Hydraulic Machinery	4+1*	0	4		
	Machine Drawing	0	6	4		
	Environmental Studies		4+1*	0	4	
	Production Technology Lab	0	3	2		
	Mechanics of Solids and Metallurgy Lab	0	3	2		
<b>Total</b>		<b>25</b>	<b>12</b>	<b>28</b>		

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III Year		COURSE STRUCTURE			Semester I	
CODE	SUBJECT	T	P/D	C		
	Managerial Economics and Financial Analysis	4+1*	0	4		
	Automobile Engineering	4+1*	0	4		
	Dynamics of Machinery	4+1*	0	4		
	Machine Tools	4+1*	0	4		
	Design of Machine Members – I	4+1*	0	4		
	Heat Transfer	4+1*	0	4		
	Fluid Mechanics and Hydraulic Machinery Lab	0	3	2		
	Thermal Engineering Lab	0	3	2		
<b>TOTAL</b>		<b>30</b>	<b>6</b>	<b>28</b>		

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III Year		COURSE STRUCTURE			Semester II	
CODE	SUBJECT	T	P/D	C		
	Industrial Management	4+1*	0	4		
	CAD/CAM	4+1*	0	4		
	Metrology and Surface Engineering	4+1*	0	4		
	Refrigeration and Air Conditioning	4+1*	0	4		
	Design of Machine Members – II	4+1*	0	4		
	Thermal Engineering - II	4+1*	0	4		
	Metrology and Machine Tools Lab	0	3	2		
	Advanced English Communication Skills Lab	0	3	2		
<b>TOTAL</b>		<b>30</b>	<b>6</b>	<b>28</b>		

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<b>IV Year</b>		<b>COURSE STRUCTURE</b>			<b>Semester I</b>		
<b>CODE</b>	<b>SUBJECT</b>	<b>T</b>	<b>P/D</b>	<b>C</b>			
	Operations Research	4+1*	0	4			
	Data Base Management Systems	4+1*	0	4			
	Finite Element Methods	4+1*	0	4			
	Instrumentation and Control Systems	4+1*	0	4			
	<b>ELECTIVE - I</b>	4+1*	0	4			
	Robotics						
	Computational Fluid Dynamics						
	Mechatronics						
	Advanced Data Structures and Algorithms						
	<b>ELECTIVE - II</b>		4+1*	0	4		
	Unconventional Machining Processes						
	Nonconventional Sources of Energy						
	Power Plant Engineering						
	Unix and Shell programming						
	Heat Transfer Lab	0	3	2			
	Production Drawing Practice and Instrumentation Lab	0	3	2			
	<b>TOTAL</b>	<b>30</b>	<b>6</b>	<b>28</b>			

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<b>B.Tech - IV</b>		<b>Semester -II</b>		
<b>CODE</b>	<b>SUBJECT</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
	Production Planning and Control	4+1*	0	4
	<b>ELECTIVE - III</b>	3+1*	0	3
	Neural Networks and Fuzzy Logic Systems			
	Tribology			
	Nanotechnology			
	Computer Organization and Architecture			
	<b>ELECTIVE - IV</b>		3+1*	0
	Principles of Entrepreneurship			3
	Automation in Manufacturing			
	Interactive Computer Graphics			
	Operating System Concepts			
	CAD/CAM Lab	0	3	2
	Industry Oriented Mini Project	0	0	2
	Seminar	0	2	
	Project Work	0	0	10
	Comprehensive Viva	0	0	2
	<b>TOTAL</b>	<b>13</b>	<b>3</b>	<b>28</b>

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

\* - Tutorial

T - Theory

P – Practical/Drawing

C - Credits

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## ENGLISH

### 1. 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 competence 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 by the students. Hence, it is suggested that they read it on their own with 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 and practice of language skills.*

### 2. OBJECTIVES:

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

### 3. 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 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 all the nine units of the prescribed text: *Learning English : A Communicative Approach.*)
  - Just A Minute(JAM) Sessions.

#### Reading Skills:

Objectives

1. To develop an awareness in the students about the significance of silent reading and comprehension.
2. 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
  - 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 the non-detailed text or other 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
- Editing a passage

#### **4. 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 **Eight Units**, are prescribed:

##### **For Detailed study**

1. **LEARNING ENGLISH: A Communicative Approach**, KAKINADA: Orient Longman, 2006. (Six Selected Lessons)

##### **For Non-detailed study**

2. **WINGS OF FIRE: An Autobiography - APJ Abdul Kalam**, Abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004.

##### **A. STUDY MATERIAL:**

###### **Unit –I**

1. Astronomy from LEARNING ENGLISH: A Communicative Approach, Orient Longman, 2005.
2. Chapters 1-4 **from** Wings of Fire: An Autobiography - **APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd.,2004**

###### **Unit –II**

3. Information Technology **from** LEARNING ENGLISH: A Communicative Approach, **Orient Longman, 2005.**
4. Chapters 5-8 **from** Wings of Fire: An Autobiography - **APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd.,2004**

###### **Unit –III**

5. Humour **from** LEARNING ENGLISH: A Communicative Approach, **Orient Longman, 2005.**
6. Chapters 9-12 **from** Wings of Fire: An Autobiography - **APJ Abdul Kalam, an abridged version with Exercises., Universities Press (India) Pvt. Ltd.,2004**

###### **Unit –IV**

7. Environment **from** LEARNING ENGLISH: A Communicative Approach, Orient Longman, 2005.
8. Chapters 13-16 **from** Wings of Fire: An Autobiography – APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004

Unit -V

9. Inspiration **from** LEARNING ENGLISH: A Communicative Approach, Orient Longman, 2005.
10. Chapters 17-20 **from** Wings of Fire: An Autobiography – APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004.

Unit - VI

11. Human Interest **from** LEARNING ENGLISH: A Communicative Approach, Orient Longman, 2005.
12. Chapters 21-24 **from** Wings of Fire: An Autobiography – APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004.

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

**Unit - VII**

**Exercises on**

- Reading and Writing Skills
- Reading Comprehension
- Situational dialogues
- Letter writing
- Essay writing

**Unit - VIII**

**Practice Exercises on Remedial Grammar covering**

Common errors in English, Subject-Verb agreement, Use of Articles and Prepositions,  
Tense and aspect

**Vocabulary development covering**

Synonyms & Antonyms, one-word substitutes, prefixes & suffixes, Idioms & phrases, words often confused.

**REFERENCES :**

1. **Strengthen Your English**, Bhaskaran & Horsburgh, Oxford University Press
2. **Basic Communication Skills for Technology**, Andrea J Rutherford, Pearson Education Asia.
3. **Murphy's English Grammar with CD**, Murphy, Cambridge University Press
4. **English Skills for Technical Students** by Orient Longman
5. **Everyday Dialogues in English** by Robert J. Dixson, Prentice-Hall of India Ltd., 2006.
6. **English For Technical Communication**, Vol. 1 & 2, by K. R. Lakshmi Narayanan, Sci tech. Publications.
7. **A Hand book of English for Engineers & Technologists** by Dr. P. Eliah, B. S. Publications.
8. **Developing Communication Skills** by Krishna Mohan & Meera Benerji (Macmillan)
9. **Speaking and Writing for Effective Business Communication**, Francis Soundararaj, MacMillan India Ltd., 2007.
10. **The Oxford Guide to Writing and Speaking**, John Seely, Oxford

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MATHEMATICS – I

**UNIT – I**

Differential equations of first order and first degree – exact, linear and Bernoulli. Applications to Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories.

**UNIT – II**

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax} V(x)$ ,  $xV(x)$ , method of variation of parameters.

**UNIT – III**

Rolle's Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – Generalized Mean Value theorem (all theorems without proof) Functions of several variables – Functional dependence- Jacobian- Maxima and Minima of functions of two variables with constraints and without constraints

**UNIT – IV**

Radius, Centre and Circle of Curvature – Evolutes and Envelopes Curve tracing – Cartesian, polar and Parametric curves.

**UNIT – V**

Applications of integration to lengths, volumes and surface areas in Cartesian and polar coordinates multiple integrals - double and triple integrals – change of variables – change of order of integration.

**UNIT – VI**

Sequences – series – Convergences and divergence – Ratio test – Comparison test – Integral test – Cauchy's root test – Raabe's test – Absolute and conditional convergence

**UNIT – VII**

Vector Calculus: Gradient- Divergence- Curl and their related properties of sums- products- Laplacian and second order operators. Vector Integration - Line integral – work done – Potential function – area- surface and volume integrals Vector integral theorems: Green's theorem-Stoke's and Gauss's Divergence Theorem (With out proof). Verification of Green's - Stoke's and Gauss's Theorems.

**UNIT – VIII**

Laplace transform of standard functions – Inverse transform – first shifting Theorem, Transforms of derivatives and integrals – Unit step function – second shifting theorem – Dirac's delta function – Convolution theorem – Periodic function - Differentiation and integration of transforms-Application of Laplace transforms to ordinary differential equations Partial fractions-Heaviside's Partial fraction expansion theorem.

**TEXT BOOKS:**

1. A text Book of Engineering Mathematics, Vol-1 T. K. V. Iyengar, B. Krishna Gandhi and Others, S. Chand & Company.
2. A text Book of Engineering Mathematics, C. Sankaraiah, V. G. S. Book Links.
3. A text Book of Engineering Mathematics, Shahnaz Bathul, Right Publishers.
4. A text Book of Engineering Mathematics, P. Nageshwara Rao, Y. Narasimhulu & N. Prabhakar Rao, Deepthi Publications.

**REFERENCES:**

1. A text Book of Engineering Mathematics, B. V. Raman, Tata Mc Graw Hill.
2. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley India Pvt. Ltd.
3. A text Book of Engineering Mathematics, Thomson Book Collection.

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MATHEMATICAL METHODS

**UNIT – I**

Matrices and Linear systems of equations: Elementary row transformations-Rank-Echelon form, Normal form – Solution of Linear Systems – Direct Methods- LU Decomposition- LU Decomposition from Gauss Elimination – Solution of Tridiagonal Systems-Solution of Linear Systems

**UNIT – II**

Eigen values, eigen vectors – properties – Cayley-Hamilton Theorem - Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonolization of matrix. Calculation of powers of matrix – Modal and spectral matrices.

**UNIT – III**

Real matrices – Symmetric, skew - symmetric, orthogonal, Linear Transformation – Orthogonal Transformation. Complex matrices: Hermitian, Skew-Hermitian and Unitary – Eigen values and eigen vectors of complex matrices and their properties. Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index - signature - Sylvester law.

**UNIT – IV**

Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

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

**UNIT – V**

Curve fitting: Fitting a straight line –Second degree curve-exponentional curve-power curve by method of least squares. Numerical Differentiation and Integration– Trapezoidal rule – Simpson's 1/3 Rule –Simpson's 3/8 Rule.

**UNIT – VI**

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods –Predictor-Corrector Methods- Adams-Moulton Method –Milne's Method.

**UNIT – VII**

Fourier Series: Determination of Fourier coefficients – Fourier series – 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 (only statement)– Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

**UNIT – VIII**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations. Method of separation of variables. z-transform – inverse z-transform - properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equation by z-transforms.

**TEXT BOOKS:**

1. Mathematical Methods, T. K. V. Iyengar, B. Krishna Gandhi and Others, S. Chand & Company.
2. Mathematical Methods, C. Sankaraiah, V. G. S. Book Links.
3. A text book of Mathematical Methods, V. Ravindranath, A. Vijayalakshmi, Himalaya Publishers.
4. A text book of Mathematical Methods, Shahnaz Bathul, Right Publisschers.

**REFERENCES:**

1. A text Book of Engineering Mathematics, B. V. Raman, Tata Mc Graw Hill.
2. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley India Pvt. Ltd.

3. Numerical Methods for Scientific and Engineering Computation, M. K. Jain, S. R. K. Iyengar & R. K. Jain, New Age International Publishers.
4. Elementary Numerical Analysis, Atkinson & Han, Wiley India, 3<sup>rd</sup> Edition, 2006

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ENGINEERING PHYSICS

**UNIT I**

**OPTICS :** Interference - Superposition of waves - Young's double slit experiment – Coherence - Interference in thin films by reflection - Newton's rings - Diffraction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction at a Single slit - Double slit - Diffraction grating - Grating spectrum - Resolving power of a grating - Rayleigh's criterion for resolving power – Polarization - Types of Polarization – Double refraction – Nicol prism.

**UNIT II**

**ULTRASONICS :** Introduction - Production of ultrasonic waves - Magnetostriction method – Piezo electric method - Detection of ultrasonic waves - Properties of ultrasonic waves - Use of ultrasonics for nondestructive testing - Applications of ultrasonics.

**ACOUSTICS OF BUILDINGS:** Basic requirement of acoustically good hall - 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 remedy.

**UNIT III**

**MAGNETIC PROPERTIES:** Permeability - Magnetization - Origin of magnetic moment – Classification of magnetic materials - Dia, para and ferro magnetism - Hysteresis curve - Soft and hard magnetic materials.

**SUPERCONDUCTIVITY:** General properties - Meissner effect - Penetration depth - Type I and Type II superconductors - Flux quantization – DC and AC Josephson effect – BCS Theory - Applications of superconductors.

**UNIT IV**

**CRYSTAL STRUCTURES AND X-RAY DIFFRACTION:** Introduction - Space lattice - Basis - Unit cell - Lattice parameter - Bravais lattices – Crystal systems - Structure and packing fractions of Simple cubic - Body centered cubic – Face centered cubic crystals - Directions and planes in crystals – Miller indices - Separation between successive [h k l] planes - Diffraction of X-rays by crystal planes - Bragg's law - Laue method - Powder method.

**UNIT V**

**LASERS :** Introduction - Characteristics of lasers - Spontaneous and stimulated emission of radiation - Einstein's coefficients - Population inversion - Ruby laser - Helium-Neon laser – CO<sub>2</sub> laser - Semiconductor laser - Applications of lasers in industry, scientific and medical fields.

**UNIT VI**

**FIBER OPTICS AND HOLOGRAPHY:** Introduction - Principle of optical fiber - Acceptance angle and acceptance cone - Numerical aperture – Types of optical fibers and refractive index profiles – Attenuation in optical fibers - Application of optical fibers – Basic principles of holography – Construction and reconstruction of image on hologram – Applications of holography.

**UNIT VII**

**DIELECTRIC PROPERTIES:** Introduction - Dielectric constant - Electronic, ionic and orientational polarizations - Internal fields in solids – Clausius - Mossotti equation – Dielectrics in alternating fields – Frequency dependence of the polarizability - Ferro and Piezo electricity.

**THERMAL PROPERTIES :** Introduction - Specific Heat of Solids – Einstein Model – Debye Model – Lattice Vibrations – Phonons – Thermal Conductivity.

**UNIT VIII**

**SCIENCE & TECHNOLOGY OF NANOMATERIALS:** Introduction to Nano materials - Basic principles of Nanoscience & Technology – Fabrication of nano materials – Physical & chemical properties of nanomaterials – Carbon nanotubes – Applications of nanotechnology.

**TEXT BOOKS :**

1. **Physics Volume 2** by Halliday, Resnick and Krane; John Wiley & Son.
2. **Applied Physics** 2<sup>nd</sup> Edition by Dr. P. Appala Naidu and Dr. M. Chandra Shekar, V.G.S. Book links.
3. **Engineering Physics** by R.K.Gaur & S.L. Gupta; Dhanpat Rai and Sons.

**REFERENCES:**

1. **Nanotechnology** by Mark Ratner and Daniel Ratner, Pearson Education.
2. **Introduction to solid state physics** by C. Kittel; Wiley Eastern Ltd.
3. **Materials Science and Engineering** by V. Raghavan; Prentice-Hall India.
4. **Engineering Physics** by Dr. M. Arumugam; Anuradha Agencies.
5. **Nanomaterials** by A.K. Bandyopadhyay; New Age International Publishers.
6. **Engineering Physics** by M.N. Avadhanulu & P.G. Kshirasagar; S. Chand & Company Ltd.

