

**ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS**

AUTOMOBILE ENGINEERING

for

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2005-2006)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

KUKATPALLY, HYDERABAD - 500 072 (A.P.)

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

B.Tech. AUTOMOBILE ENGINEERING

I Year

COURSE STRUCTURE

CODE	SUBJECT	T	P	C
HS 05231	English	2+1*	0	4
MA 05363	Mathematics-I	3+1*	0	6
PY 05226	Engineering Physics	2+1*	0	4
CM 05219	Engineering Chemistry	2	0	4
ME 05224	Engineering Mechanics	3+1*	0	6
CS 05141	Computer Programming & Numerical Methods	2+2*	0	4
ME 05223	Engineering Graphics	0	6	8
ME 05228	Engineering Physics Fuels & Lubricants Lab	0	3	4
HS 05232	English Language Communication Skills Lab	0	3	4
CS 05142	Computer Programming & Numerical Methods Lab	0	6	8
ME 05230	Engineering Work Shop Practice	0	3	4
Total		19	21	56

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B.Tech. AUTOMOBILE ENGINEERING

II Year

I Semester

COURSE STRUCTURE

CODE	SUBJECT	T	P	C
MA 05364	Mathematics-II	4+1*	0	4
CE 05375	Mechanics Of Solids	4+1*	0	4
CS 05434	OOPS Through JAVA	4+1*	0	4
ME 05551	Thermodynamics	4+1*	0	4
ME 05346	Machine Drawing	0	6	4
EE 05187	Electrical & Electronics Engg.	4+1*	0	4
EE 05188	Electrical & Electronics Lab	0	3	2
CS 05338	JAVA Lab	0	3	2
Total		25	12	28

II Year

Semester II

COURSE STRUCTURE

CODE	SUBJECT	T	P	C
MA 05476	Probability & Statistics	4+1*	0	4
AU 05061	Automotive Engines	4+1*	0	4
CE 05374	Mechanics of Fluids	4+1*	0	4
MM 05392	Metallurgy and Material Science	4+1*	0	4
CE 05239	Environmental Studies	4+1*	0	4
ME 05547	Thermal Engg.-I.	4+1*	0	4
MT 05393	Metallurgy & Mechanics of Solids Lab	0	3	2
ME 05549	Thermal Engg. Lab	0	3	2
Total		30	6	28

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B.Tech. AUTOMOBILE ENGINEERING

III Year

I Semester

COURSE STRUCTURE

CODE	SUBJECT	T	P	C
HS 05353	Managerial Economics & Financial Analysis	4+1*	0	4
ME 05295	Hydraulic Machinery & Systems	4+1*	0	4
MP 05493	Production Technology	4+1*	0	4
ME 05339	Kinematics Of Machinery	4+1*	0	4
AU 05163	Design of Machine Elements	4+1*	0	4
ME 05548	Thermal Engineering-II	4+1*	0	4
AU 05296	Hydraulic Machines and Production Technology Lab	0	3	2
ME 05057	Automobile Engineering Lab-I	0	3	2
Total		30	6	28

III Year

Semester II

COURSE STRUCTURE

CODE	SUBJECT	T	P	C
HS 05311	Industrial Management	4+1*	0	4
ME 05349	Machine Tools & Metrology	4+1*	0	4
ME 05184	Dynamics of Machinery	4+1*	0	4
ME 05283	Heat Transfer	4+1*	0	4
ME 05507	Robotics	4+1*	0	4
AU 05060	Automotive Electrical and Autotronics	4+1*	0	4
ME 05395	Metrology & Machine Tools Lab	0	3	2
ME 05058	Automobile Engineering Lab-II	0	3	2
Total		30	6	28

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B.Tech. AUTOMOBILE ENGINEERING

IV Year

I Semester

COURSE STRUCTURE

CODE	SUBJECT	T	P	C
ME 05436	Operations Research	4+1*	0	4
AU 05570	Vehicle Dynamics	4+1*	0	4
AU 05059	Automotive Chassis & Suspension	4+1*	0	4
EE 05323	Instrumentation and Control Systems	4+1*	0	4
	Elective-I	4+1*	0	4
AU 05563	Tribology			
MC 05489	Product Design and Assembly Automation			
AU 05051	Auto Air Conditioning			
	Elective-II	4+1*	0	4
EE 05425	Neural Networks & Fuzzylogic			
ME 05248	Finite Element Method			
AU 05031	Alternative Energy sources for Automobiles			
AU 05284	Heat Transfer and Instrumentation Lab	0	3	2
AU 05052	Auto Scanning & Vehicle Testing Lab	0	3	2
Total		30	6	28

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B.Tech. AUTOMOBILE ENGINEERING

IV Year

II Semester

COURSE STRUCTURE

CODE	SUBJECT	T	P	C
AU 05571	Vehicle Transport Management	4+1*	0	4
	Elective-III	4+1*	0	4
AU 05062	Automotive Pollution & Control			
AU 05569	Vehicle Body Engg. & Safety			
ME 05054	Automation in Manufacturing			
	Elective-IV	4+1*	0	4
ME 05108	CAD/CAM			
EE 05404	Micro Processors & Micro Controllers			
CS 05137	Computer Graphics			
CA 05495	PROJECT WORK	0	0	12
CA 05515	Seminar	0	0	2
CA 05315	Industry Oriented Mini Project	0	0	2
Total		15	0	28

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

- * - Tutorial
- T - Theory
- P - Practical
- C - Credits

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HYDERABAD

I Year B.Tech. AME

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(HS 05231) 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, to encourage them to develop their language skills. The two textbooks identified by the Board of Studies serve the purpose of illustrating the conceptual framework within which the syllabus is to be administered in the classroom. When a textbook is prescribed content is generally paid attention to. However, the stress in this syllabus is on language acquisition and skill development, calling for both the teacher and the taught to go beyond the prescribed texts and innovate exercises and tasks.

2. OBJECTIVES :

1. To promote the language proficiency of the students with emphasis on improving their LSRW skills.
2. To impart training to the students through the syllabus and its theoretical and practical components.
3. To improve communication skills in formal and informal situations.

3. SYLLABUS :

Listening Skills :

- Listening for general content
- Listening to fill up information gaps
- Intensive listening
- Listening for specific information
- Note-taking - guided and unguided
- Post-listening testing

Speaking Skills :

- Oral practice
- Developing confidence
- Introducing oneself/others
- Asking for/ giving information
- Describing objects/offering solutions
- Describing situations
- Role play

Expressing agreement/disagreement

Reading Comprehension

- Skimming the text
- Understanding the gist of an argument
- Identifying the topic sentence

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- Inferring lexical and contextual meaning
- Understanding discourse features
- Recognizing coherence/sequencing of sentences

NOTE : The student, through the training imparted to him/her by means of the text-based approach, will be examined in answering questions on an unseen passage.

Writing Skills :

- Writing a sentence
- Use of appropriate vocabulary
- Paragraph writing
- Coherence and cohesiveness
- Narration / description
- Interpreting data
- Formal and informal letter writing
- Sending e-mails
- Information transfer
- 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:

1. **LEARNING ENGLISH: A Communicative Approach**, Hyderabad: Orient Longman, 2005 (Selected Lessons)
2. **WINGS OF FIRE: An Autobiography – APJ Abdul Kalam**, Abridged version with Exercises, Hyderabad: Universities Press (India) Pvt. Ltd., 2004.

The following lessons from the prescribed texts are recommended for study :

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

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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

- Reading and Writing Skills
- Reading Comprehension
- Situational dialogues
- Report writing
- Letter writing
- Essay writing
- Information transfer

Unit – VIII

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

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

TEXT BOOKS :

1. **Effective Technical Communication**, M Ashraf Rizvi, Tata McGraw-Hill Publishing Company Ltd.
2. **Everyday Dialogues in English**, Robert J Dixon, Prentice Hall of India Pvt Ltd., New Delhi.

REFERENCES :

1. **Strengthen Your English**, Bhaskaran & Horsburgh, Oxford University Press
2. **English for Technical Communication**, K R Lakshminarayana, SCITECH
3. **Strategies for Engineering Communication**, Susan Stevenson & Steve Whitmore (John Wiley and sons).
4. **English for Engineers: With CD**, Sish Chaudhary, Vikas Publishing House Pvt. Ltd. With CD.
5. **Basic Communication Skills for Technology**, Andrea J Rutherford, Pearson Education Asia.
6. **Murphy's English Grammar with CD**, Murphy, Cambridge University Press
7. **A Practical Course in English Pronunciation, (with two Audio cassettes)**, Sethi, Sadanand & Jindal, Prentice –Hall of India Pvt Ltd., New Delhi.
8. **English for Professional Students**, by S S Prabhakara Rao.
9. **The Oxford Guide to Writing and Speaking**, John Seely, Oxford
10. **Grammar Games**, Renvoluch Mario, Cambridge University Press.

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HYDERABAD

I Year B.Tech. AME

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(MA 05363) MATHEMATICS – I

UNIT – I

Sequences – series – Convergences and divergence – Ratio test – Comparison test – Integral test – Cauchy's root test – Raabe's test – Absolute and conditional convergence. Rolle's theorem – Lagrange's Mean Value Theorem – Cauchy's Mean value Theorem – Generalized Mean Value theorem (Taylor's Theorem).

UNIT – II

Functions of several variables – Functional dependence- Jacobian- Maxima and Minima of functions of two variables with constraints or without constraints- Radius, Centre and Circle of Curvature – Evolutes and Envelopes.

UNIT – III

Curve tracing – Cartesian , polar and Parametric curves - Applications of integration to lengths , volumes and surface areas in Cartesian and polar coordinates.

UNIT – IV

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- 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 – V

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.

UNIT – VI

Multiple integrals - double and triple integrals – change of variables – change of order of integration.

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.

UNIT – VIII

Vector integral theorems: Green's theorem- Stoke's and Gauss's Divergence Theorem. Verification of Green's - Stoke's and Gauss's Theorems – Cylindrical, Spherical coordinates- Expressions Grad, div, curl in spherical and cylindrical coordinates.

TEXT BOOKS :

1. A text book of Engineering Mathematics Volume – 1, 2005
T.K.V.Jyengar, B.Krishna Gandhi and others, S.Chand and Company.
2. Engineering Mathematics, B.V.Ramana, Tata McGraw-Hill 2003.