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ENGINEERING CHEMISTRY

UNIT I

**Water Technology-I :** Introduction, Effect of Water on Rocks and Minerals, Types of impurities in Water, Hardness of Water – Temporary and Permanent hardness. Units and Inter conversions of Units. Estimation of hardness by EDTA Methods. Problems on Temporary and Permanent hardnesses. Analysis of Water - Alkalinity; Chlorides and Dissolved Oxygen. Disadvantages of Hard Water. Methods of Treatment of Water for Domestic Purposes-Sedimentation, Coagulation, Filtration, Disinfection - Sterilization, Chlorination, Break – point Chlorination, Ozonation.

UNIT II

**Water Technology-II :** Water for Industrial purposes - Water for Steam Making - Boiler Troubles – Carry Over - Priming and Foaming, Boiler Corrosion, Scales and Sludges, Caustic Embrittlement. Water Treatment: - Internal Treatment – Colloidal, Phosphate, Calgon, Carbonate, Sodium aluminate Conditioning of Water. External Treatment - Lime-Soda Process, Zeolite Process, Ion-Exchange Process; - Numerical Problems.

UNIT III

**Science of Corrosion :** Definition, Examples - Types of Corrosion: Theories of Corrosion and Mechanism – Dry Corrosion, (Direct Chemical attack), Wet Corrosion, (Electro Chemical Theory) Principles of Corrosion, Galvanic Series, Galvanic Corrosion, Concentration Cell Corrosion, Mechanism of Wet Corrosion – Hydrogen evolution type, Oxygen absorption type. Factors Influencing Corrosion. Control of Corrosion – Proper Design, Use of pure metal and metal alloys, Passivity, Cathodic Protection – Sacrificial anode and Impressed Current. Modifying the Environment, use of Inhibitors.

UNIT IV

**Protective Coatings and their applications :**

Surface Preparation: (1) Solvent Cleaning (2) Alkali Cleaning (3) Pickling and Etching (4) Sand Blasting (5) Mechanical Cleaning. Types Of Protective Coatings: Metallic Coatings – Anodic Coatings, Galvanization, Cathodic Coatings – Tinning, Metal Cladding, Electroplating Ex: Chromium Plating, Metal Spraying, Cementation–Sheradizing, Colourizing, Chromizing, Chemical Conversion Coatings: (1) Phosphate (2) Chromate (3) Anodized Coatings.

Organic Coatings: Paints – Constituents and their functions

UNIT V

**Polymer Science and Technology :** Polymerization Reactions – Basic concepts. Types of Polymerization – Addition and Condensation Polymerizations. Plastics –Thermosetting and Thermoplastics – Differences. Compounding and Moulding of Plastics – Compression, Injection, Transfer, and Extrusion moulding methods. Preparation, Properties and Engineering Uses of the Following: Polyethylene, PVC, Teflon, Bakelite, Nylon, Polyester, Polyurethanes and Silicone Resins. Rubber – Processing of Natural Rubber, Vulcanization and Compounding. Elastomers – Buna S, Buna N, Thiokol.

UNIT VI

**Refractories and Insulators :** Refractories – Definition, Classification With Examples; Criteria of a Good Refractory Material; Causes for the failure of a Refractory Material; Insulators – Definition and Classification with Examples; Characteristics of Insulating Materials; Thermal Insulators, Electrical Insulators – Their Characteristics and Engineering Applications.

UNIT VII

**LUBRICANTS :** Principles and function of lubricants - Types of Lubrication and Mechanism – Thick Film or Hydrodynamic Lubrication, Thin Film or Boundary Lubrication, Extreme Pressure Lubrication. Classification and properties of lubricants – Viscosity, flash and fire points, cloud and pour points, aniline point, Neutralisation Number and Mechanical Strength.

UNIT VIII

**Fuels and Combustion :** Definition and Classification.

1. Solid Fuels – Coal – Proximate and Ultimate Analysis of Coal and Significance of the Constituents – Metallurgical Coke – Characteristics & Manufacture.
2. Liquid Fuels – Petroleum – Refining – Knocking – Octane and Cetane Numbers – Synthetic Petrol Cracking– Bergius Process, Fischer- Tropsch Process.
3. Gaseous Fuels Natural gas, Coal gas – Calorific Value of Fuels – Bomb Calorimeter – Junker's Gas Calorimeter.
4. Combustion – Analysis of Flue Gas by Orsat's Apparatus ; Problems.

**TEXT BOOKS :**

1. Text Book of Engineering Chemistry by Jain & Jain. Dhanpat Rai Publishing Company, New Delhi (2004).
2. Text Book of Engineering Chemistry by C.P. Murthy, C.V. Agarwal, and Andra Naidu & B.S. Publications, Hyd (2005).

**REFERENCES :**

1. A Text Book of Engineering Chemistry by S.S. Dara. S.Chand & Co, New Delhi (2006) ( 15<sup>th</sup> Edition).
2. Engineering Chemistry by J C Kuriacose and J. Rajaram, Tata McGraw-Hill Co, New Delhi (2004)
3. A Text Book of Engineering Chemistry by Balaram Pani, Galgotia Publications, New Delhi (2004).
4. A Text Book of Engineering Chemistry by Shashi Chawla, Dhanpat Rai Publishing Company, New Delhi (2004).
5. Industrial Chemistry by O.P.Veeramani and A.K.Narula, Galgotia Publications, New Delhi (2004).
6. Advanced Engineering Chemistry by Senapati and Mohanty, Laxmi Publications, New Delhi (2002).
7. Engineering Chemistry by R. Gopalan, D. Venkappaya and S.Nagarajan, Vikas Publishing House, New Delhi (2004).
8. Engineering Chemistry by R.V. Gadag A.N. Tyanand Shortly IK. International Publishing house Pvt. Ltd. New Delhi.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
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I Year B.Tech. M.E.

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CLASSICAL MECHANICS

**UNIT – I**

Introduction to Engg. Mechanics – Basic Concepts.

**Systems of Forces** : Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

**UNIT – II**

**Equilibrium of Systems of Forces** : Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lami's Theorem, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

**UNIT – III**

**Centroid** : Centroids of simple figures (from basic principles) – Centroids of Composite Figures

**Centre of Gravity** : Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorem.

**UNIT – IV**

**Area moments of Inertia** : Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, 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 – V**

Analysis of perfect frames (Analytical Method) – Types of Frames – Assumptions for forces in members of a perfect frame, Method of joints, Method of sections, Force table, Cantilever Trusses, Structures with one end hinged and the other freely supported on rollers carrying horizontal or inclined loads.

**UNIT – VI**

**Kinematics** : Rectilinear and Curvilinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion.

**Kinetics** : Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

**UNIT – VII**

**Work – Energy Method** : Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

**UNIT – VIII**

**Mechanical Vibrations** : Definitions, Concepts – Simple Harmonic Motion – Free vibrations, simple and Compound Pendulums and its Applications –

**TEXT BOOKS :**

1. Engg. Mechanics / Irving. H. Shames Prentice – Hall.
2. Engg. Mechanics / S.S. Bharati & J.G. Rajasekharappa

**REFERENCES :**

1. Engineering Mechanics / Ferdinand . L. Singer / Harper – Collins.
2. Engg. Mechanics / Timoshenko & Young.
3. Engg. Mechanics Umesh Regi / Tayal.
4. Engg. Mechanics / R.V. Kulkarni & R.D. Askhevkar
5. Engg. Mechanics/Khurmi/S.Chand.
6. Engg. Mechanics / KL Kumar / Tata McGraw Hill.

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COMPUTER PROGRAMMING

**UNIT - I**

Algorithm / pseudo code, flowchart, program development steps, structure of C program, A Simple C program, identifiers, basic data types and sizes, Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation.

**UNIT - II**

Input-output statements, statements and blocks, if and switch statements, loops- while, do-while and for statements, break, continue, goto and labels, programming examples.

**UNIT - III**

Designing structured programs, Functions, basics, parameter passing, storage classes- extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, header files, C preprocessor, example c programs.

**UNIT - IV**

Arrays- concepts, declaration, definition, accessing elements, storing elements, arrays and functions, two-dimensional and multi-dimensional arrays, applications of arrays. pointers- concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory managements functions, command line arguments, c program examples.

**UNIT - V**

Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bitfields, C program examples.

**UNIT - VI**

Input and output – concept of a file, text files and binary files, streams, standard I/o, Formatted I/o, file I/o operations, error handling, C program examples.

**UNIT - VII**

Introduction to data structures-Stacks and Queues, representing stacks and queues in C using arrays and linked lists.

Implementation of Searching and sorting in C– Linear and binary search methods, sorting – Bubble sort, Quick Sort, merge sort.

**UNIT - VIII**

Trees- Binary trees, representation, traversals (Recursive) implemented in C, graphs- terminology, representation and basic operations on graphs.

**TEXT BOOKS :**

1. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.
2. DataStructures Using C – A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.

**REFERENCES :**

1. C & Data structures – P. Padmanabham, B.S. Publications.
2. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education
3. C Programming with problem solving, J.A. Jones & K. Harrow, dreamtech Press
4. Programming in C – Stephen G. Kochan, III Edition, Pearson Education.
5. Data Structures and Program Design in C, R.Kruse, C.L. Tondo, BP Leung, Shashi M, Second Edition, Pearson Education.

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ENGINEERING GRAPHICS

**UNIT – I**

**INTRODUCTION TO ENGINEERING DRAWING :** Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions. Curves used in Engineering Practice & their Constructions :  
a) Conic Sections including the Rectangular Hyperbola – General method only.  
b) Cycloid, Epicycloid and Hypocycloid  
c) Involute.  
d) Helices

**UNIT – II**

**DRAWING OF PROJECTIONS OR VIEWS ORTHOGRAPHIC PROJECTION IN FIRST ANGLE PROJECTION ONLY :** Principles of Orthographic Projections – Conventions – First and Third Angle Projections Projections of Points and Lines inclined to both planes, True lengths, traces.

**UNIT – III**

**PROJECTIONS OF PLANES & SOLIDS :** Projections of regular Planes, auxiliary planes and Auxiliary projection inclined to both planes. Projections of Regular Solids inclined to both planes – Auxiliary Views. Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

**UNIT – IV**

**DEVELOPMENT AND INTERPENETRATION OF SOLIDS:** Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts. Interpenetration of Right Regular 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 – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts.

**UNIT – VI**

**TRANSFORMATION OF PROJECTIONS :** Conversion of Isometric Views to Orthographic Views – Conventions.

**UNIT – VII**

**PERSPECTIVE PROJECTIONS :** Perspective View : Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods(General Method only).

**UNIT – VIII**

**Introduction to Computer aided Drafting:** Generation of points, lines, curves, polygons, simple solids, dimensioning.

**TEXT BOOK :**

1. Engineering Drawing, N.D. Bhat / Charotar
2. Engineering graphics with Auto CAD- R.B. Choudary/Anuradha Publishes
3. Engineering Drawing, Narayana and Kannaiah / Scitech publishers.

**REFERENCES :**

1. Engineering Drawing and Graphics, Venugopal / New age.
2. Engineering Drawing- Johle/Tata Macgraw Hill.
3. Computer Aided Engineering Drawing- Trymbaka Murthy- I.K. International.

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ENGINEERING PHYSICS AND FUELS AND LUBRICANTS LAB

**(A) ENGINEERING PHYSICS LAB:**

Any Ten of the following experiments are to be performed during the Academic year.

Sl.No. Name of the Experiment

1. Determination of Refractive Index of the material of a Prism -Spectrometer.
2. Dispersive power of the material of a Prism - Spectrometer.
3. Determination of wavelength of a source - Diffraction Grating.
4. Determination of thickness of a thin object using parallel fringes.
5. Newton's Rings Radius of Curvature of plano\_convex lens.
6. Determination of Rigidity modulus of a material in the form of a wire - Torsional pendulum
7. Melde's Experiment - Transverse and Longitudinal modes.
8. Time constant of R-C Circuit.
9. L-C-R Circuit.
10. Verification of laws of stretched string - Sonometer.
11. Calculation of Frequency of A.C. mains - Sonometer.
12. Magnetic field along the axis of a current carrying coil - Stewart and Gee's method.

**(B) FUELS AND LUBRICANTS LAB :**

1. Determination of Flash and Fire points of Liquid Fuels / Lubricants: Abels apparatus , Pensky martens apparatus
2. Carbon Residue Test : Solid/ Liquid Fuels
3. Determination of Viscosity : Liquid Lubricants & Fuels : Saybolts viscometer, Redwood Viscometer, Engler Viscometer.
4. Determination of Calorific Value: Solid/Liquid/Gaseous Fuels : Bomb Calorimeter.
5. Grease Penetration Test. : Junker Calorimeter.

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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 make students recognise the sounds of English through Audio-Visual aids and Computer Software.
- To help them overcome their inhibitions and self-consciousness while speaking in English and to build their confidence. *The focus shall be on fluency rather than accuracy.*
- To enable them to speak English correctly with focus on stress and intonation.

**SYLLABUS :**

The following course content is prescribed for the **English Language Laboratory** sessions:

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Situational Dialogues / Role Play.
4. Oral Presentations- Prepared and Extempore.
5. 'Just A Minute' Sessions (JAM).
6. Describing Objects / Situations / People.
7. Information Transfer
8. Debate
9. Telephoning Skills.
10. Giving Directions.

**Minimum Requirement:**

The English Language Lab shall have two parts:

- i) The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.
- ii) The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a T.V., a digital stereo –audio & video system and camcorder etc.

**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
- iii) Internet connectivity

**Suggested Software:**

- Cambridge Advanced Learners' English Dictionary with CD.
- The Rosetta Stone English Library
- Clarity Pronunciation Power
- Mastering English in Vocabulary, Grammar, Spellings, Composition
- Dorling Kindersley series of Grammar, Punctuation, Composition etc.
- Language in Use, Foundation Books Pvt Ltd with CD.
- Learning to Speak English - 4 CDs
- Microsoft Encarta with CD
- Murphy's English Grammar, Cambridge with CD

**Books to be procured 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. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.
2. English Pronouncing Dictionary Daniel Jones Current Edition with CD.
3. Spoken English- R. K. Bansal and J. B. Harrison, Orient Longman 2006 Edn.
4. A Practical course in English Pronunciation, (with two Audio cassettes) by J. Sethi, Kamlesh Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.
5. A text book of English Phonetics for Indian Students by T.Balasubramanian (Macmillan)
6. English Skills for Technical Students, WBSCTE with British Council, OL

**DISTRIBUTION AND WEIGHTAGE OF MARKS**

***English Language Laboratory Practical Paper:***

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.

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COMPUTER PROGRAMMING LAB

Objectives:

- To make the student learn a programming language.
- To teach the student to write programs in C solve the problems
- To Introduce the student to simple linear and non linear data structures such as lists, stacks, queues, trees and graphs.

Recommended Systems/Software Requirements:

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

**UNIT- I:**

- 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.

**UNIT- II:**

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

**UNIT- III:**

- 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.  
iii) To solve Towers of Hanoi problem.

**UNIT- IV:**

- a) The total distance travelled by vehicle in 't' seconds is given by distance =  $ut + \frac{1}{2}at^2$  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)

**UNIT- V:**

- a) Write a C program to find both the largest and smallest number 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

**UNIT- VI:**

- a) Write a C program that uses functions to perform the following operations:  
i) To insert a sub-string in to 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

**UNIT- VII:**

- 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.

**UNIT- VIII:**

- a) Write a C program to generate Pascal's triangle.

b) Write a C program to construct a pyramid of numbers.

**UNIT- IX:**

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

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

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.

**UNIT- X:**

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.

**UNIT- XI:**

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.)

**UNIT- XII:**

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.)