REFERENCES :

1. Engineering Mathematics-I, 2002, P.Nageswara Rao, Y.Narsimhulu, Prabhakara Rao, Deepthi Publishers
2. Engineering Mathematics-I, 2004, Dr. Shahnaz Bathul, Right Publishers.
3. Engineering Mathematics, S.K.V.S. Sri Rama Chary, M.Bhujanga Rao, Shankar, B.S. Publications 2000.
4. Engineering Mathematics-I Rukmangadhachary, Pearson Education.
5. A Text book of Engineering Mathematics, VP Mishra, Galgotia Publications.
6. Engineering Mathematics – I, Sankaralah, VGS Book Links, Hyderabad.

(PY 05226) ENGINEERING PHYSICS**UNIT I**

INTERFERENCE : Introduction - Superposition of waves - Young's double slit experiment - Coherence - Interference in thin films by reflection - Newton's rings.

DIFFRACTION : Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction at a single slit & at a double slit - Circular aperture - Diffraction grating - Grating spectrum - Resolving power of a grating - Rayleigh's criterion for resolving power.

UNIT II

POLARIZATION : Introduction - Representation of polarized and unpolarized light - Polarization by reflection - Malus law - Double refraction - Nicol prism - Circular and Elliptical polarization - Quarter wave plate - Half wave plate.

ULTRASONICS : Introduction - Production of Ultrasonic waves - Magnetostriction method - Piezo electric method - Detection of Ultrasonics - Properties of Ultrasonics - Use of Ultrasonics for non-destructive testing - Applications of Ultrasonics.

UNIT III

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.

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

UNIT IV

LASERS : Introduction - Characteristics of Lasers - Spontaneous and Stimulated Emission of radiation - Einstein's coefficients - Population inversion - Ruby Laser - Helium-Neon Laser - Semiconductor Laser - Applications of Lasers in Industry, Scientific and Medical fields.

UNIT V

FIBER OPTICS : Introduction - Principle of optical fiber - Acceptance angle and Acceptance cone - Numerical aperture - Step-Index fiber and transmission of signal in SI fiber - Graded-Index fiber and transmission of signal in GI fiber - Attenuation in optical fibers - Advantages of optical fibers in communication - Application of optical fibers in Medicine and Sensors.

UNIT VI

MAGNETIC PROPERTIES : Permeability - Magnetization - Origin of magnetic moment - Classification of magnetic materials - Dia, Para and Ferro magnetism - Hysteresis curve - Soft and Hard magnetic materials - anti-Ferro and Ferri magnetism - Ferrites and their applications.

CRYSTAL STRUCTURES :

Introduction - Space lattice - Basis - Unit cell - Lattice parameter - Crystal systems - Bravais lattices - Structure and Packing fractions of Simple cubic - Body Centred Cubic - Face Centred Cubic crystals - Structures of Diamond, ZnS, NaCl, CsCl.

UNIT VII

CRYSTAL PLANES & X-RAY DIFFRACTION : Directions and Planes in crystals - Miller Indices - Separation between successive h kl planes - Diffraction of X-rays by Crystal planes - Bragg's Law - Laue method - Powder method.

UNIT VIII

DEFECTS IN SOLIDS : Imperfections in Crystals - Point defects - Schottky and Frenkel defects - Energy for formation of a Vacancy - Equilibrium concentration of Schottky and Frenkel defects - Line defects - Edge and Screw dislocation - Burger's Vectors.

TEXT BOOKS :

1. **Engineering Physics** by R.K.Gaur - S.L. Gupta, Dhannpat Rai and Sons.
2. **Applied Physics** by Dr. M.Chandra Shekar & Dr.P.Appala Naidu, V.G.S. Book links.

REFERENCES :

1. **Engineering Physics** by Dr.M. Arumugam, Anuradha Agencies
2. **Physics Volume 2**, by Halliday, Resnick and Krane, John Wiley & Son
3. **Engineering Physics** by M.N.Avadhanulu & P.G. Kshirasagar, S.Chand & Company Ltd.
4. **Engineering Physics** by P.V.Naik, Pearson Education.
5. **Materials Science and Engineering** by V. Raghavan, Prentice-Hall India.
6. **Engineering Physics (Vol 1)** by M.D. Khanna and V. Balaswamy, Vikas Publishing House Pvt. Ltd., New Delhi.

(CM 05219) ENGINEERING CHEMISTRY**UNIT I**

Water Technology-I : Introduction, Sources of Water, 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 Soap Solution and 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 Purpose - Sedimentation, Coagulation, Filtration, Disinfection- Sterilization, Chlorination, Ozonation. Mineral Water.

UNIT II

Water Technology-II : Water for Industrial purpose - 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. Demineralization of Brackish Water - Reverse Osmosis.

UNIT III

Science of Corrosion : Definition, Examples - Underground, Soil Corrosion, Pitting Corrosion, Stress Corrosion, Season Cracking, Caustic Embrittlement. 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, Atmospheric 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 Coating Galvanization, Cathodic Coating – Tinning, Metal Cladding, Electroplating Ex: Chromium Plating, Metal Spraying, Cementation–Sheradizing, Colourizing, Chromizing
Chemical Conversion Coatings: (1) Phosphate (2) Chromate (3) Chemical Oxide (4) Anodized Coatings. Ceramic Protective Materials: (1) Vitreous Enamels (2) Ceramics.
Organic Coatings: (1) Paints – Constituents and their functions (2) Varnishes (3) Lacquers (4) Enamels (5) Emulsion Paints (6) Distempers.

UNIT V

Polymer Science and Technology : Polymerization Reactions – Basic concepts. Types of Polymerization – Addition and Condensation Polymerizations. Plastics –Thermosetting and Thermoplastics – Differences. Compounding, Casting and Spinning, Molding of Plastics – Compression, Injection, Transfer, and Extrusion molding methods.

Composition, Properties and Engineering Uses of the Following: Polyethylene, PVC, Teflon, Bakelite, Nylon, Polymethyl Methacrylate, Urea-Formaldehyde and Silicone Resins.

Rubber – Processing of Natural Rubber, Vulcanization and Compounding. Elastomers – Buna S, Buna N, Thiokol, Polyurethane Rubber, Silicone Rubber.

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- Metallic friction – Surface Energy, Surface Attraction, Adsorption, Surface Roughness. Types of Lubrication and Mechanism – Thick Film or Hydrodynamic Lubrication, Thin Film or Boundary Lubrication, Extreme Pressure and Temperature Lubrication. Classification of lubricants- Liquid lubricants- Petroleum Oils- Fixed Oils- Additives- Synthetic Lubricants- semisolid lubricants- Calcium base, soda base and Lithium base greases- Solid lubricants- Graphite- Molybdenum disulphide. Properties of Lubricants – Viscosity – Flash and Fire points – Cloud and Pour points – Emulsification – Volatility – Gravity – Colour – Carbon Residue – Oxidation Stability- Aniline-Point-Neutralization number-Saponification number-Mechanical Stability - Selection of lubricants- Cutting tools- Internal combustion engines- Steam engine cylinder- Steam turbines- Gears- Food Industry.

UNIT VIII

Fuels and Combustion : Definition and Classification.

1. Solid Fuels – Coal and Its Formation – Proximate and Ultimate Analysis of Coal and Significance of the Constituents – Metallurgical Coke.
2. Liquid Fuels – Petroleum – Origin – Extraction – Refining And Cracking – Knocking – Octane and Cetane Numbers – Synthetic Petrol – Bergius Process, Fischer- Tropisch Process.
3. Gaseous Fuels – Analysis of the Gas by Orsat's Apparatus – Calorific Value of Fuels – Bomb Calorimeter – Junker's Gas Calorimeter.
4. Nuclear Fuels, Rocket Fuels, Explosives.
5. Combustion – 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. V. Agarwal, Andhra Naidu & C.P. Murthy.

REFERENCES :

1. A Text Book of Engineering Chemistry by S. S. Dara. S.Chand & Co, New Delhi (2004).
2. Engineering Chemistry by J C Kuracose 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).

(ME 05224) ENGINEERING 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.

Equilibrium of Systems of Forces : Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces.

UNIT – II

Friction : Types of Friction – Limiting Friction – Laws of Friction – Static and Dynamic Frictions – Motion of Bodies: Wedge, Screw, Screw-jack, and Differential Screw-jack.

UNIT – III

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

UNIT – IV

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 – V

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 – 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. Bharikati & J.G. Rajasekharappa

REFERENCES :

1. Engineering Mechanics / Ferdinand. L. Singer / Harper – Collins.
2. Engg. Mechanics / Timoshenko & Young.
3. Engg. Mechanics Umesh Regl / Tayal.
4. Engg. Mechanics / R.V. Kulkarni & R.D. Askhekar
5. Strength of Materials & Applied Mechanics / IB Prasad
6. Text Book in Applied Mechanics / Malhotra, Subramanian, Gahlot and Rathore / New Age.
7. Engg. Mechanics / KL Kumar / Tata McGraw Hill.
8. Engg. Mechanics / M.V. Seshagiri Rao & D Rama Durgalah.

(CS 05141) COMPUTER PROGRAMMING AND NUMERICAL METHODS

UNIT-I : Algorithm, flowchart, program development steps, basic structures of C language, C tokens, data types and sizes, declaration of variables, assigning values, arithmetic, relational and logical operator, increment and decrement operators, conditional operator, bit-wise operators, type conversions, expressions, evaluation, input-output statements, blocks, if and switch statement, while, do-while and for statements, C programs covering all the above aspects.

UNIT-II : One dimensional & Two dimensional arrays, initialization, string variables-declaration, reading, writing, Basics of functions, String handling function, user-defined functions, recursive functions, variables and storage classes, scope rules, block structure, header files, C preprocessor, example C programs.

UNIT-III : Pointer and Arrays: Pointers and addresses. Pointers and Arrays. Pointers And function arguments, Address arithmetic, character pointers and functions, pointers to pointers, multi-dimensional arrays, initialization of pointer arrays, command line arguments, pointers to functions.

UNIT-IV : Structures: Definition, initializing, assigning values, passing of structures as arguments, Arrays of structures, pointers to structures, self referential structures: Unions and files, C program examples.

UNIT-V : Linear Data Structures: Introduction to Data Structures, representing stacks and queues in C using arrays, Infix, Postfix & Prefix programs, circular queues.

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

UNIT-VII : 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-VIII : Numerical Differentiation and Integration: The Cubic Spline Method – Trapezoidal rule – Simpson's 1/3 Rule –Simpson's 3/8 Rule- Boole's and Weddle's Rules.

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.