**UNIT- XIII:**

Write a C program that uses functions to perform the following operations on singly linked list.:

- i)Creation
- ii)Insertion
- iii) Deletion
- iv) Traversal

**UNIT- XVI:**

Write a C program that uses functions to perform the following operations on doubly linked list.:

- i)Creation
- ii)Insertion
- iii) Deletion
- iv) Traversal in both ways

**UNIT- XV:**

Write C programs that implement stack (its operations) using

- i)Arrays
- ii)Pointers

**UNIT- XVI:**

Write C programs that implement Queue (its operations) using

- i)Arrays
- ii)Pointers

**UNIT- XVII:**

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

- i)Converting infix expression into postfix expression
- ii)Evaluating the postfix expression

**UNIT- XVIII:**

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

- i)Creating a Binary Tree of integers
- ii)Traversing the above binary tree in preorder, inorder and postorder.

**UNIT- XIX:**

Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers :

- i)Linear search
- ii) Binary search

**UNIT- XX:**

Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:

- i)Bubble sort
- ii) Quick sort

**UNIT- XXI:**

Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:

- i)Insertion sort
- ii)Merge sort

**UNIT- XXII:**

Write C programs to implement the Lagrange interpolation and Newton- Gregory forward interpolation.

**UNIT- XXIII:**

Write C programs to implement the linear regression and polynomial regression algorithms.

**UNIT- XXIV:**

Write C programs to implement Trapezoidal and Simpson methods.

**Text Books**

- 1.C programming and Data Structures, P. Padmanabham, Third Edition, BS Publications
2. Data Structures: A pseudo code approach with C, second edition R.F. Gilberg and B.A. Forouzan
- 3.Programming in C, P.Dey & M. Ghosh, Oxford Univ.Press.
- 4.C and Data Structures, E Balaguruswamy, TMH publications.

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ENGINEERING WORKSHOP PRACTICE

**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. IT Workshop-I : Computer hard ware , identification of parts , Disassembly, Assembly of computer to working condition, Simple diagnostic exercises.
8. IT workshop-II : Installation of Operating system windows and Linux , simple diagnostic exercises.
9. Welding
10. Power tools in constriction, wood working, electrical engineering and mechanical engg.

**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.

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II Year B.Tech. M.E. I-Sem

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**PRODUCTION TECHNOLOGY**

**UNIT – I**

**CASTING :** Steps involved in making a casting – Advantage of casting and its applications. – Patterns and Pattern making – Types of patterns – Materials used for patterns, pattern allowances and their construction, Principles of Gating, Gating ratio and design of Gating systems

**UNIT – II**

Solidification of casting – Concept – Solidification of pure metal and alloys, short & long freezing range alloys.  
Risers – Types, function and design, casting design considerations, special casting processes 1) Centrifugal 2)Die, 3) Investment.  
**Methods of Melting :** Crucible melting and cupola operation, steel making processes, special.

**UNIT – III**

**A) Welding :** Classification of welding process types of welds and welded joints and their characteristics, design of welded joints, Gas welding, ARC welding, Forge welding, resistance welding, Thermit welding and Plasma (Air and water ) welding.

**B) Cutting of Metals:** Oxy – Acetylene Gas cutting, water plasma. Cutting of ferrous, non-ferrous metals.

**UNIT – IV**

Inert Gas welding, TIG & MIG, welding, Friction welding, Induction welding, Explosive welding, Laser welding, Soldering & Brazing. Heat affected zones in welding; welding defects – causes and remedies – destructive nondestructive testing of welds.

**UNIT – V**

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.

**UNIT - VI**

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 in the above operations.

**UNIT- VII**

**EXTRUSION OF METALS :** Basic extrusion process and its characteristics. Hot extrusion and cold extrusion – Forward extrusion and backward extrusion – Impact extrusion Hydrostatic extrusion.

**Forging processes:** Principles of forging – Tools and dies – Types Forging – Smith forging, Drop Forging – Roll forging – Forging hammers : Rotary forging – forging defects.

**UNIT - VIII**

Processing of Plastics: Types of Plastics, Properties, applications and their Processing methods & Equipment (blow & injection molding)

**TEXT BOOKS :**

1. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson Edu.
2. Manufacturing Technology / P.N. Rao/TMH

**REFERENCES :**

1. Production Technology / R.K. Jain
2. Process and materials of manufacturing –Lindberg/PE
3. Principles of Metal Castings / Roenthal.
4. Welding Process / Paramar /
5. Production Technology /Sarma P C /
6. Production Engineering – Suresh Dalela & Ravi Shankar / Galgotia Publications Pvt. Ltd.

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OBJECT ORIENTED PROGRAMMING

UNIT-I

**Object oriented thinking** :- Need for oop paradigm, A way of viewing world – Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, overriding and exceptions, summary of oop concepts, coping with complexity, abstraction mechanisms.

UNIT-II:-

**Java Basics** History of Java, Java buzzwords, datatypes, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and costing, simple java program, classes and objects – concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, string handling.

UNIT-III:-

**Inheritance** – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes.

UNIT-IV:-

**Packages and Interfaces** : Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

Exploring packages – Java.io, java.util.

UNIT-V:-

**Exception handling and multithreading** - Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

Differences between multi threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

UNIT-VI:-

**Event Handling** : Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes.

The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grib bag.

UNIT-VII:-

**Applets** – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

**Swing** – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing-JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

UNIT-VIII:-

**Networking** – Basics of network programming, addresses, ports, sockets, simple client server program, multiple clients, Java .net package

Packages – java.util,

**TEXT BOOKS :**

1. Java; the complete reference, 7<sup>th</sup> edition, Herbert Schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.

**REFERENCES :**

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley & sons.
2. An Introduction to OOP, second edition, T. Budd, pearson education.
3. Introduction to Java programming 6<sup>th</sup> edition, Y. Daniel Liang, pearson education.
4. An introduction to Java programming and object oriented application development, R.A. Johnson-Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, seventh Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education

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KAKINADA (A.P.)

II Year B.Tech. M.E. I-Sem

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ELECTRICAL AND ELECTRONICS ENGINEERING

**UNIT - I**

**ELECTRICAL CIRCUITS:** Basic definitions, Types of elements, Ohm's Law, Resistive networks, Kirchhoff's Laws, Inductive networks, capacitive networks, Series, Parallel circuits and Star-delta and delta-star transformations.

**UNIT - II**

**DC MACHINES :** Principle of operation of DC Generator – emf equation - types – DC motor types – torque equation – applications – three point starter.

**UNIT - III**

**TRANSFORMERS :** Principle of operation of single phase transformers – emf equation – losses – efficiency and regulation

**UNIT - IV**

**AC MACHINES :** Principle of operation of alternators – regulation by synchronous impedance method – Principle of operation of induction motor – slip – torque characteristics – applications.

**UNIT - V**

**INSTRUMENTS :** Basic Principle of indicating instruments – permanent magnet moving coil and moving iron instruments.

**UNIT - VI**

**DIODE AND IT'S CHARACTERISTICS :** P-n junction diode, symbol, V-I Characteristics, Diode Applications, Rectifiers – Half wave, Full wave and Bridge rectifiers (simple Problems)

**UNIT - VII**

**TRANSISTORS :** PNP and NPN Junction transistor, Transistor as an amplifier, SCR characteristics and applications

**UNIT - VIII**

**CATHODE RAY OSCILLOSCOPE :** Principles of CRT (Cathode Ray Tube), Deflection, Sensitivity, Electrostatic and Magnetic deflection, Applications of CRO - Voltage, Current and frequency measurements.

**TEXT BOOKS:**

1. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin/Pearson.
2. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand & Co.

**REFERENCES:**

1. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.
2. Basic Electrical Engineering by Kothari and Nagarath, TMH Publications, 2nd Edition.

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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.

**UNIT – IV**

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

**UNIT – V**

**ANALYSIS OF PIN-JOINTED PLANE FRAMES :** Determination of Forces in members of plane, pinjointed, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever& simply-supported trusses-by method of joints,method of sections & tension coefficient methods.

**UNIT – VI**

**DEFLECTION OF BEAMS :** Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

**UNIT – VII**

**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.– Riveted boiler shells – Thin spherical shells.

**UNIT – VIII**

Thick cylinders–lame's equation – cylinders subjected to inside & out side pressures – compound cylinders.

**TEXT BOOKS :**

1. Strength of materials by Bhavikatti, Lakshmi publications.
2. Solid Mechanics, by Popov

**REFERENCES :**

1. Strength of Materials -By Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol-III, by S.B.Junnarkar.
4. Strength of Materials by S.Timshenko
5. Strength of Materials by Andrew Pytel and Ferdinand L. Singer Longman.

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**THERMODYNAMICS**

**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, Causes of Irreversibility – Energy in State and in Transition, Types, Work and Heat, Point and Path function.

**UNIT II**

Zeroth 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.

**UNIT – III**

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, 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, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

**UNIT IV**

Pure Substances, p-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

**UNIT - V**

Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – Flow processes – Deviations from perfect Gas Model – Vander Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables.

**UNIT – VI**

Mixtures of perfect Gases – Mole Fraction, Mass fraction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction , Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation , Carrier's Equation – Psychrometric chart.

**UNIT - VII**

**Power Cycles :** Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P-V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

**UNIT VIII**

**Refrigeration Cycles :** Brayton and Rankine cycles – Performance Evaluation – combined cycles, Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

**TEXT BOOKS :**

1. Engineering Thermodynamics / PK Nag /TMH, III Edition
2. Fundamentals of Thermodynamics – Sonntag, Borgnakke and van wylen / John Wiley & sons (ASIA) Pte Ltd.

**REFERENCES :**

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 / New Age
5. Engineering Thermodynamics – K. Ramakrishna / Anuradha Publishers.

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METALLURGY AND MATERIAL SCIENCE

**UNIT - I**

**Structure of Metals :** Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size.

**UNIT - II**

**Constitution of Alloys :** Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

**UNIT -III**

**Equilibrium of Diagrams :** Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cu-Sn and Fe-Fe<sub>3</sub>C.

**UNIT -IV**

**Cast Irons and Steels :** Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

**UNIT - V**

**Heat treatment of Alloys :** Effect of alloying elements on Fe-Fe<sub>3</sub>C system, Annealing, normalizing, Hardening, TTT diagrams, tempering , Hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

**UNIT - VI**

**Non-ferrous Metals and Alloys :** Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

**UNIT - VII**

**Ceramic materials :** Crystalline ceramics, glasses, cermets, abrasive materials, nanomaterials – definition, properties and applications of the above.

**UNIT - VIII**

**Composite materials :** Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites.

**TEXT BOOKS :**

1. Introduction to Physical Metallurgy / Sidney H. Avener.
2. Essential of Materials science and engineering/ Donald R.Askeland/Thomson.

**REFERENCES :**

1. Material Science and Metallurgy/kodgire.
2. Science of Engineering Materials / Agarwal
3. Materials Science and engineering / William and collister.
4. elements of Material science / V. Rahghavan
5. An introduction to materialscience / W.g.vinas & HL Mancini
6. Material science & material / C.D.Yesudian & harris Samuel
7. Engineering Materials and Their Applications – R. A Flinn and P K Trojan / Jaico Books.
8. Engineering materials and metallurgy/R.K.Rajput/ S.Chand.

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ELECTRICAL AND ELECTRONICS ENGINEERING LAB

**Section A: Electrical Engineering:**

The following experiments are required to be conducted as compulsory experiments :

1. Swinburne's test on D.C. Shunt machine. (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiecy and regulation at given power factors)
3. Brake test on 3-phase Induction motor (Determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method.

In addition to the above four experiments, any one of the experiments from the following list is required to be conducted :

5. Speed control of D.C. Shunt motor by
  - a) Armature Voltage control b) Field flux control method
6. Brake test on D.C Shunt Motor

**Section B: Electronics Engineering :**

1. Transistor CE Characteristics (Input and Output)
2. Full wave Rectifier with and without filters.
3. CE Amplifiers.
4. RC Phase Shift Oscillator
5. Class A Power Amplifier
6. Micro Processor



**Week 10**

a) Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the textfields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an ArithmeticException Display the exception in a message dialog box.

**Week 11**

a) Write a Java program that implements a simple client/server application. The client sends data to a server. The server receives the data, uses it to produce a result, and then sends the result back to the client. The client displays the result on the console.

For ex: The data sent from the client is the radius of a circle, and the result produced by the server is the area of the circle. (Use java.net)

**Week 12**

a) Write a java program that simulates a traffic light. The program lets the user select one of three lights : red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts.

b) Write a Java program that allows the user to draw lines, rectangles and ovals.

**Week 13**

a) Write a java program to create an abstract class named Shape that contains an empty method named `numberOfSides()`. Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method `numberOfSides()` that shows the number of sides in the given geometrical figures.

b) Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using JTable component.

**TEXT BOOKS :**

1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI
2. Introduction to Java programming, Sixth edition, Y.Daniel Liang, Pearson Education
3. Big Java, 2<sup>nd</sup> edition, Cay Horstmann, Wiley Student Edition, Wiley India Private Limited.

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**PROBABILITY AND STATISTICS**

**UNIT-I**

*Probability: Sample space and events – Probability – The axioms of probability – Some Elementary theorems - Conditional probability – Baye's theorem.*

**UNIT-II**

Random variables – Discrete and continuous – Distribution – Distribution function. Distribution

**UNIT-III**

Binomial and poison distributions Normal distribution – related properties.

**UNIT-IV**

Sampling distribution: Populations and samples - Sampling distributions of mean (known and unknown) proportions, sums and differences.

**UNIT-V**

Estimation: Point estimation – interval estimation - Bayesian estimation.

**UNIT-VI**

Test of Hypothesis – Means– Hypothesis concerning one and two means– Type I and Type II errors. One tail, two-tail tests.

**UNIT-VII**

Tests of significance – Student's t-test, F-test,  $\chi^2$  test. Estimation of proportions.

**UNIT-VIII**

Queuing Theory: Pure Birth and Death Process M/M/1 Model and Simple Problems.

**Text Books:**

1. Probability & Statistics, T. K. V. Iyengar, B. Krishna Gandhi and Others, S. Chand & Company.
2. A text book of Probability & Statistics, Shahnaz Bathul, V. G. S. Book Links.

**References:**

1. Probability & Statistics, Arnold O. Allen, Academic Press.
2. Probability & Statistics for Engineers, Miller and John E. Freund, Prentice Hall of India.
3. Probability & Statistics, Mendan Hall, Beaver Thomson Publishers.
4. Probability & Statistics, D. K. Murugeson & P. Guru Swamy, Anuradha Publishers.

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KINEMATICS OF MACHINERY

**UNIT – I**

**MECHANISMS :** Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained .

**MACHINES :** Mechanism and machines – classification of machines – kinematic chain – inversion of mechanism – inversion of mechanism – inversions of quadric cycle, chain – single and double slider crank chains.

**UNIT - II**

**STRAIGHT LINE MOTION MECHANISMS :** Exact and approximate copiers and generated types – Peaucellier, Hart and Scott Russel – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.

**UNIT – III**

**KINEMATICS :** Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration diagrams – Graphical method – Application of relative velocity method four bar chain.

**Analysis of Mechanisms :** Analysis of slider crank chain for displacement , velocity and acceleration of slider – Acceleration diagram for a given mechanism, Kleins construction, Coriolis acceleration, determination of Coriolis component of acceleration.

**Plane motion of body :** Instantaneous center of rotation, centroids and axodes – relative motion between two bodies – Three centres in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

**UNIT – IV**

**STEERING Mechanisms :** Conditions for correct steering – Davis Steering gear, Ackermans steering gear – velocity ratio.

**HOOKE'S JOINT :** Single and double Hooke's joint – Universal coupling – application – problems.

**UNIT – V**

**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. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

**Analysis of motion of followers :** Roller follower – circular cam with straight, concave and convex flanks.

**UNIT – VI**

Higher pairs, friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference.

Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact – Introduction to Helical, Bevel and worm gearing.

**UNIT – VII**

**Belt Rope and Chain Drives :** Introduction, Belt and rope drives, selection of belt drive- types of belt drives,V-belts, materials used for belt and rope drives, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains- length, angular speed ratio, classification of chains.