TEXT BOOKS :

1. Computer Programming and Numerical Methods – P.Padmanabham, BS Publications
2. The C Programming Language, B.W. Kernighan, Dennis M. Ritchie, PHI/Pearson Education.

REFERENCES :

1. C & Data Structures, Ashok N.Kamthane, Pearson Education.
2. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education
3. C & Data Structures–Prof. P.S.DeshPande, Prof O.G.Kakde, Wiley Dreamtech Pvt. Ltd., NewDelhi.
4. DataStructures Using C – A.S. Tanenbaum, PHI/Pearson education
5. Applied Numerical Methods for Engineers using MATLAB & C, Robert J. Schilling, Sandra L. Harries, Thomson.
6. Numerical Methods in C, J.G.Kori, Laxmi publications.
7. Introductory Methods of Numerical Analysis: S.S.Sastry, Prentice Hall of India, Pvt Ltd.

(ME 05223) 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. Scales used in Engineering Practice and Representative Fraction – Construction of Plain, Diagonal and Vernier Scales.

UNIT – II

PLANE GEOMETRIC DRAWING : Construction of Polygons – Inscription and Superscription of Polygon given the diameter of the Circles. Curves used in Engineering Practice & their Constructions :
a) Conic Sections including the Rectangular Hyperbola – General method only.
b) Cycloid, Epicycloid and Hypocycloid
c) Involute.

UNIT – III

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 - Projections of Planes regular auxiliary planes and Auxiliary projection inclined to both planes.

UNIT – IV

PROJECTIONS OF SOLIDS : 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 – V

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 – VI

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 – VII

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

UNIT – VIII

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

TEXT BOOK :

1. Engineering Drawing, N.D. Bhal / Charotar

REFERENCES :

1. Engineering Drawing, Narayana and Kanniah / Scietch publishers.
2. Engineering Drawing and Graphics, Venugopal / New age.

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I YEAR B.Tech. A.M.E. T P C
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(MIE 05228) ENGINEERING PHYSICS AND FUELS & LUBRICATION 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. Cauchy's constants - Spectrometer.
 4. Determination of wavelength of a source - Diffraction Grating.
 5. Determination of thickness of a thin object using parallel fringes.
 6. Newton's Rings.
 7. Determination of Rigidity modulus of a material in the form of a wire - Torsional pendulum
 8. Melde's Experiment - Transverse and Longitudinal modes.
 9. Determination of velocity of sound - Volume resonator.
 10. Single slit diffraction using Sodium lamp.
 11. Double slit diffraction using Sodium lamp.
 12. Single slit diffraction using Lasers.
 13. Double slit diffraction using Lasers.
 14. Time constant of R-C Circuit.
 15. L-C-R Circuit.
 16. Verification of laws of stretched string - Sonometer.
 17. Calculation of Frequency of A.C. mains - Sonometer.
 18. Study of Characteristics of LED and LASER sources.
 19. Study of Characteristics of p-n and avalanche photo diode detectors.
 20. Bending losses of fibers.
 21. Evaluation of Numerical Aperture of a given fiber.
 22. Magnetic field along the axis of a current carrying coil - Stewart and Gee's method.
 23. Hall effect.
 24. B-H curve.
 25. Energy gap of a material of p-n junction.
 26. Determination of Young's modulus and Poisson's ratio by Cornu's method
 27. Thermo Electric effect – Seebeck effect and Peltier effect.
- (B) FUELS AND LUBRICANTS LAB :**
1. Determination of Flash and Fire points of Liquid Fuels / Lubricants: Abels apparatus , Pensky matens apparatus
 2. Carbon Residue Test : Solid/ Liquid Fuels
 3. Determination of Viscosity: Liquid Lubricants & Fuels : Saybolls 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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(HS 05232) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

The language Lab focuses computer-aided multi-media instruction and language acquisition to achieve the following targets :

- To expose the students to a variety of self-instructional, learner-friendly modes of language learning.
- To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer-based competitive exams such GRE, TOEFL, GMAT etc.
- To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To train them to use language effectively to face interviews, group discussions, public speaking.
- To initiate them into greater use of the computer in resume preparation, report writing, format-making etc.

However, depending upon the available infrastructure and budget, the above targets can also be achieved by procuring the minimum required equipment suggested for the establishment of a Conventional Lab the details of which are given below. The lab should cater to the needs of the students to build up their confidence to help them develop leadership qualities through their communicative competence.

SYLLABUS :

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

1. Introduction to Phonetics.
2. Introduction to Vowels and Consonants and associated Phonetic symbols.
3. Introduction to Accent, Intonation and Rhythm.
4. Situational Dialogues / Role Play.
5. Public Speaking.
6. Debate
7. Group discussions
8. Facing Interviews
9. Resume preparation
10. e-correspondence

Minimum Requirement :

- Computer aided multi media language lab with 30 systems with LAN facility.

- Conventional language Lab, with audio and video systems, speakers, head phones and a teacher console to accommodate 30 students.

Suggested Software :

- Cambridge Advanced Learners' Dictionary with exercises
- The Rosetta Stone English Library
- Clearly Pronunciation Power
- Mastering English in Vocabulary, Grammar, Spellings, Composition
- Dorling Kindersley series of Grammar, Punctuation, Composition etc.
- Language in Use, Foundation Books Pvt Ltd
- Learning to Speak English - 4 CDs
- Microsoft Encarta
- Murphy's English Grammar, Cambridge
- Time series of IQ Test, Brain-teasers, Aptitude Test etc.
- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.

BOOKS SUGGESTED FOR ENGLISH LAB :

- Developing Communication Skills by Krishna Mohan & Meera Benerji (Macmillan)
- Speaking English Effectively by Krishna Mohan & NP Singh (Macmillan)
- Better English Pronunciation by JDO Connor (UBS – Cambridge)
- Oxford Practice Grammar with Answers, John Eastwood, Oxford
- Handbook of English Grammar and Usage, Mark Lester and Larry Beason, Tata McGraw-Hill
- A text book of English Phonetics for Indian Students by T. Balasubramanian (Macmillan)
- Lingua TOEFL CBT Insider, by Dreamtech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- English Skills for Technical Students, WBSCTE with British Council, OL
- A Handbook of English for Competitive Examinations, by B Shyamala Rao, Blake Books, Chennai.

DISTRIBUTION AND WEIGHTAGE OF MARKS :**ENGLISH LANGUAGE LABORATORY PRACTICE**

- The practical examinations for the English Language Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
- 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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(CS05142)COMPUTER PROGRAMMING AND NUMERICAL METHODS LAB

- Write a C program to evaluates the following algebraic expressions after reading necessary values from the user:
 - $ax+bx+bx$
 - $2.5 \log x + \cos 32^\circ + |x^2 - y^2| + \sqrt{2}xy$
 - $1/\alpha \sqrt{2} \pi e^{-(x-m/\sqrt{2}\sigma)^2}$
 - Write a C program for the following
 - Printing three given integers in ascending order
 - Sum of $1 + 2 + 3 + \dots + n$
 - $1 + x^2/2! + x^4/4! + \dots$ upto ten terms
 - $x + x^3/3! + x^5/5! + \dots$ upto 7th digit accuracy
 - Read x and compute $Y = 1$ for $x > 0$
 $Y = 0$ for $x = 0$
 $Y = -1$ for $x < 0$
 - Write C program using FOR statement to find the following from a given set of 20 integers.
 - Total number of even integers.
 - Total number of odd integers.
 - Sum of all even integers.
 - Sum of all odd integers.
 - Write a C program to obtain the product of two matrices A of size (3X3) and B of size (3X2). The resultant matrix C is to be printed out along with A and B. Assume suitable values for A & B.
 - Using switch-case statement, write a C program that takes two operands and one operator from the user, performs the operation and then prints the answer. (consider operators +, -, /, * and %).
 - Write C procedures to add, subtract, multiply and divide two complex numbers (x+iy) and (a+ib). Also write the main program that uses these procedures.
 - A cloth show room has announced the following seasonal discounts on purchase of items.

Purchase Amount	Discount (Percentage)
1-100	Mill Cloth
	Handloom items
	5.0
101-200	5.0
	7.5
201-300	7.5
	10.0
Above 300	10.0
	15.0
- Write a C program using switch and If statements to complete the net amount to be paid by a customer.

8. Given a number, write C program using while loop to reverse the digits of the number. Example 1234 to be written as 4321.
9. The Fibonacci sequence of numbers is 1,1,2,3,5,8... based on the recurrence relation $f(n) = f(n-1) + f(n-2)$ for $n > 2$.
Write C program using do-while to calculate and print the first m fibonacci numbers.
10. Write a C program to extract a portion of a character string and print the extracted string. Assume that m characters are extracted starting with the n th character.
11. Write a function that will scan a character string passed as an argument and convert all lower case characters into their upper case equivalents.
12. Implement the following data structures using Arrays
 - i) Stacks
 - ii) Linear Queues
 - iii) Circular queues
13. Simple expression evaluator, that can handle +, -, / and *.
14. Implement the algorithms for the following Iterative Methods Using C to find one root of the equation $f(x) = x \sin x + \cos x = 0$
 - a) Bisection
 - b) False Position
 - c) Newton-Raphson
 - d) Successive Approximation
15. Implement the algorithms for the following iterative methods using C to find one root of the equation $9x^1 + 2x^2 + 4x^3 = 20$
 $x^1 + 10x^2 + 4x^3 = 6$
 $2x^1 - 4x^2 + 10x^3 = -15$.
16. Write Computer programs to implement the Lagrange Interpolation and Newton-Gregory forward Interpolation.
17. Implement in 'C' the linear regression and polynomial regression algorithms.
18. Implement Traezoidal and Simpson methods.

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(ME 05230) ENGINEERING WORKSHOP PRACTICE

1. TRADES FOR EXERCISES :

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.

2. TRADES FOR DEMONSTRATION & EXPOSURE :

1. Plumbing
2. Welding
3. Machine Shop
4. Power Tools in construction, Wood working, Electrical Engg & Mechanical Engg.
5. Metal Cutting (Water Plasma)

TEXT BOOK :

1. Work shop Manual / P.Kannanah/ K.L.Narayana/ Sctech Publishers.

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II YEAR B.Tech. A.M.E. - I Semester

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(MA 05364) MATHEMATICS – II

UNIT – I : Matrices : Elementary row transformations – Rank – Normal form - Echelon form – Consistency – Solution of system of simultaneous linear homogeneous and non-homogeneous equations.

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

UNIT-III : Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index - signature - Sylvester law.