**UNIT – VIII**

**GEAR TRAINS:** Introduction – Train value – Types – Simple and reverted wheel train – Epicyclic gear Train. Methods of finding train value or velocity ratio – Epicyclic gear trains.  
Selection of gear box-Differential gear for an automobile.

**TEXT BOOKS :**

1. Theory of Machines and Mechanisms-S.S.Rattan, Tata McGraw Hill Publishers
2. Theory of Machines R.S Khurmi & J.K Gupta

**REFERENCES :**

1. Theory of Machines by Thomas Bevan/ CBS
2. Theory of Machines / R.K Bansal
3. Theory of Machines Sadhu Singh Pearson's Edn
4. Mechanism and Machine Theory / JS Rao and RV Dukkipati / New Age
5. The theory of Machines /Shiegley/ Oxford.
6. Theory of machines – PL. Balaney/khanna publishers.

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**THERMAL ENGINEERING - I**

**UNIT – I**

**Actual Cycles and their Analysis:** Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blowdown-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles Of CI Engines.

**UNIT-II**

**I.C. ENGINES :** Classification - Working principles, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems – Fuel, Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication.

**UNIT – III**

**Combustion in S.I. Engines :** Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Type of Abnormal combustion, pre-ignition and knocking (explanation of) – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types.

**UNIT IV**

**Combustion in C.I. Engines :** Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

**UNIT – V**

**Testing and Performance :** Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

**UNIT – VI**

**COMPRESSORS** – Classification –positive displacement and roto dynamic machinery – Power producing and power absorbing machines, fan, blower and compressor – positive displacement and dynamic types – reciprocating and rotary types.

**Reciprocating** : Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance, stage compression, undercooling, saving of work, minimum work condition for stage compression.

**UNIT VII**

**Rotary (Positive displacement type)** : Roots Blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.

**Dynamic Compressors** : Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

**UNIT-VIII**

**Axial Flow Compressors** : Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations – Polytropic efficiency.

**TEXT BOOKS:**

1. I.C. Engines / V. GANESAN- TMH
2. Thermal Engineering / Rajput / Lakshmi Publications.

**REFERENCES:**

1. IC Engines – Mathur & Sharma – Dhanpath Rai & Sons.
2. Engineering fundamentals of IC Engines – Pulkrabek / Pearson /PHI
3. Thermal Engineering / Rudramoorthy - TMH
4. Thermodynamics & Heat Engines / B. Yadav/ Central Book Depot., Allahabad
5. I.C. Engines / Heywood /McGrawHill.
6. Thermal Engineering – R.S. Khurmi & J.K.Gupta – S.Chand
7. IC Engines/ Ramalingam/ Scitech publishers
8. Thermal engineering data book-B.Srinivasulu Reddy/JK International Pub.

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**FLUID MECHANICS AND HYDRAULIC MACHINERY**

**UNIT I**

**Fluid statics** : Dimensions and units: physical properties of fluids- specific gravity, viscosity surface tension- vapor pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure – measurement of pressure- Piezometer, U-tube and differential manometers.

**UNIT II**

**Fluid kinematics** : Stream line, 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 flow.

**Fluid dynamics** : Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

**UNIT III**

**Closed conduit flow:** Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line.

Measurement of flow: pilot tube, venturimeter, and orifice meter, Flow nozzle, Turbine flow meter (Ref.4)

**UNIT IV**

**Basics of turbo machinery** : Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

**UNIT V**

**Hydroelectric power stations** : Elements of hydro electric power station-types-concept of pumped storage plants-storage requirements, mass curve (explanation only) estimation of power developed from a given catchment area; heads and efficiencies.

**UNIT VI**

**Hydraulic Turbines** : Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies , hydraulic design –draft tubetheory-functions and efficiency.

**UNIT VII**

**Performance of hydraulic turbines** : Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

**UNIT VIII**

**Centrifugal pumps** : Classification, working, work done – manometric head- losses and efficiencies-specific speed- pumps in series and parallel-performance characteristic curves, NPSH.

**Reciprocating pumps** : Working, Discharge, slip, indicator diagrams.

**TEXT BOOKS :**

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.

**REFERENCES :**

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.
4. Instrumentation for Engineering Measurements by James W. Dally, William E. Riley ,John Wiley & Sons Inc. 2004 (Chapter 12 – Fluid Flow Measurements).

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MACHINE DRAWING

**Machine Drawing Conventions :**

- Need for drawing conventions – introduction to IS conventions
- a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
  - b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
  - c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
  - d) Title boxes, their size, location and details - common abbreviations & their liberal usage
  - e) Types of Drawings – working drawings for machine parts.

**I. Drawing of Machine Elements and simple parts**

Selection of Views, additional views for the following machine elements and parts with every drawing proportions.

- a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
- b) Keys, cottered joints and knuckle joint.
- c) Rivetted joints for plates
- d) Shaft coupling, spigot and socket pipe joint.
- e) Journal, pivot and collar and foot step bearings.

**II. Assembly Drawings:**

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

- a) Engine parts – stuffing boxes, cross heads, Eccentrics, Petrol Engine connecting rod, piston assembly.
- b) Other machine parts - Screws jacks, Machine Vices Plummer block, Tailstock.
- c) Valves : Steam stop valve, 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.

**TEXT BOOKS :**

- 1. Machine Drawing – Dhawan, S.Chand Publications
- 2. Machine Drawing –K.L.Narayana, P.Kannaiah & K. Venkata Reddy / New Age/ Publishers

**REFERENCES :**

- 1. Machine Drawing – P.S.Gill.
- 2. Machine Drawing – Luzzader
- 3. Machine Drawing - Rajput

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ENVIRONMENTAL STUDIES

**UNIT - I**

**Multidisciplinary nature of Environmental Studies:** Definition, Scope and Importance – Need for Public Awareness.

**UNIT - II**

**Natural Resources :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. - Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

**UNIT - III**

**Ecosystems :** Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**UNIT - IV**

**Biodiversity and its conservation :** Introduction - Definition: genetic, species and ecosystem diversity. - Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a megadiversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, manwildlife conflicts. - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Exsitu conservation of biodiversity.

**UNIT - V**

**Environmental Pollution :** Definition, Cause, effects and control measures of :

- a. Air pollution
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

**Solid waste Management :** Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

**UNIT - VI**

**Social Issues and the Environment :** From Unsustainable to Sustainable development -Urban problems related to energy -Water conservation, rain water harvesting, watershed management -Resettlement and rehabilitation of people; its problems and concerns. Case Studies -Environmental ethics: Issues and possible solutions. -Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. -Wasteland reclamation. -Consumerism and waste products. -Environment Protection Act. -Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation. -Public awareness.

**UNIT - VII**

**Human Population and the Environment :** Population growth, variation among nations. Population explosion - Family Welfare Programme. -Environment and human health. -Human Rights. -Value Education. -HIV/AIDS. -Women and Child Welfare. -Role of information Technology in Environment and human health. -Case Studies.

**UNIT - VIII**

**Field work :** Visit to a local area to document environmental assets River /forest grassland/hill/mountain -Visit to a local polluted site-Urban/Rural/industrial/ Agricultural Study of common plants, insects, birds. - Study of simple ecosystems-pond, river, hill slopes, etc.

**TEXT BOOK:**

- 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:**

- 1 Textbook of Environmental Sciences and Technology by M. Anji Reddy, BS Publication.

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**PRODUCTION TECHNOLOGY LAB**

Minimum of 12 Exercises need to be performed

**I. METAL CASTING LAB :**

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

**II WELDING LAB :**

1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 1 Exercise
3. TIG Welding - 1 Exercise
4. Plasma welding and Brazing - 2 Exercises  
(Water Plasma Device)

**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

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MECHANICS OF SOLIDS AND METALLURGY 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

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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

**Unit I Introduction to Managerial Economics:**

Definition, Nature and Scope of Managerial Economics—Demand Analysis: Demand Determinants, Law of Demand and its exceptions.

**Unit II Elasticity of Demand:**

Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

**Unit III Theory of Production and 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, Opportunity cost, Fixed vs. Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems)- Managerial Significance and limitations of BEA.

**Unit IV Introduction to Markets & Pricing Policies:**

**Market structures:** Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly.

**Objectives and Policies of Pricing- Methods of Pricing:** Cost Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two-Part Pricing, Block Pricing, Bundling Pricing, Peak Load Pricing, Cross Subsidization.

**Unit V Business & New Economic Environment:**

Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-liberalization scenario.

**Unit VI Capital and Capital Budgeting:**

Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance.

Nature and scope of 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 VII Introduction to Financial Accounting:**

Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

**Unit VIII Financial Analysis through ratios:**

Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

**TEXT BOOKS:**

1. Aryasri: Managerial Economics and Financial Analysis, 2/e, TMH, 2005.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2003.

**REFERENCES:**

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 4<sup>th</sup> Ed.
3. Suma Damodaran, Managerial Economics, Oxford University Press.
4. Lipsey & Chrystel, Economics, Oxford University Press.
5. S. A. Siddiqui & A. S. Siddiqui, Managerial Economics & Financial Analysis, New age International Space Publications.
6. Domnick Salvatore: Managerial Economics In a Global Economy, 4th Edition, Thomson.
7. Narayanaswamy: Financial Accounting—A Managerial Perspective, PHI.
8. Raghunatha Reddy & Narasimhachary: Managerial Economics& Financial Analysis, Scitech.
9. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas.

10. Truet and Truet: Managerial Economics:Analysis, Problems and Cases, Wiley.
11. Dwivedi:Managerial Economics, 6th Ed., Vikas.

**Prerequisites:** Nil

**Objective:** To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making.

**Codes/Tables:** Present Value Tables need to be permitted into the examinations Hall.

**Question Paper Pattern:** 5 Questions to be answered out of 8 questions.  
Each question should not have more than 3 bits.

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AUTOMOBILE ENGINEERING

**UNIT – I**

**Introduction :** Components of four wheeler automobile – chassis and body – power unit – power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction, turbo charging and super charging – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, reboring, decarbonisation, Nitriding of crank shaft..

**UNIT – II**

**Fuel System :** S.I. Engine : Fuel supply systems, Mechanical and electrical fuel pump – filters – carburettor – types – air filters – petrol injection.

**C.I. Engines :** Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, spray formation, injection timing, testing of fuel pumps.

**UNIT – III**

**Cooling System :** Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporating 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.

**Unit – IV**

Emission 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, electrical-their merits and demerits.

**UNIT – V**

**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 – VI**

**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, construct 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.

**UNIT – VII**

**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 – VIII**

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

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

**TEXT BOOKS :**

1. Automotive Mechanics – Vol. 1 & Vol. 2 / Kripal Sing.
2. Automobile Engineering / William Crouse

**REFERENCES :**

1. Automotive Engineering / Newton Steeds & Garrett
2. Automotive Mechanics / G.B.S. Narang
3. Automotive Mechanics / Heitner
4. Automotive Engines / Srinivasan
5. Automobile Engineering – K.K. Ramalingam / Scitech Publications (India) PVT. LTD.

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DYNAMICS OF MACHINERY

**UNIT – I**

**PRECESSION :** Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships. Static and dynamic force analysis of planar mechanisms.

**UNIT – II**

**FRICITION :** Inclined plane, friction of screw and nuts, pivot and collar, uniform pressure, uniform wear, friction circle and friction axis : lubricated surfaces, boundary friction, film lubrication.

**UNIT – III**

**Clutches:** Friction clutches- Single Disc or plate clutch, Multiple Disc Clutch, Cone Clutch, Centrifugal Clutch.

**BRAKES AND DYNAMOMETERS :** Simple block brakes, internal expanding brake, band brake of vehicle. Dynamometers – absorption and transmission types. General description and methods of operations.

**UNIT – IV**

**TURNING MOMENT DIAGRAM AND FLY WHEELS :** Turning moment – Inertia Torque connecting rod angular velocity and acceleration, crank effort and torque diagrams – Fluctuation of energy – Fly wheels and their design.

**UNIT-V**

**GOVERNERS :** Watt, Porter and Proell governors. Spring loaded governors – Hartnell and hartung with auxiliary springs. Sensitiveness, isochronism and hunting.

**UNIT – VI**

**BALANCING :** Balancing of rotating masses Single and multiple – single and different planes.

**UNIT – VII**

**Balancing of Reciprocating Masses:** Primary, Secondary, and higher balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples – examination of "V" multi cylinder in line and radial engines for primary and secondary balancing, locomotive balancing – Hammer blow, Swaying couple, variation of tractive efforts.

**UNIT – VIII**

**VIBRATION :** Free Vibration of mass attached to vertical spring – oscillation of pendulums, centers of oscillation and suspension. Transverse loads, vibrations of beams with concentrated and distributed loads. Dunkerly's methods, Raleigh's method. Whirling of shafts, critical speeds, torsional vibrations, two and three rotor systems. Simple problems on forced damped vibration Isolation & Transmissibility

**TEXT BOOKS :**

1. Theory of Machines / S.S Ratan/ Mc. Graw Hill Publ.
2. Theory of Machines / Jagadish Lal & J.M.Shah / Metropolitan.

**REFERENCES :**

1. Mechanism and Machine Theory / JS Rao and RV Dukkipati / New Age
2. Theory of Machines / Shiegly / MGH
3. Theory of Machines / Thomas Bevan / CBS Publishers
4. Theory of machines / Khurmi/S.Chand.

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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.

Kinematic schemes of machine tools – Constructional features of speed gear box and feed gear box.

**UNIT – II**

Engine lathe – Principle of working, specification of lathe – types of lathe – work holders tool holders – Box tools Taper turning thread turning – for Lathes and attachments.

Turret and capstan lathes – collet chucks – other work holders – tool holding devices – box and tool layout. Principal features of automatic lathes – classification – Single spindle and multi-spindle automatic lathes – tool layout and cam design.

**UNIT – III**

Shaping slotting and planing machines – Principles of working – Principal parts – specification classification, operations performed. Kinematic scheme of the shaping slotting and planning machines, machining time calculations.

**UNIT – IV**

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 – V**

Milling machine – Principles of working – specifications – classifications of milling machines – Principal features of horizontal, vertical and universal milling machines – machining operations Types geometry of milling cutters – milling cutters – methods of indexing – Accessories to milling machines, kinematic scheme of milling cutters – milling cutters – methods of indexing.

**UNIT – VI**

Grinding machine – Fundamentals – Theory of grinding – classification of grinding machine – 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.

**UNIT - VII**

Lapping, honing and broaching machines – comparison to grinding – lapping and honing. Kinematics scheme of Lapping, Honing and Broaching machines. Constructional features of speed and feed Units, machining time calculations

**UNIT - VIII**

Principles of design of Jigs and fixtures and uses. Classification of Jigs & Fixtures – Principles of location and clamping – Types of clamping & work holding devices. Typical examples of jigs and fixtures.

**TEXT BOOKS :**

1. Production Technology by R.K. Jain and S.C. Gupta.
2. Production Technology by H.M.T. (Hindustan Machine Tools).

**REFERENCES:**

1. Machine Tools – C.Elanchezhian and M. Vijayan / Anuradha Agencies Publishers.
2. Workshop Technology – B.S.Raghu Vamshi – Vol II

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**DESIGN OF MACHINE MEMBERS - I**

**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 – Combined stresses – Torsional and bending stresses – impact stresses – stress strain relation – Various theories of failure – factor of safety – Design for strength and rigidity – preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations – Static strength design based on fracture toughness.

**UNIT – II**

**STRENGTH OF MACHINE ELEMENTS :** Stress concentration – Theoretical stress Concentration factor – Fatigue stress concentration factor notch sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Goodman's line – Soderberg's line – Modified goodman's line.

**UNIT – III**

Riveted and welded joints – Design of joints with initial stresses – eccentric loading

**UNIT – IV**

Bolted joints – Design of bolts with pre-stresses – Design of joints under eccentric loading – locking devices – both of uniform strength, different seals

**UNIT – V**

**KEYS, COTTERS AND KNUCKLE JOINTS :**

Design of Keys-stresses in keys-cottered joints-spigot and socket, sleeve and cotter, jib and cotter joints- Knuckle joints.

**UNIT – VI**

**SHAFTS :** Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – Shaft sizes – BIS code. Use of internal and external circlips, Gaskets and seals (stationary & rotary).

**UNIT – VII**

**SHAFT COUPLING :** Rigid couplings – Muff, Split muff and Flange couplings. Flexible couplings – Flange coupling (Modified).

**UNIT – VIII**

**Mechanical Springs :**

Stresses and deflections of helical springs – Extension -compression springs – Springs for fatigue loading – natural frequency of helical springs – Energy storage capacity – helical torsion springs – Co-axial springs, leaf springs.

**TEXT BOOKS :**

1. Machine Design, V.Bandari Tmh Publishers
2. Machine Design, S MD Jalaludin, AnuRadha Publishers
3. Design Data hand Book, S MD Jalaludin, AnuRadha Publishers

**REFERENCES :**

1. Design of Machine Elements / V.M. Faires
2. Machine design / Schaum Series.
3. Machine design – Pandya & shah.

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**HEAT TRANSFER**

**UNIT – I**

**Introduction :** Modes and mechanisms of heat transfer – Basic laws of heat transfer –General discussion about applications of heat transfer.

**Conduction Heat Transfer :** Fourier rate equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates.

**UNIT – II**

Simplification and forms of the field equation – steady, unsteady and periodic heat transfer – Initial and boundary conditions.

**One Dimensional Steady State Conduction Heat Transfer :** Homogeneous slabs, hollow cylinders and spheres – overall heat transfer coefficient – electrical analogy – Critical radius of insulation

**One Dimensional Steady State Conduction Heat Transfer :** Variable Thermal conductivity – systems with heat sources or Heat generation. Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin, Application to error measurement of Temperature.

**UNIT III**

**One Dimensional Transient Conduction Heat Transfer :** Systems with negligible internal resistance

– Significance of Biot and Fourier Numbers - Chart solutions of transient conduction systems- Concept of Functional Body

**UNIT – IV**

**Convective Heat Transfer :** Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham Pi Theorem and method, application for developing semi – empirical non- dimensional correlation for convection heat transfer – Significance of non-dimensional numbers – Concepts of Continuity, Momentum and Energy Equations.

**Forced convection: External Flows :** Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer -Flat plates and Cylinders.

**Internal Flows :** Concepts about Hydrodynamic and Thermal Entry Lengths – Division of internal flow based on this –Use of empirical relations for Horizontal Pipe Flow and annulus flow.

**UNIT – V**

**Free Convection :** Development of Hydrodynamic and thermal boundary layer along a vertical plate - Use of empirical relations for Vertical plates and pipes.

**UNIT VI**

**Heat Transfer with Phase Change: Boiling:** – Pool boiling – Regimes Calculations on Nucleate boiling, Critical Heat flux and Film boiling.

**Condensation:** Film wise and drop wise condensation –Nusselt's Theory of Condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.

**UNIT VII**

**Heat Exchangers:**

Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

**UNIT VIII**

**Radiation Heat Transfer :**

Emission characteristics and laws of black-body radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

**TEXT BOOKS :**

1. Heat Transfer / HOLMAN/TMH
2. Heat Transfer – P.K.Nag/ TMH

**REFERENCE BOOKS:**

1. Fundamentals of Engg. Heat and Mass Transfer / R.C.SACHDEVA / New Age International
2. Heat Transfer – Ghoshdastidar – Oxford University Press – II Edition
3. Heat and Mass Transfer –Cengel- McGraw Hill.
4. Heat and Mass Transfer – R.K. Rajput – S.Chand & Company Ltd.
5. Essential Heat Transfer - Christopher A Long / Pearson Education
7. Heat and Mass Transfer – D.S.Kumar / S.K.Kataria & Sons
8. Heat and Mass Transfer-Kondandaraman
9. Fundamentals of Heat Transfer & Mass Transfer- Incropera & Dewitt / John Wiley Pub.

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FLUID MECHANICS AND HYDRAULIC MACHINES LAB

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Turbine flow meter.

**Note :** Any 10 of the above 12 experiments are to be conducted.

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**THERMAL ENGINEERING LAB**

1. I.C. Engines Valve / Port Timing Diagrams
2. I.C. Engines Performance Test( 4 -Stroke Diesel Engines )
3. I.C. Engines Performance Test on 2-Stroke Petrol
4. Evaluation of Engine friction by conducting Morse test on 4-Stroke Multi cylinder Petrol Engine and retardation and motoring test on 4- stroke diesel engine
5. I.C. Engines Heat Balance.
6. I.C.Engines Air/Fuel Ratio and Volumetric Efficiency
7. Performance Test on Variable Compression Ratio Engines, economical speed test.
8. Performance Test on Reciprocating Air – Compressor Unit
9. Study of Boilers
10. Dis-assembly / Assembly of Engines.

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INDUSTRIAL MANAGEMENT

**UNIT I**

Concepts of Management and Organisation – Functions of Management – Evolution of Management Thought : Taylor's Scientific Management, Fayol's Principles of Management, Douglas Mc-Gregor's Theory X and Theory Y, Mayo's Hawthorne Experiments, Herzberg's Two Factor Theory of Motivation, Maslow's Hierarchy of Human Needs – Systems Approach to Management.

**UNIT II**

**Designing Organisational Structures** : Basic concepts related to Organisation - Departmentation and Decentralisation, Types of mechanistic and organic structures of organisation (Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organisation, Cellular Organisation, team structure, boundaryless organization, inverted pyramid structure, lean and flat organization structure) and their merits, demerits and suitability.

**UNIT III**

Plant location, definition, factors affecting the plant location, comparison of rural and urban sites-methods for selection of plant- Matrix approach. Plant Layout – definition, objectives, types of production, types of plant layout – various data analyzing forms-travel chart.

**UNIT IV**

Work study - Definition, objectives, method study - definition, objectives, steps involved- various types of associated charts-difference between micromotion and memomotion studies. Work measurement- definition, time study, steps involved-equipment, different methods of performance rating- allowances, standard time calculation. Work Sampling – definition, steps involved, standard time calculations, differences with time study.

**UNIT V**

Materials Management-Objectives, Inventory – functions, types, associated costs, inventory classification techniques-ABC and VED analysis. Inventory Control Systems-Continuous review system-periodical review system. Stores Management and Stores Records. Purchase management, duties of purchase of manager, associated forms.

**UNIT VI**

**Introduction to PERT / CPM** : Project management, network modeling-probabilistic model, various types of activity times estimation-programme evaluation review techniques- Critical Path-probability of completing the project, deterministic model, critical path method (CPM)-critical path calculation-crashing of simple of networks.

**UNIT VII**

Inspection and quality control, types of inspections - Statistical Quality Control-techniques-variables and attributes-assignable and non assignable causes- variable control charts, and R charts, attributes control charts, p charts and c charts. Acceptance sampling plan- single sampling and double sampling plans-OC curves. Introduction to TQM-Quality Circles, ISO 9000 series procedures.

**UNIT VIII**

Introduction to Human Resource Management, Functions of HRM, Job Evaluation, different types of evaluation methods. Job description, Merit Rating.- difference with job evaluation, different methods of merit ratings, wage incentives, different types of wage incentive schemes. Marketing, marketing vs selling, marketing mix, product life cycle.

**TEXT BOOKS:**

1. Amrine, Manufacturing Organization and Management, Pearson, 2nd Edition, 2004.
2. Industrial Engineering and Management O.P. Khanna Dhanpat Rai.

**REFERENCES :**

1. Stoner, Freeman, Gilbert, *Management*, 6th Ed, Pearson Education, New Delhi, 2005.
2. Panner Selvam, Production and Operations Management, PHI, 2004.
3. Dr. C. Nadha Muni Reddy and Dr. K. Vijaya Kumar Reddy, Reliability Engineering & Quality Engineering, Galgotia Publications, Pvt., Limited.
4. Ralph M Barnes, Motion and Time Studies, John Wiley and Sons, 2004.
5. Chase, Jacobs, Aquilano, Operations Management, TMH 10th Edition, 2003.
6. L.S.Srinath, PERT / CPM, affiliate East-West Press, New Delhi, 2000.
7. Gary Dessler, Human Resource Management, Pearson Education Asia, 2002.
8. Phillip Kotler, Marketing Management, Pearson, 2004.
9. A.R.Aryasri, Management Science for JNTU (B.Tech), Tata McGraw-Hill, 2002.

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JAWAHAR LAL NEHRU TECHNOLOGICAL UNIVERSITY  
KAKINADA

III Year B.Tech. M.E. - II Semester

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(ME 05108) CAD / CAM

**UNIT – I**

Computers in Industrial Manufacturing, Product cycle, CAD / CAM Hardware, Basic structure, CPU, Memory types, input devices, display devices, hard copy devices, storage devices.

**UNIT – II**

**Computer Graphics :** Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

**UNIT – III**

**Geometric modeling :** Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

**UNIT – IV**

**Drafting and Modeling systems :** Basic geometric commands, layers, display control commands, editing, dimensioning, solid modeling.

**UNIT – V**

**Numerical control :** NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools, features of Machining center, turning center, CNC Part Programming : fundamentals, manual part programming methods, Computer Aided Part Programming.

**UNIT – VI**

**Group Tech :** Part family, coding and classification, production flow analysis, advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

**UNIT – VII**

**Computer Aided Quality Control:** Terminology in quality control, the computer in QC, contact inspection methods, noncontact inspection methods-optical, noncontact inspection methods-nonoptical, computer aided testing, integration of CAQC with CAD/CAM.

**UNIT – VIII**

**Computer integrated manufacturing systems:** Types of Manufacturing systems, Machine tools and related equipment, material handling systems, computer control systems, human labor in the manufacturing systems, CIMS benefits.

**TEXT BOOK :**

1. CAD / CAM A Zimmers & P.Groover/PE/PHI
2. CAD / CAM Theory and Practice / Ibrahim Zeid / TMH

**REFERENCES :**

1. Automation , Production systems & Computer integrated Manufacturing/ Groover/P.E
2. CAD / CAM / CIM / Radhakrishnan and Subramanian / New Age
3. Principles of Computer Aided Design and Manufacturing / Farid Amrouche / Pearson
4. CAD/CAM: Concepts and Applications/Alavala/ PHI
5. Computer Numerical Control Concepts and programming / Warren S Seames / Thomson.

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III Year B.Tech. M.E. II-Sem

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METROLOGY AND SURFACE ENGINEERING

**UNIT – I**

**Systems of limits and fits:** Introduction, normal size, tolerance limits, deviations, allowance, fits and their types – unilateral and bilateral tolerance system, hole and shaft basis systems – interchangeability and selective assembly. Indian standard Institution system – British standard system, International Standard system for plain ad screwed work.

**UNIT – II**

**LINEAR MEASUREMENT :** Length standard, line and end standard, slip gauges – calibration of the slip gauges, Dial indicator, micrometers.

**MEASUREMENT OF ANGLES AND TAPERS :** Different methods – Bevel protractor – angle slip gauges – spirit levels – sine bar – Sine plate, rollers and spheres used to determine the tapers.

**LIMIT GAUGES :** Taylors principle – Design of go and No go gauges, plug ring, snap, gap, taper, profile and position gauges.

**UNIT – III**

**OPTICAL MEASURING INSTRUMENTS :** Tool maker's microscope and its uses – collimators, optical projector – optical flats and their uses, interferometer.

**FLAT SURFACE MEASUREMENT :** Measurement of flat surfaces – instruments used – straight edges – surface plates – optical flat and auto collimator.

**UNIT – IV**

**SURFACE ROUGHNESS MEASUREMENT :** Differences between surface roughness and surface waviness-Numerical assessment of surface finish – CLA,R, R.M.S Values – Rz values, Rz value, Methods of measurement of surface finish-profilograph. Talysurf, ISI symbols for indication of surface finish.

**MEASUREMENT THROUGH COMPARATORS :** Comparators – Mechanical, Electrical and Electronic Comparators, pneumatic comparators and their uses in mass production.

**UNIT-V**

**SCREW THREAD MEASUREMENT :** Element of measurement – errors in screw threads – measurement of effective diameter, angle of thread and thread pitch, profile thread gauges.

**UNIT -VI**

**MACHINE TOOL ALIGNMENT TESTS :** Requirements of Machine Tool Alignment Tests, Alignment tests on lathe, milling, drilling machine tools.. Preparation of acceptance charts.

**UNIT- VII**

**GEAR MEASUREMENT:** Gear measuring instruments, Gear tooth profile measurement. Measurement of diameter, pitch pressure angle and tooth thickness.

**Coordinate Measuring Machines:** Types of CMM, Role of CMM, and Applications of CMM.

**UNIT – VIII**

**SURFACE ENGINEERING :** Surface treatment processes and their character tics and applications. (a) Overlay coatings (b) Diffusion coatings (c) Thermal or mechanical modification of Surfaces

**TEXT BOOKS :**

1. Engineering Metrology / I C Gupta./ Danpath Rai
2. Engineering Metrology / R.K. Jain / Khanna Publishers

**REFERENCES :**

1. BIS standards on Limits & Fits, Surface Finish, Machine Tool Alignment etc.
2. Fundamentals of Dimensional Metrology 4e / Connie Dotson / Thomson
3. Handbook of Tribology: Materials, Coating, and Surface Treatments/ Bharat Bhushan and B.K.Gupta.
4. Surface Engineering with Lasers/ Dehosson J.T.
5. Surface Engineering for corrosion and wear resistance / JR Davis/ Woodhead Publishers.

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III Year B.Tech. M.E. II-Sem

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REFRIGERATION AND AIR CONDITIONING

**UNIT – I**

**Introduction to Refrigeration :** Necessity and applications – Unit of refrigeration and C.O.P. – Mechanical Refrigeration – Types of Ideal cycles of refrigeration.

Air Refrigeration: Bell Coleman cycle and Brayton Cycle, Open and Dense air systems – Actual air refrigeration system problems – Refrigeration needs of Air crafts.

**UNIT – II**

Vapour compression refrigeration – working principle and essential components of the plant – simple Vapour compression refrigeration cycle – COP – Representation of cycle on T-S and p-h charts – effect of sub cooling and super heating – cycle analysis – Actual cycle Influence of various parameters on system performance – Use of p-h charts – numerical Problems.

**UNIT III**

**System Components :** Compressors – General classification – comparison – Advantages and Disadvantages.

Condensers – classification – Working Principles

Evaporators – classification – Working Principles

Expansion devices – Types – Working Principles

**Refrigerants** – Desirable properties – classification refrigerants used – Nomenclature – Ozone Depletion – Global Warming .

**UNIT IV**

Vapor Absorption System – Calculation of max COP – description and working of NH<sub>3</sub> – water system and Li Br –water ( Two shell & Four shell) System. Principle of operation Three Fluid absorption system, salient features.

**UNIT V**

Steam Jet Refrigeration System – Working Principle and Basic Components.

Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube.

**UNIT – VI**

**Introduction to Air Conditioning :** Psychometric Properties & Processes – Characterization of Sensible and latent heat loads — Need for Ventilation, Consideration of Infiltration – Load concepts of RSHF, GSHF- Problems, Concept of ESHF and ADP.

**UNIT VII**

Requirements of human comfort and concept of effective temperature- Comfort chart –Comfort Air conditioning – Requirements of Industrial air conditioning , Air conditioning Load Calculations.

**UNIT – VIII**

Air Conditioning systems - Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, fans and blowers.

Heat Pump – Heat sources – different heat pump circuits.

**TEXT BOOKS :**

1.     Refrigeration and Air Conditioning / CP Arora / TMH.
2.     A Course in Refrigeration and Air conditioning / SC Arora & Domkundwar / Dhanpatrai

**REFERENCES :**

1.     Refrigeration and Air Conditioning / Manohar Prasad / New Age.
2.     Principles of Refrigeration - Dossat / Pearson Education.
3.     Refrigeration and Air Conditioning-P.L.Bellaney
4.     Basic Refrigeration and Air-Conditioning – Ananthanarayanan / TMH
5.     Refrigeration and Air Conditioning – R.S. Khurmi & J.K Gupta – S.Chand – Eurasia Publishing House (P) Ltd.