UNIT –IV : **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.

UNIT-V : 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 – Classification of second order linear Partial Differential Equations, solutions of one dimensional heat equation, wave equation and two-dimensional Laplace's equation under initial and boundary conditions.

UNIT –VI : Fourier integral theorem – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

UNIT-VII : Z-transform – Inverse z-transform - properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equation by z-transforms.

UNIT-VIII : Wavelets – The Haar wavelets – A wavelet expansion - Multiresolution analysis with Haar Wavelets - General construction of wavelets and multiresolution analysis - Shannon wavelets.

TEXT BOOKS :

1. A Text book of Engineering Mathematics Volume – II, 2005, T. K. V. Jengar, B. Krishna Gandhi and others, S. Chand and Company.

2. Engineering Mathematics, B. V. Ramana, Tata McGraw-Hill 2003.

REFERENCES :

1. Engineering Mathematics–II, 2002, P. Nageswara Rao, Y. Narasimulu, Prabhakara Rao
2. Engineering Mathematics, S. K. V. S. Sri Rama Chary, M. Bhujanga Rao, Shankar. B. S. Pubs. 2000.
3. Adv. Engg. Mathematics (8th edition), Erwin Kreyszig, John Wiley & Sons (ASIA) Pvt. Ltd. 2001.
4. Advanced Engineering Peter V. O'Neill Thomson Brooks/Cole.
5. Advanced Engineering Mathematics, Meirle C. Potter, J. L. Goldberg, E. F. Aburafdel, Oxford University Press, Third Edition 2005.
6. Engineering Mathematics – II, 2005, Sankarajah, VGS Book Links, Hyderabad.

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II YEAR B.Tech. A.M.E. - I Semester

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(CE 05375) 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, pin-jointed, 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 Bhalkathi: Lakshmi publications.
 2. Strength of Materials -By Jindal, Umesh Publications.
- REFERENCES :**
1. Solid Mechanics, by Popov
 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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(CS 05434) OOPS THROUGH JAVA

UNIT-I

Introduction : Creation of Java, importance of Java to Internet, byte code, Java buzzwords, OOP Principles, Encapsulation, Inheritance and Polymorphism, data types, variables, declaring variables, dynamic initialization, scope and life time of variables, arrays, operators, control statements, type conversion and casting, compiling and running of simple Java program.

UNIT-II

Classes and Objects : Concepts of classes and objects, class fundamentals Declaring objects, assigning object reference variables, introducing methods, constructors, usage of static with data and methods, usage of final with data, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing – call by value, recursion, nested classes and inner classes, exploring the String class.

UNIT-III

Inheritance : Basic concepts, member access rules, usage of super key word, forms of inheritance, method overriding, abstract classes, dynamic method dispatch, using final with inheritance, the Object class.

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.

UNIT-V

Exception Handling and Multithreading : Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes, Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks, thread groups.

UNIT-VI

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

AWT : Concepts of components, container, panel, window, frame, canvas, Font class, Color class and Graphics.

UNIT-VII

AWT Controls : Buttons, Labels, Textfields, Text area, Check boxes, Check box groups, Lists, Choice, Scrollbars, Menus, Layout Managers – Flow, Border, Grid, Card and Gridbag.

Swing – JApplet, JFrame and JComponent, Icons and Labels, Handling threading issues, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbbed Panes, Scroll Panes, Trees, and Tables.

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

UNIT-VIII

Networking and Java Library : Basics of Networking, InetAddress, TCP/IP sockets, Datagram, URL, URL connection, String handling, java.util, java.io and java.net packages.

TEXT BOOKS :

1. The Complete Reference Java J2SE 5th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi.
2. Big Java 2nd Edition, Cay Horstmann, John Wiley and Sons.

REFERENCES :

1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI
2. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
3. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
4. Beginning in Java 2, Iver Horton, Wrox Publications.
5. Java, Somasundaram, Jaico.

(ME 05551) 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 specialities, 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. Fundamentals of Classical Thermodynamics – G. Van Wylen & R.E. Sonntag – John Wiley Pub.
2. Engineering Thermodynamics – Jones & Dugan
3. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles / TMH
4. Thermodynamics – J.P. Holman / McGraw-Hill
5. An introduction to Thermodynamics / YVC Rao / New Age
6. Engineering Thermodynamics – K. Ramakrishna / Anuradha Publishers.

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II YEAR B.Tech. A.M.E. - I Semester

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(ME 05346) MACHINE DRAWING

Machine Drawing Conventions :

Need for drawing conventions – introduction to ISI 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.Kamalah & K. Venkata Reddy /New Age/ Publishers

REFERENCES :

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD (A.P)

II YEAR B.Tech. A.M.E. - I Semester

T P C
4+1 0 4

(EE 05187) 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 - VIII

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. Kems, JR, J. David Irwin
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. Kamakshiah, TMH Publ.
2. Basic Electrical Engineering by Kohari and Nagarath, TMH Publications, 2nd Edition.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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II YEAR B.Tech. A.M.E. - I Semester

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(EE 05188) ELECTRICAL & ELECTRONICS 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 efficiency 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.
5. In addition to the above four experiments, any one of the experiments from the following list is required to be conducted :
 - a) Speed control of D.C. Shunt motor by Armature Voltage control motor by
 - 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

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II YEAR B.Tech. A.M.E. - I Semester

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(CS 05338) JAVA LAB

1. Write a Java program that prints all real solutions to the quadratic equation $ax^2 + bx + c = 0$. Read in a, b, c and use the quadratic formula. If the discriminant $b^2 - 4ac$ is negative, display a message stating that there are no real solutions.
2. The Fibonacci sequence is defined by the following rule. The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.
3. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that Integer.
4. Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.
5. Write a Java program for sorting a given list of names in ascending order.
6. Write a Java program that reads a line of integers, and then displays each integer, and the sum of all the integers. (use string to kenrizer class)
7. Write a Java program that reads on file name from the user then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
8. Write a Java program that reads a file and displays a file and displays the file on the screen, with a line number before each line.
9. Write a Java program that displays the number of characters, lines and words in a text file.
10. Write a Java program that:
 - a) Implements stack ADT.
 - b) Converts infix expression into Postfix form.
11. Write an applet that displays a simple message.
12. Write an applet that computes the payment of a loan based on the amount of the loan, the interest rate and the number of months. It takes one parameter from the browser: Monthly rate; If true, the interest rate is per month; Other wise the interest rate is annual.
13. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the + - X % operations. Add a text field to display the result.
14. Write a Java program for handling mouse events.
15. Write a Java program for creating multiple threads
16. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
17. Write a Java program that lets users create Pie charts. Design your own user interface (with swings & AWT)
18. Write a Java program that allows the user to draw lines, rectangles and OUs.
19. 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.
20. Write a Java program that illustrates how run time polymorphism is achieved.

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II YEAR B.Tech. A.M.E. - II Semester	T	P	C
(MA 05476) PROBABILITY & STATISTICS	4	+1	0 4

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.

UNIT-III

Distribution - Binomial, poisson and 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 and proportions – 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, χ^2 test. Estimation of proportions.

UNIT-VIII

Curve fitting : The method of least squares – Inferences based on the least squares estimations - Curvilinear regression – multiple regressions – correlation for univariate and bivariate distributions.

TEXT BOOKS :

1. Probability and statistics for engineers:Erwin Miller And John E.Freund. Prentice-Hall of India / Pearson, Sixth edition.
2. Text book of Probability and Statistics by Dr. Shahnaz Bathul, V.G.S.Publishers 2003.

REFERENCES :

1. Probability, Statistics and Random Processes Dr.K.Murugesan & P.Gurusamy by Anuradha Agencies, Deepthi Publications.
2. Advanced Engineering Mathematics (Eighth edition), Erwin Kreytzsig, John Wiley and Sons (ASIA) Pvt. Ltd., 2001.
3. Probability and Statistics for Engineers: G.S.S.Bhishma Rao,slechn., Second edition 2005.

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HYDERABAD (A.P)

II YEAR B.Tech. A.M.E. - II Semester	T	P	C
(AU 05061) AUTOMOTIVE ENGINES	4	+1	0 4

UNIT - I

Introduction : Historical development of Automobiles, Different Types of Automotive Power plants, principles of I.C engine operation and classification of engines, supercharging and turbo charging.

UNIT - II

Two stroke and four stroke engines : Different types of scavenging systems for 2stroke engines, scavenging efficiency. Relative merits and demerits in comparison to four stroke engines. Valve and Port timing diagrams, special types of I.C engines like Sterling, Wankle rotary, variable compression ratio engines and Variable valve timing engines.

UNIT - III

Automobile Engine Components : Classification, Function, Materials, Constructional details and Manufacturing process of engine components: Cylinder head, cylinder block, cylinder liner, piston, piston ring, connecting rod, crankshaft, camshaft, Bearings, Gudgeon pin, Valve & Valve gear, valve mechanisms, Inlet and Exhaust manifolds, crankcase, flywheel, oil sump and crank case.

UNIT - IV

Carburetion : Mixture requirements in SI Engines, fundamental of carburetion flow characteristics of carburetion, methods of mixture correction, calculation of throat and jet sizes of a carburetor. Types of carburetors, simple, S.U. carburetor, zenith carburetor etc. Means of compensation during starting, idling and acceleration. Carburetor adjustments, field and lab tests. Fuelfeed pumps, Petrol injection. Disadvantages of carburetion.

UNIT - V

Advantages of petrol injection, need to have a close control over air fuel ratio in SI Engines for emission reduction, cylinder port and manifold injection systems, timed and continuous injection systems, multipoint fuel injection systems, Gasoline direct injection.

UNIT - VI

Fuel Injection in CI Engines : Fuel filters, transfer pumps, injection pumps, Injection nozzles, their functions. Diesel fuel pumps; principle Delivery characteristics of fuel pumps, characteristic injection lag effect of injection, pressure waves in fuel lines, rotary distributor pumps.

UNIT – VII

Governors : Maximum and minimum speed governors. Mechanical and pneumatic governors. Fuel spray characteristics: Types of Injection nozzles and their characteristics, Multihole, pinhole and Pintlaux nozzles, Unit injectors.

UNIT – VIII

Lubrication Systems: Functions of the lubrication system, classification of lubricating oils, Lubricating

systems -wet sump lubrication - dry sump lubrication, oil filters, oil pumps, crankcase ventilation, oil additives, Air and water cooling systems, thermo syphon and forced water cooling systems.