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**DESIGN OF MACHINE MEMBERS – II**

**UNIT – I**

**BEARINGS :** Types of Journal bearings – Lubrication – Bearing Modulus – Full and partial bearings – Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design – Ball and roller bearings – Static loading of ball & roller bearings, Bearing life.

**UNIT – II**

**ENGINE PARTS :** Connecting Rod : Thrust in connecting rod – stress due to whipping action on connecting rod ends – Cranks and Crank shafts, strength and proportions of over hung and center cranks – Crank pins, Crank shafts.

**UNIT – III**

Pistons, Forces acting on piston – Construction Design and proportions of piston., Cylinder, Cylinder liners,

**UNIT – IV**

Design of curved beams: introduction, stresses in curved beams, Expression for radius of neutral axis for rectangular, circular, trapezoidal and T-Section. Design of crane hooks, C –clamps.

**UNIT – V**

**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 – VI**

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

**UNIT – VII**

**Design of power screws :** Design of screw, Square ACME , Buttress screws, design of nut, compound screw, differential screw, ball screw- possible failures.

**UNIT – VIII**

**Machine Tool Elements :** Design of beds, slide ways, spindles- material selection, design of strength and rigidity of parts.

**TEXT BOOK :**

1. Machine Design, V.Bandari Tmh Publishers
2. Machine Design, S MD Jalaludin, Anuradha Publishers
3. Machine Design, Kannaiah/ Scitech.

**REFERENCES :**

1. Design Data hand Book, S MD Jalaludin, Anuradha Publishers
2. Machine Design / R.N. Norton
3. Data Books : (I) P.S.G. College of Technology (ii) Mahadevan
4. Mech. Engg. Design / JE Shigley
5. Thermal Engineering – R.S. Khurmi & J.S.Gupta / S.Chand Pub.

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III Year B.Tech. M.E. II-Sem

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**Thermal Engineering - II**

**UNIT – I**

**Basic Concepts :** Rankine cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration & reheating. Combustion: fuels and combustion, concepts of heat of reaction, adiabatic flame temperature, stoichiometry, flue gas analysis

**UNIT II**

**Boilers :** Classification – Working principles – with sketches including H.P.Boilers – Mountings and Accessories – Working principles, Boiler horse power, equivalent evaporation, efficiency and heat balance – Draught, classification – Height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced.

**UNIT – III**

**Steam Nozzles :** Function of nozzle – applications - types, Flow through nozzles, thermodynamic analysis – assumptions -velocity of nozzle at exit-Ideal and actual expansion in nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, criteria to decide nozzle shape: Super saturated flow, its effects, degree of super saturation and degree of under cooling - Wilson line.

**UNIT – IV**

**Steam Turbines :** Classification – Impulse turbine; Mechanical details – Velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency – condition for maximum efficiency. De-Laval Turbine - its features. Methods to reduce rotor speed-Velocity compounding and pressure compounding, Velocity and Pressure variation along the flow – combined velocity diagram for a velocity compounded impulse turbine.

**UNIT V**

**Reaction Turbine :** Mechanical details – principle of operation, thermodynamic analysis of a stage, degree of reaction –velocity diagram – Parson's reaction turbine – condition for maximum efficiency.

**UNIT VI**

**Steam Condensers :** Requirements of steam condensing plant – Classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its affects, air pump- cooling water requirement.

**UNIT – VII**

**Gas Turbines :** Simple gas turbine plant – Ideal cycle, essential components – parameters of performance – actual cycle – regeneration, inter cooling and reheating –Closed and Semi-closed cycles – merits and demerits, Brief concepts about compressors, combustion chambers and turbines of Gas Turbine Plant.

**UNIT – VIII**

**Jet Propulsion :** Principle of Operation –Classification of jet propulsive engines – Working Principles with schematic diagrams and representation on T-S diagram - Thrust, Thrust Power and Propulsion Efficiency – Turbo jet engines – Needs and Demands met by Turbo jet – Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation – Methods.

**Rockets :** Application – Working Principle – Classification – Propellant Type – Thrust, Propulsive Efficiency – Specific Impulse – Solid and Liquid propellant Rocket Engines.

**TEXT BOOKS :**

1. Thermal Engineering / R.K. Rajput / Lakshmi Publications
2. Gas Turbines – V.Ganesan /TMH

**REFERENCES :**

1. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot
2. Gas Turbines and Propulsive Systems – P.Khajuria & S.P.Dubey - /Dhanpatrai
3. Gas Turbines / Cohen, Rogers and Saravana Muttoo / Addison Wesley – Longman
4. Thermal Engineering-R.S Khurmi/JS Gupta/S.Chand.
5. Thermal Engineering-P.L.Bellaney/ khanna publishers.
6. Thermal Engineering-M.L.Marthur & Mehta/Jain bros.

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KAKINADA

III Year B.Tech. M.E. II-Sem

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METROLOGY AND MACHINE TOOLS LAB

**Section A :**

1. Measurement of lengths, heights, diameters by vernier calipers micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear teeth, vernier calipers and checking the chordal addendum and chordal height of spur gear.
4. Machine tool "alignment of test on the lathe.
5. Machine tool alignment test on milling machine.
6. Tool makers microscope and its application
7. Angle and taper measurements by Bevel protractor, Sine bars, etc.
8. Use of spirit level in finding the flatness of surface plate.
9. Thread measurement by Two wire/ Three wire method or Tool makers microscope.
10. Surface roughness measurement by Taly Surf.
11. Surface Wear Resistances Test using Electro Spark Coating Device.

**Section B :**

1. Introduction of general purpose machines -Lathe, Drilling machine, Milling machine, Shaper, Planing machine, slotting machine, Cylindrical Grinder, surface grinder and tool and cutter grinder.
2. Step turning and taper turning on lathe machine
3. Thread cutting and knurling on -lathe machine.
4. Drilling and Tapping
5. Shaping and Planing
6. Slotting
7. Milling
8. Cylindrical Surface Grinding
9. Grinding of Tool angles.

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III Year B.Tech. M.E. II-Sem

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**ADVANCED ENGLISH COMMUNICATION SKILLS LAB**

**1. Introduction**

The introduction of the English Language 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 an integrated theory and lab course to enable students to use 'good' English and perform the following:

- Gather ideas and information, to organise ideas relevantly and coherently.
- Engage in debates.
- Participate in group discussions.
- Face interviews.
- Write project/research reports/technical reports.
- Make oral presentations.
- Write formal letters.
- Transfer information from non-verbal to verbal texts and vice versa.
- To take part in social and professional communication.

**2. Objectives:**

This Lab focuses on using computer-aided multimedia 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.

**3. Syllabus:**

The following course content is prescribed for the Advanced Communication Skills Lab:

- Functional English - starting a conversation – responding appropriately and relevantly – using the right body language – role play in different situations.
- Vocabulary building – synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrases.
- Group Discussion – dynamics of group discussion , intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.
- Interview Skills – concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing.
- Resume' writing – structure and presentation, planning, defining the career objective, projecting ones strengths and skill-sets, summary, formats and styles, letter-writing.
- Reading comprehension – reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading.
- Technical Report writing – Types of formats and styles, subject matter – organization, clarity, coherence and style, planning, data-collection, tools, analysis.

**4. Minimum Requirement:**

**The English Language Lab shall have two parts:**

- i) **The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.
- ii) **The Communication Skills Lab** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

**System Requirement ( Hardware component):**

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

- iv) P – IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- v) Headphones of High quality

**5. Suggested Software:**

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

**Suggested Software:**

- Clarity Pronunciation Power – part II
- 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 & BARRENS, USA, Cracking GRE by CLIFFS)
- The following software from 'train2success.com'
  - Preparing for being Interviewed,
  - Positive Thinking,
  - Interviewing Skills,
  - Telephone Skills,
  - Time Management
  - Team Building,
  - Decision making
- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

**6. Books Recommended:**

1. Effective Technical Communication, M. Ashraf Rizvi, Tata Mc. Graw-Hill Publishing Company Ltd.
2. A Course in English communication by Madhavi Apte, Prentice-Hall of India, 2007.
3. Communication Skills by Leena Sen, Prentice-Hall of India, 2005.
4. Academic Writing- A Practical guide for students by Stephen Bailey, Rontledge Falmer, London & New York, 2004.
5. English Language Communication : A Reader cum Lab Manual Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai
6. Body Language- Your Success Mantra by Dr. Shalini Verma, S. Chand, 2006.
7. DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice, New Age International (P) Ltd., Publishers, New Delhi.
8. Books on TOEFL/GRE/GMAT/CAT by Barron's/cup
9. IELTS series with CDs by Cambridge University Press.
10. Technical Report Writing Today by Daniel G. Riordan & Steven E. Pauley, Biztantra Publishers, 2005.
11. Basic Communication Skills for Technology by Andra J. Rutherford, 2<sup>nd</sup> Edition, Pearson Education, 2007.
12. Communication Skills for Engineers by Sunita Mishra & C. Muralikrishna, Pearson Education, 2007.
13. Objective English by Edgar Thorpe & Showick Thorpe, 2<sup>nd</sup> edition, Pearson Education, 2007.
14. Cambridge Preparation for the TOEFL Test by Jolene Gear & Robert Gear, 4<sup>th</sup> Edition.
15. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press.

**DISTRIBUTION AND WEIGHTAGE OF MARKS:**

**Advanced Communication Skills Lab Practicals:**

1. The practical examinations for the English Language 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 a 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 with the help of another member of the staff of the same department of the same institution.

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IV Year B.Tech. M.E. I-Sem

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**OPERATIONS RESEARCH**

**UNIT – I**

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

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

**UNIT – II**

**TRANSPORTATION PROBLEM** – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy. Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem- Traveling Salesman problem.

**SEQUENCING** – Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines.

**UNIT – III**

**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 – Minimax (maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – 2 X 2 games – dominance principle – m X 2 & 2 X n games -graphical method.

**UNIT – V**

**WAITING LINES :** Introduction – Single Channel – Poisson arrivals – exponential service times – with infinite population and finite population models– Multichannel – Poisson arrivals – exponential service times with infinite population single channel Poisson arrivals.

**UNIT – VI**

**INVENTORY :** Introduction – Single item – Deterministic models – Purchase inventory models with one price break and multiple price breaks – shortages are not allowed – Stochastic models – demand may be discrete variable or continuous variable – Instantaneous production. Instantaneous demand and continuous demand and no set up cost.

**UNIT – VII**

**DYNAMIC PROGRAMMING :** Introduction – Bellman's Principle of optimality – Applications of dynamic programming- capital budgeting problem – shortest path problem – linear programming problem.

**UNIT – VIII**

**SIMULATION :** Definition – Types of simulation models – phases of simulation– applications of simulation – Inventory and Queuing problems – Advantages and Disadvantages – Simulation Languages.

**TEXT BOOK :**

1. Operations Research / S.D.Sharma-Kedarnath
2. Introduction to O.R/Hiller & Libermann (TMH).

**REFERENCES :**

1. Operations Research /A.M.Natarajan,P.Balasubramani,A. Tamilarasi/Pearson Education.
2. Operations Research: Methods & Problems / Maurice Saseini, Arthur Yaspan & Lawrence Friedman
3. Operations Research / R.Pannar Selvam,PHI Publications.
4. Operations Research / Wagner/ PHI Publications.
5. Operation Research /J.K.Sharma/MacMilan.
6. O.R/Wayne L.Winston/Thomson Brooks/cole
7. Introduction to O.R /Taha/PHI

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**DATABASE MANAGEMENT SYSTEMS**

**UNIT – I**

Data base System Applications, data base System VS file System – View of Data – Data Abstraction – Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor

**UNIT – II**

History of Data base Systems. Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Concept Design with the ER Model – Conceptual Design for Large enterprises.

**UNIT – III**

Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views.

Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.

**UNIT – IV**

Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL Triggers and Active Data bases.

**UNIT – V**

Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form.

**UNIT – VI**

Transaction Concept- Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Testing for serializability- Lock – Based Protocols – Timestamp Based Protocols- Validation- Based Protocols – Multiple Granularity.

**UNIT – VII**

Recovery and Atomicity – Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of nonvolatile storage-Advance Recovery systems- Remote Backup systems.

**UNIT – VIII**

Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning- Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM) – B+ Trees: A Dynamic Index Structure.

**TEXT BOOKS :**

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition
2. Data base System Concepts, Silberschatz, Korth, McGraw hill, V edition.

**REFERENCES :**

1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrata Pearson Education
3. Introduction to Database Systems, C.J.Date Pearson Education

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**FINITE ELEMENT METHODS**

**UNIT – I**

Introduction to Finite Element Method for solving field problems. Stress and Equilibrium. Strain – Displacement relations. Stress – strain relations.

**UNIT – II**

One Dimensional problems : Finite element modeling coordinates and shape functions. Potential Energy approach : Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

**UNIT – III**

**Analysis of Beams** : Element stiffness matrix for two node, two degrees of freedom per node beam element.

**UNIT – IV**

Finite element modelling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions.

**UNIT – V**

Finite element modelling of Axisymmetric solids subjected to Axisymmetric loading with triangular elements.

**UNIT-VI**

Two dimensional four noded isoparametric elements and numerical integration.

**UNIT – VII**

Steady state heat transfer analysis : one dimensional analysis of a fin and two dimensional analysis of thin plate. Analysis of a uniform shaft subjected to torsion.

**UNIT-VIII**

Dynamic Analysis : Formulation of finite element model, element matrices, evaluation of Eigen values and Eigen vectors for a stepped bar and a beam.

**TEXT BOOK :**

1. Introduction to Finite Elements in Engineering / Chandraputla, Ashok and Belegundu / Prentice – Hall.
2. The Finite Element Methods in Engineering / SS Rao / Pergamon.

**REFERENCES :**

1. An introduction to Finite Element Method / JN Reddy / Me Graw Hill
2. Finite Element Methods/ Alavala/TMH
3. The Finite Element Method for Engineers – Kenneth H. Huebner, Donald L. Dewhirst, Douglas E. Smith and Ted G. Byrom / John Wiley & sons (ASIA) Pte Ltd.
4. Finite Element Analysis/ C.S.Krishna Murthy

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**INSTRUMENTATION 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.

**UNIT – II**

**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 – III**

**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.

**UNIT – IV**

**MEASUREMENT OF LEVEL :** Direct method – Indirect methods – capacitative, ultrasonic, magnetic, cryogenic fuel level indicators – Bubler level indicators.

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

**UNIT – V**

**MEASUREMENT OF SPEED :** Mechanical Tachometers – Electrical tachometers – Stroboscope, Noncontact type of tachometer

**Measurement of Acceleration and Vibration :** Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle.

**UNIT – VI**

**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 – VII**

**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 – VIII**

**ELEMENTS OF CONTROL SYSTEMS :** Introduction, Importance – Classification – Open and closed systems Servomechanisms–Examples with block diagrams–Temperature, speed & position control systems.

**TEXT BOOKS :**

1. Measurement Systems: Applications & design by D.S Kumar.
2. Mechanical Measurements / BeckWith, Marangoni, Linehard, PHI / PE

**REFERENCES :**

1. Measurement systems: Application and design, Doeblin Ernest. O. Adaptation by Manik and Dhanesh/ TMH
2. Instrumentation and Control systems/ S.Bhaskar/ Anuradha Agencies.
3. Experimental Methods for Engineers / Holman.
4. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.
5. Instrumentation & mech. Measurements by A.K. Tayal ,Galgotia Publications
6. Instrumentation, measurement & analysis by B.C.Nakra & K.K.Choudhary, TMH
7. Mechanical Measurements /sahani

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**ROBOTICS**  
**(ELECTIVE – I)**

**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.

**UNIT – II**

**Components of the Industrial Robotics:** Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

**UNIT – III**

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

**UNIT – IV**

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

**UNIT – V**

Differential transformation and manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.

**UNIT VI**

Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion – Robot programming, languages and software packages.

**UNIT VII**

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

**UNIT VIII**

**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. Industrial Robotics / Groover M P /Pearson Edu.
2. Robotics and Control / Mittal R K & Nagrath I J / TMH.

**REFERENCES :**

1. Robotics / Fu K S/ McGraw Hill.
2. An Introduction to Robot Technology, / P. Coiffet and M. Chaironze / Kogam Page Ltd. 1983 London.
3. Robotic Engineering / Richard D. Klafter, Prentice Hall
4. Robot Analysis and Intelligence / Asada and Sbow time / Wiley Inter-Science.
5. Introduction to Robotics / John J Craig / Pearson Edu.
6. Robot Dynamics & Control – Mark W. Spong and M. Vidyasagar / John Wiley & Sons (ASIA) Pte Ltd.

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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 and instability, computational methods for error estimation, Convergence of Sequences.

**UNIT – II**

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 - III**

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.

**UNIT - IV**

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 - V**

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

**UNIT - VI**

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 - VII**

Steady flow, dimensionless form of Momentum and Energy equations, Stokes equation, conservative body force fields, stream function - Vorticity formulation.

**UNIT -VIII**

**Finite Volume Method:** Approximation of surface integrals, volume integrals, interpolation and differentiation practices, Upwind interpolation, Linear interpolation and Quadratic interpolation.

**TEXT BOOK :**

1. Numerical heat transfer and fluid flow / Suhas V. Patankar- Butter-worth Publishers
2. Computational fluid dynamics - Basics with applications - John. D. Anderson / Mc Graw Hill.

**REFERENCES :**

1. Computational Fluid Flow and Heat Transfer/ Niyogi, Pearson Publications
2. Fundamentals of Computational Fluid Dynamics – Tapan K. Sengupta / Universities Press.

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**MECHATRONICS  
(ELECTIVE – I)**

**UNIT – I**

**INTRODUCTION :** Definition – Trends - Control Methods: Standalone , PC Based ( Real Time Operating Systems, Graphical User Interface , Simulation ) - Applications: SPM, Robot, CNC, FMS, CIM.

**UNIT – II**

**SIGNAL CONDITIONING :** Introduction – Hardware - Digital I/O , Analog input – ADC , resolution , sped channels

Filtering Noise using passive components – Resistors, capacitors - Amplifying signals using OP amps – Software - Digital Signal Processing – Low pass , high pass , notch filtering

**UNIT – III**

**PRECISION MECHANICAL SYSTEMS :** Pneumatic Actuation Systems - Electro-pneumatic Actuation Systems - Hydraulic Actuation Systems - Electro-hydraulic Actuation Systems - Timing Belts - Ball Screw and Nut - Linear Motion Guides - Linear Bearings - Harmonic Transmission - Bearings- Motor / Drive Selection.

**UNIT – IV**

**ELECTRONIC INTERFACE SUBSYSTEMS :** TTL, CMOS interfacing - Sensor interfacing - Actuator interfacing – solenoids , motors Isoation schemes- opto coupling, buffer IC's - Protection schemes – circuit breakers , over current sensing , resetable fuses , thermal dissipation - Power Supply - Bipolar transistors / mosfets

**UNIT – V**

**ELECTROMECHANICAL DRIVES :** Relays and Solenoids - Stepper Motors - DC brushed motors - DC brushless motors - DC servo motors - 4-quadrant servo drives , PWM's - Pulse Width Modulation - Variable Frequency Drives, Vector Drives - Drive System load calculation.

**UNIT – VI**

**MICROCONTROLLERS OVERVIEW :** 8051 Microcontroller , micro processor structure - Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications. Programming –Assembly , C ( LED Blinking , Voltage measurement using ADC).

**UNIT – VII**

**PROGRAMMABLE LOGIC CONTROLLERS :** Basic Structure - Programming : Ladder diagram - Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling - Analog input / output - PLC Selection - Application.

**Unit – VIII**

**PROGRAMMABLE MOTION CONTROLLERS :** Introduction - System Transfer Function - Laplace transform and its application in analysing differential equation of a control system - Feedback Devices : Position , Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive , Capacitive , Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers - P , PI , PID Control - Control modes – Position , Velocity and Torque - Velocity Profiles – Trapezoidal - S. Curve - Electronic Gearing - Controlled Velocity Profile - Multi axis Interpolation , PTP , Linear , Circular - Core functionalities – Home , Record position , Go to Position - Applications : SPM, Robotics.

**TEXT BOOKS :**

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering by W Bolton, Pearson Education Press, 3rd edition, 2005.
2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

**REFERENCES :**

1. Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai.
2. Mechatronics – N. Shanmugam / Anuradha Agencies Publishers.
3. Mechatronics System Design / Devdas shetty/Richard/Thomson.

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**ADVANCED DATA STRUCTURES AND ALGORITHMS  
(ELECTIVE – I)**

Unit I:-

C++ Class Overview- Class Definition, Objects, Class Members, Access Control, Class Scope, Constructors and destructors, parameter passing methods, Inline functions, static class members, this pointer, friend functions, dynamic memory allocation and deallocation (new and delete), exception handling.

Unit II:-

Function Overloading, Operator Overloading, Generic Programming- Function and class templates, Inheritance basics, base and derived classes, inheritance types, base class access control, runtime polymorphism using virtual functions, abstract classes, streams I/O.

Unit III:-

Algorithms, performance analysis-time complexity and space complexity,O-notation, Omega notation and Theta notation, Review of basic data structures - the list ADT, stack ADT, queue ADT, implementation using template classes in C++, sparse matrix representation.

Unit IV:-

Dictionaries, linear list representation, skip list representation, operations- insertion, deletion and searching, hash table representation, hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing,extendible hashing, comparison of hashing and skip lists.

Unit V:-

Priority Queues – Definition, ADT, Realizing a Priority Queue using Heaps, Definition, insertion, Deletion, Application-Heap Sort, External Sorting- Model for external sorting, Multiway merge, Polyphase merge.

Unit VI:-

**Search trees (part I) :** Binary search trees, definition, ADT, implementation, operations-searching, insertion and deletion, Balanced search trees- AVL trees, definition, height of an AVL tree, representation, operations-insertion, deletion and searching.

**Search trees (part II) :** Introduction to Red –Black trees and Splay Trees, B-Trees-B-Tree of order m, height of a B-Tree, insertion, deletion and searching, Comparison of Search Trees.

Unit VII:-

Divide and Conquer- General method, applications – Binary search, merge sort, quick sort, Strassen's matrix multiplication

Efficient non recursive tree traversal algorithms, Biconnected components. Disjoint set operations, union and find algorithms.

Unit VIII:-

**Greedy method and Dynamic programming :** General method (Greedy), Minimum cost spanning trees, Job sequencing with deadlines, General method (Dynamic Programming), Optimal binary search trees, 0/1 knapsack problem, Ordering Matrix Multiplications

**TEXT BOOKS :**

1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education, second edition.
2. Data structures, Algorithms and Applications in C++, S.Sahni, University press (India) pvt Ltd, 2<sup>nd</sup> edition, Orient Longman pvt.ltd.

**REFERENCE :**

1. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and D.Mount, Seventh Edition Wiley student edition, John Wiley and Sons.
2. Data Structures and Algorithms in C++, Third Edition, Adam Drozdek, Thomson
3. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.
4. C++, The Complete Reference, 4<sup>th</sup> Edition, Herbert Schildt, TMH.
5. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI/Pearson Education.

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UNCONVENTIONAL MACHINING PROCESSES  
(ELECTIVE – II)

**UNIT – I**

**INTRODUCTION** – Need for non-traditional machining methods-Classification of modern machining processes – considerations in process selection. Materials. Applications.

**UNIT II**

Ultrasonic machining – Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent development.

**UNIT – III**

Abrasive jet machining, Water jet machining and abrasive water jet machine : Basic principles, equipments, process variables, mechanics of metal removal, MRR, application and limitations.

**UNIT - IV**

**ELECTRO – CHEMICAL PROCESSES** : Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy economic aspects of ECM – Simple problems for estimation of metal removal rate. Fundamentals of chemical, machining, advantages and applications.

**UNIT - V**

**THERMAL METAL REMOVAL PROCESSES** : General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection. Wire EDM, principle, applications.

**UNIT – VI**

Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes –General Principle and application of laser beam machining – thermal features, cutting speed and accuracy of cut.

**UNIT-VII**

Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.  
Chemical machining-principle- maskants –etchants- applications.

**UNIT – VIII**

Magnetic abrasive finishing, Abrasive flow finishing, Electrostream drilling, Shaped tube electrolytic machining.

**TEXT BOOK :**

1. Advanced machining processes/ VK Jain/ Allied publishers.

**REFERENCES :**

1. Modern Machining Process / Pandey P.C. and Shah H.S./ TMH.
2. New Technology / Bhattacharya A/ The Institution of Engineers, India 1984.
2. Modern Production / Operations Management / Baffa & Rakesh Sarin.

**REFERENCES :**

1. Operations Management – S.N. Chary.
2. Inventory Control Theory and Practice / Martin K. Starr and David W. Miller.
3. Reliability Engineering & Quality Engineering by Dr. C. Nadha Muni Reddy and Dr. K. Vijaya Kumar Reddy, Galgotia Publications, Pvt., Limited.
4. Production Control A Quantitative Approach / John E. Biegel.
5. Production Control / Moore.
6. Operations Management / Joseph Monks.

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**NON-CONVENTIONAL SOURCES OF ENERGY  
(ELECTIVE - II)**

**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 titled 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.

**UNIT-III**

**SOLAR ENERGY STORAGE AND APPLICATIONS :** Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

**UNIT-IV**

**WIND ENERGY :** Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

**UNIT-V**

**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-VI**

**GEOHERMAL ENERGY :** Resources, types of wells, methods of harnessing the energy, potential in India.

**UNIT-VII**

**OCEAN ENERGY :** OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

**UNIT-VIII**

**DIRECT ENERGY CONVERSION :** Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, seebeck, peltier and joul Thomson 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, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

**TEXT BOOKS:**

1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy Sources /G.D. Rai

**REFERENCES:**

1. Renewable Energy Sources /Twidell & Weir
2. Solar Energy /Sukhame
3. Splar Power Engineering / B.S Magal Frank Kreith & J.F Kreith.
4. Principles of Solar Energy / Frank Krieth & John F Kreider.
5. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
6. Non-Conventional Energy Systems / K Mittal /Wheeler
7. Renewable Energy Technologies /Ramesh & Kumar /Narosa

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**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.

**UNIT II**

**STEAM POWER PLANT : 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 – III**

**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.

**UNIT IV**

**GAS TURBINE PLANT :** Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparision.

**UNIT – V**

**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.

**UNIT VI**

**POWER FROM NON-CONVENTIONAL SOURCES:** Utilization of Solar- Collectors- Principle of Working, Wind Energy – types – HAWT, VAWT -Tidal Energy.

**DIRECT ENERGY CONVERSION:** Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.

**UNIT – VII**

**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 – VIII**

**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. A Text Book of Power Plant Engineering / Rajput / Laxmi Publications
2. Power Plant Engineering – P.C.Sharma / S.K.Kataria Pub

**REFERENCES :**

1. Power Plant Engineering: P.K.Nag/ II Edition /TMH.
2. Power plant Engineering/ Ramalingam/ Scitech Publishers
3. A Course in Power Plant Engineering: / Arora and S. Domkundwar.
4. Power station Engineering – ElWakil / McHill.
5. An Introduction to Power Plant Technology / G.D. Rai.
6. Power plant Engg - Elanchezhian- I.K. International Pub.

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**UNIX AND SHELL PROGRAMMING  
(ELECTIVE-II)**

**Unit I:**

Introduction to Unix:- Architecture of Unix, Features of Unix , Unix Commands – PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip.

**Unit II :**

Unix Utilities:- Introduction to unix file system, vi editor, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text processing utilities and backup utilities , detailed commands to be covered are tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio

**Unit III :**

**Introduction to Shells :**

Unix Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization.

**Filters :**

Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count characters, Words or Lines, Comparing Files.

**Unit IV :**

**Grep :**

Operation, grep Family, Searching for File Content.

**Sed :**

Scripts, Operation, Addresses, commands, Applications, grep and sed.

**Unit V :**

**awk:**

Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications, awk and grep, sed and awk.

**Unit VI :**

**Interactive Korn Shell :**

Korn Shell Features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, Options, Startup Scripts, Command History, Command Execution Process.

**Korn Shell Programming :**

Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

**Unit VII :**

**Interactive C Shell :**

C shell features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, On-Off Variables, Startup and Shutdown Scripts, Command History, Command Execution Scripts.

**C Shell Programming :**

Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

**Unit VIII :**

**File Management :**

File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.

**TEXT BOOKS :**

1. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson
2. Your Unix the ultimate guide, Sumitabha Das, TMH. 2<sup>nd</sup> Edition.

**REFERENCES :**

1. Unix for programmers and users, 3rd edition, Graham Glass, King Ables, Pearson Education.
2. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
3. The Complete Reference Unix, Rosen, Host, Klee, Farber, Rosinski, Second Edition, T

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**HEAT TRANSFER LAB**

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
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. Heat transfer in forced convection apparatus.
8. Heat transfer in natural convection
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan Boltzman Apparatus.
12. Heat transfer in drop and film wise condensation.
13. Critical Heat flux apparatus.
14. Study of heat pipe and its demonstration.
15. Study of Two – Phase flow.

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**PRODUCTION DRAWING PRACTICE AND INSTRUMENTATION LAB**

**UNIT – I**

Conventional representation of Materials – conventional representation of parts – screw joints, welded joints, springs, gears, electrical, hydraulic and pneumatic circuits – methods of indicating notes on drawings.

**UNIT – II**

**Limits and Fits :** Types of fits, exercises involving selection / interpretation of fits and estimation of limits from tables.

**UNIT – III**

**Form and Positional Tolerances :** Introduction and indication of the tolerances of form and position on drawings, deformation of runout and total runout and their indication.

**UNIT – IV**

**Surface roughness and its indication :** Definitions – finishes obtainable from various manufacturing processes, recommended surface roughness on mechanical components.

**UNIT – V**

Heat treatment and surface treatment symbols used on drawings.

**UNIT – VI**

**Detailed and Part drawings:** Drawing of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc.

**UNIT – VII**

Part drawing using computer aided drafting by CAD software

**TEXT BOOKS :**

1. Production and Drawing – K.L. Narayana & P. Kannaiyah/ New Age
2. machine Drawing with Auto CAD- Pohit and Ghosh, PE

**REFERENCE :**

1. Geometric dimensioning and tolerancing- James D. Meadows/ B.S Publications
2. Engineering Metrology, R.K. Jain, Khanna Publications

**(B) INSTRUMENTATION LAB**

1. Calibration of Pressure Gauges
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for temperature measurement.
5. Calibration of thermocouple for temperature measurement.
6. Calibration of capacitive transducer for angular displacement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotometer for flow measurement.
10. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of Mcleod gauge for low pressure.

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**PRODUCTION PLANNING AND CONTROL**

**UNIT – I**

Introduction : Definition – 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 department – Internal organization of department.

**UNIT – II**

Forecasting – Importance of forecasting – Types of forecasting, their uses – General principles of forecasting – Forecasting techniques – qualitative methods and quantitative methods.

**UNIT – III**

Inventory management – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – P-Systems and Q-Systems –

**UNIT – IV**

Introduction to MRP & ERP, LOB (Line of Balance), JIT inventory, and Japanese concepts.

**UNIT – V**

Routing – Definition – Routing procedure – Route sheets – Bill of material – Factors affecting routing procedure. Schedule –definition – Difference with loading

**UNIT – VI**

Scheduling Policies – Techniques, Standard scheduling methods,

**UNIT – VII**

Line Balancing, Aggregate planning, Chase planning, Expediting, controlling aspects.

**UNIT – VIII**

Dispatching – Activities of dispatcher – Dispatching procedure – followup – definition – Reason for existence of functions – types of followup, applications of computer in production planning and control.