TEXT BOOKS :

1. K Newton and Steeds -The Motor Vehicle, SAE Publications
2. ML Mathur & RP Sharma -A course in Internal combustion Engines - Dharpal Rai

REFERENCES :

1. Bosch Gasoline Engines management – Bosch Publications
2. Bosch Diesel Engine management – Bosch Publication
3. B.P. Obert I C Engines & Air Pollution – Harper & Row Publications
4. Heinz Heisler, Internal Combustion Engines, SAE Publications
5. Richard Stone, Introduction to Internal Combustion Engines, MacMillan UK
6. V Ganesan , I.C Engines.

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II YEAR B.Tech. A.M.E. - II Semester

T P C
4+1 0 4

(CE 05374) MECHANICS OF FLUIDS

UNIT - I

Fluid Properties And Fluid Statics : Density, Specific weight, Specific gravity, viscosity, Vapour pressure, compressibility, Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Hydro static law, Piezometer, Simple and differential manometers, pressure gauges, total pressure and center of pressure – plane, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

UNIT - II

Fluid Kinematics : Stream line, path line, streak line, stream tube, classification of flows, steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrotational flows, one, two and three dimensional flows – Continuity equation in 3D flow, stream function, velocity potential function.

UNIT - III

Fluid Dynamics : Surface and Body forces – Euler's and Bernoulli's equation derivation, Navier- Stokes equation (explanation only) Momentum equation - applications, vortex – Free and Forced. Forced vortex with free surface.

UNIT - IV

Similitude and Flow Measurement – Similarly laws, distorted models, Flow through Venturimeters and Orificemeter, flow through notches and weirs, Viscometers, Hot wire Anemometers, Pitot tube, Flow through nozzles.

UNIT - V

Approximate solutions of N.S. Equations - Boundary layer- concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate Von-karman's momentum integral equation (No derivation), laminar and turbulent Boundary layers, BL in transition, separation of BL, control of BL separation, flow around submerged objects, Drag and lift – types of drag – Magnus effect.

UNIT - VI

Closed Conduit Flow: Characteristics of real fluids – Reynolds experiment – Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line.

UNIT - VII

Exact Solutions of Navier Stokes Equations: Flow between parallel plates, flow through long tubes - Flow through inclined tubes, Turbulent flow, variation of friction factor with Reynold's Number–Mody's chart.

UNIT - VIII

Flow of Compressible Fluid: Introduction, Thermodynamic relations, basic equations of compressible flow, velocity of sound wave in a fluid for isothermal and adiabatic process, mach number and its applications, mach angle, Propagation of Pressure waves and stagnation properties

TEXT BOOKS :

1. Fluid Mechanics Hydraulics & Hydraulics Machines Modi & Seth, Standard publications, NewDelhi.
2. Engineering Fluid Mechanics by K.L.Kumar, S.Chand & Co.

REFERENCES :

1. Fluid Mechanics – Frnk in white Mc-Grawhill.
2. Fluid Mechanics - John – F.Dauglas, Pearson Educations publishers.
3. Fluid Mechanics & Hydraulic Machines - D. Ramadurgaiah, Newage Publishers.

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II Year B.Tech. A.M.E. – II Semester

T P C
4+1 0 4**(MM 05392) METALLURGY & 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-Al, Cu-Sn and Fe-Fe₃C.

UNIT -IV

Cast Irons and Steels : Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal 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-Fe₃C system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Harderability surface -hardening methods, Age hardening treatment, Cytogenic 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, cernaets, abrasive materials, nonomaterials – 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. Material science & Metallurgy/ Kodgire

REFERENCES :

1. Science of Engineering Materials/ Agarwal
2. Materials Science/ Vijendra Singh
3. elements of Material science / V. Rahghavan
4. An introduction to materials science /W g viras & HL Mancini
5. Material science & material/ C.D. Yesudian & harris Samuel
6. Engineering Materials and Their Applications – R. A Flinn and P K Trojan / Jaico Books.

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

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4+1 0 4

(CE 05239) 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 ecosystems:

- 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 mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ 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.

II YEAR B.Tech. A.M.E. II Semester

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(ME 05547) THERMAL ENGINEERING - I

UNIT - I

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 - II

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 III

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 - IV

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 - V

Positive displacement and rotodynamic machinery – Power producing and power absorbing machines
COMPRESSORS – Classification – 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 VI

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.

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.

UNIT VII

REFRIGERATION : Mechanical Refrigeration and types – units of refrigeration – Air refrigeration system, details and principle of operation – applications of air refrigeration, vapour compression refrigeration

systems – calculation of COP – effect of superheating and sub cooling, desired properties of refrigerants and common refrigerants Vapour absorption system – mechanical details – working principle.

UNIT VIII

AIR CONDITIONING : Concepts of Psychrometry – Properties of moist air – Usage of Psychrometric Chart – Calculation of moist air properties.

Types of air –conditioning systems – Requirements – schematic layout of a typical plant.

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. Yadvav/ Central Book Depot., Allahabad
5. I.C. Engines / Heywood /McGrawHill.
6. Thermal Engineering – R.S. Khurmi & J.K.Gupta – S.Chand

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II YEAR B.Tech. A.M.E. - II Semester

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(MT 05393) METALLURGY AND MECHANICS OF SOLIDS LAB

(A) METALLURGY LAB :

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

(B) MECHANICS OF SOLIDS LAB :

1. Direct tension test
2. Bending test on
 - a) Simple supported
 - b) Cantilever beam
3. Torsion test
4. Hardness test
 - a) Brinell's 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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II YEAR B.Tech. A.M.E. - II Semester

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(ME 05549) THERMAL ENGINEERING LAB

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

(HS 05353) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**UNIT - I**

Introduction to Managerial Economics : Definition, Nature and Scope 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, 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 strategies**

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

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 VIII

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, 2004.
2. Shim & Siegel: Financial Accounting (Schaum's Outlines), 2/e, TMH, 2004
3. Chary: Production and Operations Management, 3/e, TMH, 2004.
4. Dominick Salvatore: Managerial Economics In a Global Economy, 4th Edition, Thomson, 2003.
5. Narayanaswamy: Financial Accounting—A Managerial Perspective, PHI, 2005
6. Peterson & Lewis: Managerial Economics, 4th Edition, Pearson Education, 2004
7. Raghunatha Reddy & Narasimachary: Managerial Economics & Financial Analysis, Scitech, 2005.
8. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2005.
9. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2004.
10. Dwivedi: Managerial Economics, 6th Ed., Vikas, 2002
11. Yogesh Maheswari: Managerial Economics, 2nd Ed., PHI, 2005.

(ME 05295) HYDRAULIC MACHINERY & SYSTEMS**UNIT – I**

IMPACT OF WATER JETS : Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip-velocity triangles at inlet and outlet expressions for work done and efficiency – angular momentum principle – applications to radial flow turbines – Jet propulsion of ships.

UNIT – II

HYDRAULIC TURBINES : Overshot and undershot water wheels – classification of Water turbines – Pelton Wheel – Work done and working proportions, Francis, Kaplan and propeller turbines – work done and working proportions – draft tubes – types.

UNIT – III

PERFORMANCE OF TURBINES : Performance under unit head – unit quantities – performance under specific conditions – specific speed – performance characteristic curves – model testing of turbines – cavitation governing of turbines – surge tanks.

UNIT – IV

RECIPROCATING PUMPS : Main components and working of a reciprocating pump- types of reciprocating pumps- power required to drive the pump, coefficient of discharge and slip indicator diagram – effect of acceleration head in suction and delivery pipes – effect of friction – maximum vacuum pressure, work saved by air vessels – rate of flow into and from air vessels – pump duty.

UNIT – V

CENTRIFUGAL PUMPS – I : Types Component parts and working-work done by the impeller-Manometric head – losses and efficiencies – effect of vane angle on manometric efficiency – effect of finite number of vanes of the impeller on head and efficiency – minimum starting speed – loss of head due to reduced or increased flow – diameters of impeller and pipes.

UNIT – VI

CENTRIFUGAL PUMPS – II : Specific speed – Model testing of pumps – Multistage Pumps – Pumps in parallel – performance of pumps – characteristics curves – NPSH – Cavitation, priming devices – pump troubles and remedies.

UNIT – VII

HYDRAULIC DEVICES : Hydraulic accumulator, Hydraulic Intensifier – Hydraulic ram, Hydraulic press, Hydraulic lift, Hydraulic crane – hydraulic couplings and torque converters – Air lift pump.

UNIT – VIII

HYDRAULIC SYSTEMS : Transmission of power through pipes : Condition for maximum power transmission – Gear and Vane pumps, Hydraulic valves, fluids and hydraulic piping.

TEXT BOOKS :

1. Hydraulic Machines/ Benga & Sharma
2. Hydraulics and Hydraulic Machines / Modi & Sethi.

REFERENCES :

1. Elements of Hydraulic Machines and Fluidics / Jagdish Lal
2. Fluid mechanics & fluid power engineering by D.S. Kumar , S. K. Kaitirala & Sons publications.

(MP 05493) 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.

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

TEXT BOOKS :

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

REFERENCES :

1. Production Technology / R.K. Jain
2. Metal Casting / TV Ramana Rao / New Age
3. Principles of Metal Castings / Roenthal.
4. Welding Process / Paramar /
5. Production Technology/Sarma P C /
6. Production Engineering – Suresh Dalela & Rav Shankar / Galgotia Publications Pvt. Ltd.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,
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III Year B.Tech. A.M.E. - I Semester

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(ME 05339) 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 for bar chain.

Analysis of Mechanisms : Analysis of slider crank chain for displacement, velocity and acceleration of slider – Acceleration diagram for a given mechanism, Klein's 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, selection of belt drive- types of belt drives, types of belts- material used belt drives- types of flat belt drives, velocity ratio of belt drives, slip of belt, creep of belt, length of an open belt drive, length of cross belt drive, ratio of driving tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, condition for transmission of maximum power.

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 Pearsons Edn
4. Mechanism and Machine Theory / JS Rao and RV Duddipati / New Age
5. The theory of Machines/ Shigley/ Oxford.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

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III Year B.Tech. A.M.E. - I Semester

T P C
4+1 0 4**(AU 05163) DESIGN OF MACHINE ELEMENTS****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 – factors 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

Bolted joints – Design of bolts with pre-stresses – both of uniform strength.

UNIT – IV**SHAFTS, KEYS AND COTTERS:**

SHAFTS : Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – Shaft sizes – BIS code. Design of Keys- stresses in keys- cottered joints- spigot and socket, sleeve and cotter.

UNIT – V**MECHANICAL SPRINGS :**

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

UNIT – VI

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.

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 –VIII

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

TEXT BOOKS :

1. Dr.P. Kamaiah Scitech Publishers
2. Machine Design/ Soundararaja Murthy and Shanmugam

REFERENCES :

1. Design of Machine Elements / V.M. Faires
2. Machine design / Schaum Series.
3. Mech. Engg. Design / J.E Shigley
4. Machine Design / Sarma and Agarwal
5. Machine Design / V.V. Bhandari
6. Machine design – Pandya & Shah.

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III Year B.Tech. A.M.E. - I Semester

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(ME 05548) THERMAL ENGINEERING - II

UNIT – I

Basic Concept : 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 Turbojet – 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. Applied Thermodynamics, ELBS, T.D. eastop and A. McIlonkey
4. Power plant engineering by, TMH 2002
5. Gas Turbines /Cohen, Rogers and Saravana Mutoo / Addison Wesley – Longman
6. Thermal Engineering – R.S. Khurmi & J.S.Gupta / S.Chand Pub.

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III Year B.Tech. A.M.E. - I Semester

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**(AU 05296) HYDRAULIC MACHINES LAB AND PRODUCTION
 TECHNOLOGY LAB**

(A) HYDRAULIC MACHINERY LAB.

1. Impact of jet on vanes
 2. Performance test on single stage centrifugal pump
 3. Performance test on reciprocating pump
 4. Performance and Specific speed test on Pelton wheel (or Turbo Wheel)
 5. Performance and specific speed test on Francis Turbine
 6. Performance and specific speed test on Kaplan Turbine
 7. Performance test on multi stage pump
 8. Suitability test on centrifugal pump
 9. Drag and Lift Coefficients of an Aerofoil model.
- Any five of the above experiments are to be covered.

(B) PRODUCTION TECHNOLOGY LAB**I. METAL CASTING LAB**

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

II WELDING LAB

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

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III Year B.Tech. A.M.E. - I Semester

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(ME 05057) AUTOMOBILE ENGINEERING LABORATORY – I

PART-A

1. Study of Hand power and measuring tools -sketching, materials used and their uses.
2. Writing technical specifications and descriptions of all types of automobile engines (petrol and diesel) -materials, functions with sketches.
3.
 - i) Dismantling, Inspection for wear and tear, crack, material breakdown of different engines components. Servicing of engines by paraffin and degreasing methods, decarborising procedure, Dismantling, Inspection and Assembly of different parts of two wheelers, 3 wheelers & 4 wheelers. Tractor & Heavy duty engines covering 2-stroke and 4 stroke, SI and CI engines using the concepts of torque and assembly diagrams.
 - ii) Measurement of dimensions of different components of the above engines and compare the same with standard specifications. Assembling the engines with using special tools, necessary adjustments of the engine components. Valve spring testing, connecting rod alignment, piston ring testing procedure for dismantling and assembling.

PART-B

4. Testing of I.C. Engines-Basic measurements- speed, fuel, flow, air consumption, measurement of BHP using different types of dynamometers, their working principles. Determination of IHP, BHP. Mech. efficiency, break thermal efficiency, indicated thermal efficiency, volumetric efficiency SFC, etc; Drawing head balance sheet for petrol and diesel engines.
5. Test on multi cylinder engines, Morse test.
6. Valve and port timing diagrams-determination of compression ratio.
7. Tests on Fuel and Lubricants.

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

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(HS 05311) 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 memmomon 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 VIII

Inspection and quality control, types of inspections - Statistical Quality Control-techniques-variables and attributes-assignable and non assignable causes- variable control charts, \bar{x} 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. Ravishanker, Industrial Engineering and Management, Galgotia, 2004.
2. Amrine, Manufacturing Organization and Management, Pearson, 2nd Edition, 2004.

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. Industrial Engineering and Management O.P. Khanna Dhanpat Rai.
10. A.R.Ayazri, Management Science for JNTU (B.Tech), Tata McGraw-Hill, 2002.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD.

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

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(ME 05349) MACHINE TOOLS & METROLOGY

UNIT - I

Elementary treatment of metal cutting theory -Element of cutting process- 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.

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.

UNIT - II

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 .

Milling machine -Principles of working -specifications -classifications of milling machines -Principal features of horizontal,

vertical and universal milling machines- machining operations.

UNIT - III

Shaping slotting and planing machines -Principles of working -Principal parts -specification classification, operations performed.

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.

UNIT - IV

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.

Lapping, honing and broaching machines -comparison to grinding.

UNIT - V

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 -interchange ability and selective assembly. Indian standard Institution system -British standard system, International Standard system for plain ad screwed work.

Application of suitable limits and tolerances -for correct functioning and economic manufacture and control of size during manufacturing and inspection.

UNIT - VI

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 -Sift e plate, rollers and spheres used to determine the tapers.

LIMIT GAUGES : Taylor's principle -Design of go and No go gauges, plug ring, snap, gap, taper, profile and position gauges.

UNIT - VIII

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, auto collimator.

SURFACE ROUGHNESS MEASUREMENT : Differences between surface roughness and surface waviness -Numerical assessment of surface finish -CLA, R, R.M.8 Values -Rz values, R10 value, Methods of measurement of surface finish -profilograph, Talysurf, 181 symbols for indication of surface finish.

UNIT - VIII

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

SCREWTHREAD MEASUREMENT : Element of measurement -errors in screw threads -measurement of effective diameter, angle of thread and thread pitch, profile thread gauges. Machine Tool Alignment Tests: Brief Treatment of the subject

TEXT BOOKS :

1. Production Technology by R.K. Jain and S.C. Gupta.
2. Manufacturing engineering and Technology /Kalpakian /Abeis 19n Wesley.

REFERENCES :

1. BIS standards on Limits & Fits, Surface Finish, Machine Tool Alignment etc.
2. Precision Engineering in Manufacturing /RL M:ri:thy / New Age .
3. Machine Tools – C.Elanchezhan and M. Vijayan / Anuradha Agencies Publishers.
4. Production Technology by H.M. T. (Hindustan Machine Tools).
5. Engineering Metrology / R.K. Jain / Khanna Publishers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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

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(ME 05184) 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

FRICTION : 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, clutches.

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" mult 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 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 Dukkippati / New Age
2. The Theory of Machines Through Solved Example / JS Rao / New Age
3. Theory of Machines / Shiegly / MGH
4. Theory of Machines / Thomas Bevan / CBS Publishers

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

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(MIE 05283) 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 P 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 VIII**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 – Ghoshdastidar – Oxford University Press – II Edition
2. Heat Transfer – P.K. Nag/ TMH

REFERENCES:

1. Fundamentals of Engg. Heat and Mass Transfer / R.C.SACHDEVA / New Age International
2. Heat and Mass Transfer – R. Yadav /CP
3. Heat Transfer – S.P Sukhatme – Universities Press
4. Heat and Mass Transfer – R.K. Rajput – S.Chand & Company Ltd.
5. Essential Heat Transfer - Christopher A Long / Pearson Education
6. Heat and Mass Transfer – Frank P. Incropera and David P. De Witt / John Wiley & sons (ASIA) Pte Ltd.
7. Heat and Mass Transfer – D.S.Kumar / S.K.Kataria & Sons
8. Heat Transfer /HOLMAN/TMH
9. Fundamentals of Heat Transfer & Mass Transfer- Incropera & Dewitt / John Wiley Pub. Engineering Heat and Mass Transfer – Sarit K. Das / Dhanpat Rai Pub.

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III Year B.Tech. A.M.E. - II Semester T P C
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(ME 05507) ROBOTICS

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 / Fu K S / McGraw Hill.

REFERENCES :

1. Robotics, CSP Rao and V.V. Reddy, Pearson Publications (In press)
2. Robotics and Control / Mittal R K & Nagrath I J / TMH.
3. An Introduction to Robot Technology, / P. Coffret and M. Chaironze / Kogam Page Ltd. 1983 London.
4. Robotic Engineering / Richard D. Klafner, Prentice Hall
5. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science
6. Introduction to Robotics / John J Craig / Pearson Edu.
7. Robot Dynamics And Control – Mark W. Spong and M. Vidyasagar / John Wiley & Sons (ASIA) Pte Ltd.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

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

T P C
4+1 0 4

(AU 05060) AUTOMOTIVE ELECTRICAL AND AUTOTRONICS

UNIT - I

Storage Battery: Principles of lead acid cells and their characteristics. construction and working of lead acid battery. types of batteries, testing of batteries, effect of temperature on capacity and voltage, battery capacity, voltage, efficiency, charging of batteries, sulphation and desulphation, maintenance and servicing, Fault diagnosis. New developments in electrical storage.

UNIT - II

Ignition System: Conventional Ignition system and study of its components. Types of ignition systems, spark advance and retarding mechanisms. Types of spark plugs, ignition timing, maintenance, servicing and fault diagnosis. Electronic ignition systems, programmed ignition, distributorless ignition.

UNIT - III

a) Starter motor: Construction and working of series and shunt automotive starter motor, types of device arrangement, solenoid switches, starter motor troubles and repairs.

b) Electronic controls of carburetion, component of fuel injection systems, multipoint injection, Bosch L-variation electronic control diesel fuel injection.

UNIT - IV

Charging system: Principle of generation of direct current. Principle, construction and working of alternator generating systems. Maintenance, servicing and trouble shooting. Bosch com- pact alternator.

UNIT - V

Wiring for auto electrical Systems: Earth return and insulated return systems, six volt and twelve volt systems, fusing of circuits, low and high voltage automotive cables, wiring diagram for typical automotive wiring systems, maintenance and servicing.

UNIT - VI

Dash board units and electrical accessories: Principle of automobile illumination, head lamp construction and wiring, horn, wind screen wiper signalling devices, fog lamps, auxiliary lighting, temperature gauge, oil pressure gauge, fuel gauge, speedometer, odometer.

Unit – VII

Number system codes and data representation: Binary numbers, number base conversion, decimal, octal and hexa-decimal numbers, BCD codes, memory representation of positive and negative integers, conversion real numbers, floating point notations and representations of floating point numbers, binary arithmetics, addition and subtraction of binary numbers, ones and twos complement method.

Unit - VIII

Logic gates, arithmetic circuits and introduction to microprocessors: Study of basic and universal logic gates, study of X-OR and X-NOR gates, flip flop, S-R, S-J flip flop and counters and shift resistance, half adders and subtractors.