**TEXT BOOKS :**

1. Elements of Production Planning and Control / Samuel Eilon.
2. Modern Production/ operation managements / Baffa & Rakesh Sarin

**REFERENCES :**

1. Operations Management – S.N. Chary.
2. Inventory Control Theory and Practice / Martin K. Starr and David W. Miller.
3. Reliability Engineering & Quality Engineering by Dr. C. Nadha Muni Reddy and Dr. K. Vijaya Kumar Reddy, Galgotia Publications, Pvt., Limited.
4. Production Control A Quantitative Approach / John E. Biegel.
5. Production Control / Moore.
6. Operations Management / Joseph Monks.

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**NEURAL NETWORKS AND FUZZY LOGIC SYSTEMS**  
**(Elective – III)**

**Objective :**

This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks. Also deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components. The Neural Network and Fuzzy Logic application to Systems Engineering is also presented. This subject is very important and useful for doing Project Work.

**Unit – I: Introduction to Neural Networks**

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

**Unit- II:                   Essentials of Artificial Neural Networks**

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules.

**Unit-III: Single Layer Feed Forward Neural Networks**

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Limitations of the Perceptron Model.

**Unit- IV: Multilayer Feed forward Neural Networks**

Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

**Unit V: Associative Memories**

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function.

Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis.

**Unit – VI:               Classical & Fuzzy Sets**

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

**UNIT VII:               Fuzzy Logic System Components**

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

**UNIT VIII:               Applications**

**Neural network applications:** Process identification, control, fault diagnosis.

**Fuzzy logic applications:** Fuzzy logic control and Fuzzy classification.

**TEXT BOOK:**

1. S. Rajasekharan and G. A. Vijayalakshmi pai, "Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications", PHI Publication, 2004.
2. John Yen and Reza Langari, "Fuzzy Logic: Intelligence, Control and Information", Pearson Education, 2004.

**REFERENCE BOOKS:**

1. Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2001.
2. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networks using MATLAB 6.0", TMH, 2006.
3. James A Freeman and Davis Skapura, Neural Networks Pearson Education, 2002.
4. Timothy J. Ross, " Fuzzy Logic With Engineering Applications", McGraw-Hill Inc. 1997

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**TRIBOLOGY**  
**(ELECTIVE – III)**

**UNIT - I**

Study of various parameters: Viscosity, flow of fluids, viscosity and its variation -absolute and kinematic viscosity, temperature variation, viscosity index determination of viscosity, different viscometers used.

**UNIT - II**

Hydrostatic lubrication: Hydrostatic step bearing, application to pivoted pad thrust bearing and other applications, hydrostatic lifts, hydrostatic squeeze films and its application to journal bearing.

**UNIT - III**

Hydrodynamic theory of lubrication: Various theories of lubrication, petroffs equation, Reynold's equation in two dimensions -Effects of side leakage - Reynolds equation in three dimensions, Friction in sliding bearing, hydro dynamic theory applied to journal bearing, minimum oil film thickness, oil whip and whirl anti-friction bearing.

**UNIT - IV**

Friction and power losses in journal bearings :Calibration of friction loss friction in concentric bearings, bearing modulus, Sommerfield number, heat balance, practical consideration of journal bearing design considerations.

**UNIT - V**

Air lubricated bearing: Advantages and disadvantages application to Hydrodynamic journal bearings, hydrodynamic thrust bearings. Hydrostatic thrust bearings. Hydrostatic bearing Analysis including compressibility effect.

**UNIT - VI**

Study of current concepts of boundary friction and dry friction.

**UNIT - VII**

Types of bearing oil pads: Hydrostatic bearing wick oiled bearings, oil rings, pressure feed bearing, partial bearings -externally pressurized bearings.

**UNIT - VIII**

**Bearing materials :** General requirements of bearing materials, types of bearing materials.

**TEXT BOOK :**

1. Fundamentals of Tribology, Basu, SenGupta and Ahuja/PHI
2. Tribology in Industry : Sushil Kumar Srivatsava, S. Chand &Co.

**REFERENCE :**

1. Tribology – B.C. Majumdar

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NANOTECHNOLOGY  
(ELECTIVE – III)

**UNIT-I**

**General Introduction:** Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band structure in solids, Mossbauer and Spectroscopy, optical phenomena bonding in solids, Anisotropy.

**UNIT-II**

**Silicon Carbide:** Application of Silicon carbide, nano materials preparation, Sintering of SiC, X-ray Diffraction data, electron microscopy sintering of nano particles,

**Nano particles of Alumina and Zirconia:** Nano materials preparation, Characterization, Wear materials and nano composites,

**UNIT-III**

**Mechanical properties:** Strength of nano crystalline SiC, Preparation for strength measurements, Mechanical properties, Magnetic properties,

**Unit -IV**

**Electrical properties:** Switching glasses with nanoparticles, Electronic conduction with nano particles

**Optical properties:** Optical properties, special properties and the coloured glasses

**UNIT-V**

Process of synthesis of nano powders, Electro deposition, Important nano materials

**UNIT-VI:**

**Investigating and manipulating materials in the nanoscale:** Electron microscopics, scanning probe microscopics, optical microscopics for nano science and technology, X-ray diffraction.

**UNIT-VII**

**Nanobiology :** Interaction between bimolecules and nanoparticle surface, Different types of inorganic materials used for the synthesis of hybrid nano-bio assemblies, Application of nano in biology, nanoprobe for Analytical Applications-A new Methodology in medical diagnostics and Biotechnology, Current status of nano Biotechnology, Future perspectives of Nanobiology, Nanosensors.

**UNIT-VIII**

**NanoMedicines :** Developing of Nanomedicines Nanosystems in use, Protocols for nanodrug Administration, Nanotechnology in Diagnostics applications, materials for used in Diagnostics and Therapeutic applications, Molecular Nanomechanics, Molecular devices, Nanotribology, studying tribology at nanoscale, Nanotribology applications.

**TEXT BOOKS:**

1. Nano Materials- A.K.Bandyopadhyay/ New Age Publishers.
2. Nano Essentials- T.Pradeep/TMH

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COMPUTER ORGANIZATION AND ARCHITECTURE  
(ELECTIVE – III)

**UNIT-I**

**BASIC STRUCTURE OF COMPUTERS :** Computer Types, Functional unit, Basic Operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers. Data Representation. Fixed Point Representation. Floating – Point Representation. Error Detection codes. Addition, subtractions and multiplications and algorithms.

**UNIT-II**

**REGISTER TRANSFER LANGUAGE AND MICROOPERATIONS :** Register Transfer language. Register Transfer Bus and memory transfers, Arithmetic Microoperations, logic micro operations, shift micro operations, Arithmetic logic shift unit. Instruction codes. Computer Registers Computer instructions – Instruction cycle.

**UNIT-III**

**Memory** – Reference Instructions. Input – Output and Interrupt. STACK organization. Instruction formats. Addressing modes. DATA Transfer and manipulation. Program control. Reduced Instruction set computer.

**UNIT-IV**

**MICRO PROGRAMMED CONTROL :** Control memory, Address sequencing, microprogram example, design of control unit Hard wired control. Microprogrammed control

**UNIT-V**

**THE MEMORY SYSTEM :** Basic concepts semiconductor RAM memories. Read-only memories Cache memories performance considerations, Virtual memories secondary storage. Introduction to RAID.

**UNIT-VI**

**INPUT-OUTPUT ORGANIZATION :** Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt Direct memory Access, Input –Output Processor (IOP) Serial communication; Introduction to peripheral component, Interconnect (PCI) bus. Introduction to standard serial communication protocols like RS232, USB, IEEE1394.

**UNIT-VII**

**PIPELINE AND VECTOR PROCESSING :** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.

**UNIT-VIII**

**MULTI PROCESSORS :** Characteristics or Multiprocessors, Interconnection Structures, Interprocessor Arbitration. InterProcessor Communication and Synchronization Cache Coherence. Shared Memory Multiprocessors.

**TEXT BOOKS :**

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafaaZaky, Vth Edition, McGraw Hill.
2. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson/PHI

**REFERENCES :**

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, - Sivarama Dandamudi Springer Int. Edition.
4. Computer Organization, Anjaneyulu, Himalaya Pub house.

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

**Unit I** :Introduction to Entrepreneurship

Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Intrapreneur. The Entrepreneurial decision process. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur.

**Unit II** : Creating and Starting the Venture

Sources of new Ideas, Methods of generating ideas, creating problem solving, product planning and development process.

**Unit III** : The Business Plan

Nature and scope of Business plan , Writing Business Plan, Evaluating Business plans, Using and implementing business plans. Marketing plan, financial plan and the organizational plan, Launching formalities.

**Unit IV** : 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.

**Unit V** : New venture Expansion Strategies and Issues

Features and evaluation of joint ventures, acquisitions, merges, franchising. Public issues, rights issues, bonus issues and stock splits.

**Unit VI** : Institutional support to Entrepreneurship

Role 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 VII** :Production and Marketing Management

Thrust 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 VIII**

Labour legislation, Salient Provision under Indian Factories Act, Industrial Disputes Act, Employees State Insurance Act, Workmen's Compensation Act and payment of Bonus Act.

This course replaces the course offered in earlier years as 'Entrepreneurship& Management'

**Text Books:**

1. Robert Hisrich, & Michael Peters: Entrepreneurship, TMH, 5<sup>th</sup> Edition.
2. Dollinger: Entrepreneurship,4/e, Pearson, 2004.

**REFERENCES:**

1. Vasant Desai: Dynamics of Entrepreneurial Development and management, Himalaya Publishing House, 2004.
2. Harvard Business Review on Entrepreneurship. HBR Paper Back, 1999.
3. Robert J.Calvin: Entrepreneurial Management, TMH, 2004.
4. Gurmeet Naroola: The Entrepreneurial Connection, TMH, 2001.
5. Bolton & Thompson : Entrepeneurs- Talent, Temperament, Technique, Butterworth Heinemann, 2001.
6. Agarwal :Indian Economy , Wishwa Prakashan 2005.
7. Dutt & Sundaram : Indian Economy. S. Chand, 2005.
8. Srivastava: Industrial Relations & Labour Laws, Vikas, 2005.
9. Aruna Kaulgud: Entrepreneurship Management by. Vikas publishing house, 2003.
10. Thomas W. Zimmerer & Norman M. Scarborough: Essential of Entrepreneurship and small business management, PHI, 4/e, 2005.
11. Mary Coulter: Entrepreneurship in Action, PHI, 2/e, 2005.
12. Kaplan: Patterns of Entrepreneurship, Willey, 2005.
13. ND Kapoor: Industrial Law, Sultan Chand & Sons, 2005.

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**AUTOMATION IN MANUFACTURING  
(ELECTIVE – IV)**

**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.

**UNIT – III**

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 – IV**

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

**UNIT – V**

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

**UNIT -VI**

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

**UNIT – VII**

Adaptive control systems : Introduction, adaptive control with optimization, Adaptive control with constraints, Application of A.C. in Machining operations. Use of various parameters such as cutting force, Temperatures, vibration and acoustic emission.

**UNIT – VIII**

Business process Re-engineering: Introduction to BPE logistics, ERP, Software configuration of BPE, concurrent Engineering, Techniques of Rapid Proto typing.

**TEXT BOOK :**

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

**REFERENCES :**

1.     Computer control of Manufacturing Systems by Yoram Coreom.
2.     CAD / CAM/ CIM by Radhakrishnan.
3.     Automation by W. Buekinsham.

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**INTERACTIVE COMPUTER GRAPHICS  
(ELECTIVE - IV)**

Unit-1

Introduction, Application area of Computer graphics, overview of graphic system, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices

Unit-II

Output primitives: Points and lines, line drawing algorithms, mid-point circle algorithm,  
Filled area primitives: scan-line polygon fill algorithm, boundary-fill and flood-fill algorithm

Unit-III

2-D geometrical transformations: Translation, scaling, rotation, reflection and shear transformation matrix representations and homogeneous co-ordinates, composite transformations, transformations between coordinates

Unit -IV

2-D viewing : The viewing pipe-line, viewing coordinate reference frame, window to view-port co-ordinate transformations, viewing function, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland-Hodgeman polygon clipping algorithm

Unit -V

3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curve, Bezier and B-spline surfaces, Basic illumination models, shading algorithms

Unit -VI

3-D geometric transformations: Translation, rotation, scaling, reflection and shear transformation and composite transformations

Unit -VII

Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting

Unit-VIII

Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation language, key frame system, motion specification

Text books:

1. " Computer Graphics C version" Donald Hearn and M. Pauline Baker, Pearson/PHI
2. "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education

**REFERENCES :**

1. "Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc-Graw hill edition.
2. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
3. "Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
4. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.
5. Computer Graphics, Steven Harrington, TMH

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OPERATING SYSTEM CONCEPTS  
(ELECTIVE – IV)

**UNIT I :**

**Computer System and Operating System Overview:** Overview of computer operating systems operating systems functions protection and security distributed systems special purpose systems operating systems structures and systems calls operating systems generation

**UNIT II :**

**Process Management** – Process concepts threads, scheduling-criteria algorithms, their evaluation, Thread scheduling, case study of Windows

**UNIT III :**

**Concurrency** : Process synchronization, the critical- section problem, Peterson's Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors, Synchronization examples, atomic transactions. Case study of Windows

**UNIT IV :**

**Memory Management** : Swapping, contiguous memory allocation, paging, structure of the page table , segmentation, virtual memory, demand paging, page-Replacement, algorithms, case study of Windows

**UNIT V :**

**Principles of deadlock** – system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery from deadlock,  
**I/O** systems, Hardware, application interface, kernel I/O subsystem, Transforming I/O requests Hardware operation, STREAMS, performance.

**UNIT VI :**

**File system Interface**- the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

**File System implementation**- File system structure, file system implementation, directory implementation, directory implementation, allocation methods, free-space management, efficiency and performance, case study of Windows

**UNIT VII :**

**Mass-storage structure** overview of Mass-storage structure, Disk structure, disk attachment disk scheduling, swap-space management, RAID structure, stable-storage implementation, Tertiary storage structure.

**UNIT VIII :**

**Protection and Security:** Protection, Goals of Protection, Principles of Protection, Access control The Security problem, program threats, system and network threats cryptography as a security tool,

**TEXT BOOKS :**

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Operating systems- A Concept based Approach-D.M.Dhamdhere, 2<sup>nd</sup> Edition, TMH

**REFERENCES :**

1. Operating Systems' – Internal and Design Principles Stallings, Fifth Edition–2005, Pearson education/PHI
2. Operating System A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum 2nd edition Pearson/PHI.

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CAD / CAM LAB

( A) CAD / CAM LAB :

1. **Drafting** : Development of part drawings for various components in the form of orthographic and isometric. Representation of Dimensioning and tolerances scanning and plotting. Study of script, DXF AND IGES FILES.
2. **Part Modeling** : Generation of various 3D Models through Protrusion, revolve, shell sweep. Creation of various features. Study of parent child relation. Feature based and Boolean based modeling surface and Assembly Modeling. Study of various standard Translators. Design simple components.
3. a). Determination of deflection and stresses in 2D and 3D trusses and beams.  
b). Determination of deflections component and principal and Von-mises stresses in plane stress, plane strain and Axisymmetric components.  
c). Determination of stresses in 3D and shell structures (at least one example in each case)  
d). Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.  
e). Steady state heat transfer Analysis of plane and Axisymmetric components.
4. a). Development of process sheets for various components based on tooling Machines.  
b). Development of manufacturing and tool management systems.  
c). Study of various post processors used in NC Machines.  
d). Development of NC code for free form and sculptured surfaces using CAM packages.  
e). Machining of simple components on NC lathe and Mill by transferring NC Code / from a CAM package. Through RS 232.  
f) Quality Control and inspection.

**Any Six Software Packages from the following:**

Use of Auto CAD, Micro Station, CATIA, Pro-E, I-DEAS, ANSYS, NISA, CAEDEM, Gibbs CAM, Master CAM etc.