TEXTBOOKS :

1. Automotive Electrical auxiliary systems -By N. R. Khatwale
2. Digital Logic and Computer Design by Mano, Prentice hall of India

REFERENCES :

1. Automotive Electrical systems -By Young and Griffith, Butterworth
2. Basic automotive electrical systems -By C.P. Nakra, Dhanpat Rai.
3. Automotive mechanics -By William H. Grouse, TMH 5. Modern Electrical Equipments -By A. W. Judge, Automotive Electrical Equipment -By P. I. Kohli, TMH

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

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

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(ME 05395) METROLOGY & 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 gear.
4. Machine tool alignment 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 resistance test using electro spark cutting device.

Section B :

1. Introduction of general purpose machines -Lathe, Drilling machine, Milling machine, Shaper, Planing machine, slotting machine, Cyl. j 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.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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III Year B.Tech. A.M.E. - II Semester

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(ME 05058) AUTOMOBILE ENGINEERING LAB - II

1. Dismantling and assembly of LMV components as following :

- a) Gear box b) Clutch assembly c) Propeller shaft d) Differential gear box e) Rear axle f) Suspension system g) Steering mechanism.
2. Dismantling and assembly of door frames, door locks and window locks
3. Study of driver's seat layout in anyone LMV and anyone HMV.
4. Testing, servicing and charging of batteries
5. Servicing of generator, alternator and starter motor with dismantling, testing, inspection and assembly.
6. Servicing of ignition systems
7. Drawing of general electrical wiring diagrams of various vehicles (two and four wheelers)
8. Calibration of micrometer, measurement of plain plug, measurement of plain ring gauge, taper gauge
9. Measurement of taper using sine bar and other instruments.
10. Measurement of base circle diameter and tooth thickness of spur and helical gears
11. Use of slip gauges, measurement of screw threads using screw thread micrometer, use of comparators, experiments involving profile projectors.

Note: Driving practice of a geared two wheeler and anyone LMV for a minimum of 10 hours during 5th & 6th semester be provided .

JAWAHAR LAL NEHRU TECHNOLOGICAL UNIVERSITY

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IV Year B.Tech. A.M.E. - I Semester

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(ME 05436) 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-Kedamath.

REFERENCES :

1. Operations Research /A.M.Natarajan, P.Balasuubramani, A. Tamilarasi/Pearson Education.
2. Operations Research: Methods & Problems /Maurice Saseeni, Arthur Yaspas & Lawrence Friedman
3. Operations Research / R.Pannerseivam, PHI Publications.
4. Operations Research / Wagner/ PHI Publications.
5. Operations Research /J.K.Sharma/MacMillan.
6. Introduction to O.R.Hillier & Liberman (TMH).
7. O.R/Wayne L.Winston/Thomson Brooks/cole
8. Introduction to O.R /Taha/PHI

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

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IV Year B.Tech. A.M.E. - I Semester

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(AU 05570) VEHICLE DYNAMICS

UNIT - I

Undamped free vibration : Single degree of freedom Systems, introduction, undamped free vibration - Natural frequency of free vibration, Rayleigh's method, stiffness of spring elements, effects of spring mass, Energy method, Newton's method and D'Alembert's principle- problems.

UNIT - II

Damped free vibration : Single degree of freedom systems, different types of damping, concept of critical damping and its importance, response study of viscous damped systems for cases of under damping and over damping, logarithmic decrement.

UNIT - III

Forced vibration : Single degree of freedom systems, steady state solution with viscous damping due to harmonic force solution by complex algebra, concept of response, reciprocating and rotating unbalance, vibration isolation Transmissibility ratio, energy dissipated by damping equivalent, Viscous damping, Structural damping, sharpness or resonance, base excitation.

UNIT - IV

Vibration measuring Instruments- Accelerometers and vibrometers, whirling of shafts with and without air damping, discussion of speeds above and below critical speeds.

UNIT - V

Systems with two degree of freedom : Introduction, principle modes and normal modes" co-ordinate coupling, generalised and principle co-ordinate, free vibrations in terms of natural conditions. Lagranges equation, semi-definite systems, forced oscillations: harmonic excitation.

UNIT - VI

Vehicle vibrations : Vehicle vibration with single degree of freedom free vibration, forced vibration, vibration due to road roughness, vibration due to engine unbalance, transmissibility of engine mounting vibration with two degree of freedom, free vibration, compensated suspension systems forced vibration, vibration due to road roughness.

UNIT-VII

Different types of tyres – Materials used : Tyre construction, physics of tyre traction on dry and wet surface, tyre traction on dry and wet surface, tyre forces and moments, SAE recommended terminologies of tyre road interaction.

UNIT - VIII

Numerical methods for multi degree of freedom systems : Introduction, influence coefficients,

Maxwell's reciprocal theorem, Dunkerley's equation, orthogonality principle, method of matrix iteration- method of determination of all the natural frequencies using sweeping matrix and orthogonality principle, Holzer's method for systems with free, fixed free and fixed ends.

TEXTBOOKS :

1. Mechanical Vibration -By G.K.Grover, Nemchand & Brothers
2. Vibration Theory & Applications -By William I Thomson, Prentice Hall

REFERENCES :

1. Mechanics of Pneumatic Tyre -By S.K.Clark, Prentice Hall
2. Mechanical Vibration Analysis -By Srinivasan, TMH
3. Mechanical Vibration -By Church, Wile) International
4. Theory & Problems of Mechanical Vibration -By William W. Seto, McGrawHill (schaum's outline series)
5. Problems in Automobile Mechanics-By N.K.Giri, Khanna Pub.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD (A.P)**

IV Year B.Tech. A.M.E. - I Semester T P C
4+1 0 4

(AU 05059) AUTOMOTIVE CHASSIS AND SUSPENSION

UNIT - I

Introduction to Chassis System : Introduction: Requirements of an automobile with types of automobiles, layout of an automobile with reference to power plant, power required for propulsion, various resistances to motion of the automobile.

UNIT - II

Frames : Types of frames, materials, calculation of stresses on sections, constructional details, loading points, testing of frames.

Wheels and tyres: Types of wheels, construction, structure and function of tyres, static&function of tyres.

UNIT - III

Steering systems : Types of steering gears, front axle, under steer and over steer, wheel alignment, power steering, steering geometry, wheel balancing, centre point steering, steerability.

UNIT - IV

BRAKES : Necessity of brake, stopping distance and time, brake efficiency, weight transfer, brake shoe theory, determination of braking torque, braking systems -mechanical, hydraulic, disc, parking and emergency brakes, servo and electrical brakes, details of hydraulic system, mechanical system and components, types of master cylinders, factors influencing operation of brakes such as operating temperature, lining brake clearance, pedal pressure, linkages etc.

UNIT - V

SUSPENSION : Types of suspension, leaf springs, materials, independent suspension, torsion bar, air bellows or pneumatic, suspension, hydraulic suspension, constructional details of telescopic shock absorbers, Types, vibrations and riding comfort, role axis of spring suspension.

UNIT - VI

Front Wheel Mounting, Rear Wheel Mounting, Engine mounting, Various types of springs used in suspension system, Requirements and various types, Material.

UNIT - VIII

Testing : Testing procedures, types of tests and chassis components, equipment for lab and road tests, preparation of test reports.

UNIT - VIII

Two and three wheelers : Classification of two and three wheelers, construction details, construction details of frames and forks, suspension systems and shock absorbers, different arrangement of cylinders, Carburetion system and operation.

TEXTBOOK :

1. Automotive chassis and body -P. L. Kohli, TMH

REFERENCES :

1. Introduction to automobile engineering -N.R. Khatawale, Khanna pub,
2. Automotive mechanics -Joseph Heininger, Affiliated East West Press
3. Problems in Automobile Engineering -N.K.Giri, Khanna Pub
4. Automotive Chassis -P.M. Heldt, Chilton & Co.
5. Automobile Engineering -T. R. Banga & Nainu Singh, Khanna

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

IV Year B.Tech. A.M.E. - I Semester

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(EE 05323) 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 – capacitance, ultrasonic, magnetic, cryogenic fuel level indicators – Bubbler level indicators.

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

UNIT - V

MEASUREMENT OF SPEED : Mechanical Tachometers – Electrical tachometers – Stroboscope, Non-contact type of tachometer

Measurement of Acceleration and Vibration : Different simple instruments – Principles of Seismic instruments – 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. Instrumentation, measurement & analysis by B.C.Nakra & K.K.Choudhary, TMH

REFERENCES :

1. Instrumentation and Control systems/S.Bhaskar/ Anuradha Agencies.

2. Experimental Methods for Engineers / Holman.

3. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.

4. Mechanical Measurements / Sirohi and Radhakrishna / New Age.

Instrumentation & mech. Measurements by A.K. Tayal Galgotia Publications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

HYDERABAD

IV Year B.Tech. A.M.E. - I Semester

T P C
4+1 0 4

(AU 05563) TRIBOLOGY
(ELECTIVE – I)

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, hydro- static 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, Sommerfeld 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. **Tribology in Industry :** Sushil Kumar Srivatsava, S. Chand &Co.

REFERENCE :

1. Tribology – B.C. Majumdar

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

HYDERABAD

IV Year B.Tech. A.M.E. - I Semester

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(MC 05489) PRODUCT DESIGN AND ASSEMBLY AUTOMATION
(ELECTIVE – I)

UNIT - I

AUTOMATIC FEEDING AND ORIENTING DEVICES : Vibrator feeders : Mechanics of vibratory conveying, estimating the mean conveying velocity, load sensitivity, solutions to load sensitivity, spiral elevators, balanced feeders.

UNIT - II

Orientation of typical oriental system, effect of active orienting devices on feed rate, analysis of orienting systems, performance of an orienting device, natural resting aspects, of parts for automatic handling, analysis of a typical orienting system, out-of-bowl tooling. Mechanical feeders: Reciprocating-tube hopper feeder, magazines:

UNIT - III

Assembly Automation : Development of the assembly process, choice of assembly method, automation advantages, social effects of automation.

UNIT -IV

AUTOMATIC ASSEMBLY TRANSFER SYSTEMS : Continuous transfer, intermittent transfer, indexing mechanisms, and operator - paced free – transfer machine.

UNIT -V

PRODUCT DESIGN FOR HIGHSPEED AUTOMATIC ASSEMBLY AND ROBOT ASSEMBLY : Introduction, design of parts for: high speed, feeding and orienting, example, additional feeding difficulties, high speed automatic insertion, example, analysis of an assembly, general rules for product design for automation, design of parts for feeding and orienting, summary of design rules for high speed automatic assembly, product for robot assembly.

UNIT -VI

DESIGN OF MANUAL ASSEMBLY : Design for assembly fits in the design process, general design guidelines for manual assembly, development of the systematic DFA methodology, assembly efficiency, classification system for manual handling, classification system for manual insertion and fastening, effect of part symmetry on handling time, effect of part thickness and size on handling time, effect of weight on handling time, parts requiring two hands for manipulation, effects of combinations of factors, effect of symmetrically effect of chamfer design on insertion operations, estimation of insertion time.

UNIT -VII

Avoiding jams during assembly, reducing risk assembly problems, effects of holding down, manual assembly data base and design data sheets, application of the DFA methodology and general design guidelines.

UNIT -VIII

PERFORMANCE AND ECONOMICS OF ASSEMBLY SYSTEMS : Indexing machines, free transfer machines, basis for economic comparisons of automation equipment, comparison of indexing and free-transfer machines' economics of robot assembly.

FEASIBILITY STUDY FOR ASSEMBLY AUTOMATION : Machine design factors to reduce machine downtime due to defective parts. Feasibility study.

TEXT BOOK :

1. Geoffrey Boothroyd, "Assembly Automation and Product Design", Marcel Dekker Inc., NY, 1992.

REFERENCES :

1. Geoffrey Boothroyd, "Hand Book of Product Design" Marcel and Dekken, N.Y. : 1990.
2. A Delbainbre "Computer Aided Assembly London, 1992.

**AWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

IV Year B.Tech. A.M.E. - I Semester

T P C
4+1 0 4

**(AU 05051) AUTO AIR CONDITIONING
(ELECTIVE – I)**

UNIT - I

Fundamentals of Refrigeration, vapour compressors refrigeration - working principle, cycle COP - refrigeration cycle in T -s and P-h coordinates, Effect of sub cooling & super heating and cycle analysis and problems using P-h charts.

UNIT - II

Introduction to Air Conditioning – Psychrometric properties and processes, sensible and latent heat loads, characterization and SHF load for ventilation and filtration, concepts of RSHF & SHF ESHF and ADP, concepts of human comfort and effective temperature.

UNIT - III

Components of Air conditioners: Air-conditioning Components: Compressor-Evaporator-Condenser-Expansion valve-Receiver Drier- Filters-Mufflers -special features-compressor protection Anti freezing relay.

UNIT - IV

Vehicle cooling, load estimation, capacity requirements of Air Conditioning System, refrigerants used in Automobiles – properties.

UNIT - V

Operation of an Air-conditioning System: Type of Air conditioners. Heaters-Vehicle ventilation-combination heater and air conditioner-manually controlled air conditioner and heater system- automatically controlled air conditioner and heater systems.

UNIT - VI

Air Heating equipment, Ducts, Registers and Grills, blowers, filters

UNIT - VII

Trouble Shooting and Services: Servicing of heating Systems, Causes of air conditioner Failure, leak testing guide, Discharging the system- Evacuating the system-charging the System-trouble shooting air conditioner heater Systems.

UNIT - VIII

Servicing of Air Conditioners- Heating Systems: Air conditioner maintenance and service, Compressor trouble shooting and service, clutch service- shaft seal leakage compressor. Seal removal checking oil level-oil addition, repairs on compressors.

TEXT BOOK :

1. Automotive Air-conditioning- By William H. Grouse & Donald L. Anglin. MH

REFERENCES :

1. Automotive Air-conditioning- By Leslie F. Gomgs.. McGraw-Hill
2. Automotive Air-conditioning- By Boyce H. Dwigins. Reston Pub.
3. Refrigeration & Air Conditioning by Manohar Prasad
4. Refrigeration & Air Conditioning by CP Arora

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

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IV Year B.Tech. A.M.E. - I Semester

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(EE 05425) NEURAL NETWORKS & FUZZY LOGIC

(ELECTIVE-II)

UNIT - I

Introduction to Neural Networks : Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, 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, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application

UNIT - III

Single Layer Feed Forward Neural Networks : Introduction, Perception Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications.

UNIT - IV

Multi-layer 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 (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem.

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

Summary and Discussion of Instance/Memory Based Learning Algorithms, Applications.

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 and load forecasting.

Fuzzy logic applications : Fuzzy logic control and Fuzzy classification.

TEXT BOOKS :

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.

2. Introduction to Artificial Neural Systems - Jacek M. Zurada, Jaiico Publishing House, 1997.

REFERENCES :

1. Neural and Fuzzy Systems: Foundation, Architectures and Applications, - N. Yadaiah and S. Bapi Raju, Pearson Education

2. Neural Networks – James A Freeman and Davis Skapura, Pearson, 2002.

3. Neural Networks – Simon Hykins , Pearson Education

4. Neural Engineering by C.Eliasmith and CH Anderson, PHI

5. Neural Networks and Fuzzy Logic System by Bork Kosk, PHI Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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IV Year B.Tech. M.E. - I Semester

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(ME 05248) FINITE ELEMENT METHOD
(ELECTIVE I)

UNIT - I

Introduction to Finite Element Method for solving field problems. Stress and Equilibrium. Boundary conditions. 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. Two dimensional four noded isoparametric elements and numerical integration.

UNIT - VI

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.

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

UNIT - VII

Finite element – formulation to 3D problems in stress analysis, convergence requirements.

UNIT - VIII

Mesh generation, Techniques such as semi automatic and fully Automatic Mesh generation Techniques : use of softwares such as ANSYS, CAEFEM, NISA NASTRAN etc. Comparison of commercially available packages.

TEXT BOOK :

1. Introduction to Finite Elements in Engineering / Chandrupatla, Ashok and Belegundu / Prentice – Hall.

REFERENCES :

1. Finite element analysis / C.S. Krishna murthy.
2. The Finite Element Methods in Engineering / SS Rao / Pergamon.
3. An Introduction to Finite Element Method / JIN Reddy / Mc Graw Hill
4. 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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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IV Year B.Tech. A.M.E. - I Semester

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(AU 05031) ALTERNATIVE ENERGY SOURCES FOR AUTOMOBILES
(ELECTIVE - II)

UNIT - I

Introduction : Need for non-conventional energy sources. Energy alternative : solar , photo-voltaic, Hydrogen, Bio mass. Electrical - their merits and demerits.

UNIT - II

Solar photo-voltaic conversion, Collection and storage of solar energy, collection devices, flat plate collectors, concentrating type collectors, principles and working of photo-voltaic Conversion, Applications to automobiles.

UNIT - III

Energy from Bio mass : Photosynthesis, photosynthetic oxygen production, energy plantation. Bio gas production from organic waste, description of Bio gas plant, types of Bio gas plants, problems involved in production and transportation. Application of Bio gas in engines as a single fuel and dual fuel modification - Merits and demerits performance characteristics and their comparison.

UNIT - IV

Hydrogen Energy : Properties of Hydrogen, sources of Hydrogen, Thermodynamics of water splitting Production of Hydrogen, Electrolysis of water. Thermal decomposition of water. Thermo-chemical production, Biochemical production.

UNIT - V

Hydrogen fuel, Storage and Transportation methods, Applications to engines modifications necessary, precautions and safety measures - Performance characteristics in Engine and their comparison.

UNIT - VI

Electric Automobiles : Design considerations, limitations. opportunities for improvement Batteries, problems. future possibilities , capacities, types , material requirement.

UNIT - VII

Applicability of electric cars, Driving requirements, cost of electric car, comparative use of fuel and energy. Availability of energy for recharging , impacts on use of fuel and energy , impact on urban air quality, impact on price, material requirement Traction motors and types.

UNIT - VIII

Use of gas turbines in cars, arrangement, control merits and de- merits.
Design of turbochargers for automobiles, their usefulness on the performance.

TEXT BOOKS :

1. G.D. Rai 'Non-conventional sources of energy Khamma Lab.
2. William Hamilton 'Electric Automobiles', PHI

REFERENCES :

1. S.P. Sukhatme 'Solar Energy', Tata McGraw Hill.
2. S. Rao & B.B. Larulekar 'Energy Technology', Khamma Lab
3. Frank Kreith & Jan F. Krieder 'Principles of Solar Engineering', McGraw Hill.
4. J.A. Duffie & W.A. Beckman 'Solar Energy -thermal Process' McGrawHill
5. E. D. Tolla, 'Solar Hydrogeff Energy-Systems'
6. T.N. Veziroglu. 'Alternative energy sources.
7. Mitsui E. Stal, 'Biological solar energy conversion.

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IV Year B.Tech. A.M.E. - I Semester

T P C
0 3 2**(AU 05284) HEAT TRANSFER AND INSTRUMENTATION LAB****(A) 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. Heat transfer in forced convection apparatus.
7. Heat transfer in natural convection
8. Parallel and counter flow heat exchanger.
9. Emissivity apparatus.
10. Stefan Boltzman Apparatus.

Pre-Requisite : Heat Transfer

Objective : To understand physically different aspects of modes of heat transfer and the effect of different parameters like geometry, mass flow rate, heat flux & wall temperatures etc., on the heat transfer rates by different modes.

Tables/Codes : Heat and Mass Transfer data book / C.P. Kothandaraman, Subramanian/ New Age Pub.

Question Paper Pattern :**(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.

REFERENCE :

1. Metallography Laboratory Practice / George / KEHL

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IV Year B.Tech. A.M.E. - I Semester

T	P	C
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(AU 05052) AUTO SCANNING AND VEHICLE TESTING LAB

1. Computerised engine analyzer study and practice.
2. Computerised wheel balancing machine study and practice.
3. Computerised wheel alignment machine study and practice.
4. Exhaust emission test of petrol and diesel engine
5. Two wheeler chassis dynamometer study and practice
6. Study of wind tunnel - determining of coeff of drag for a given aerofoil .
7. Road worthness test a) Acceleration b) Gradability c) Maximum speed d) Constant speed fuel consumption (High way drive) e) city drive fuel consumption tests.
8. Head light focussing test.
9. Visibility test .
10. Braking distance test.
11. Drawings of automobile bodies -light and heavy vehicles for different seating capacities .
12. Dimensional drawings of bus depots and service station workshop layouts.

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IV Year B.Tech. A.M.E. - II Semester

T	P	C
4+1	0	4

(AU 05571) VEHICLE TRANSPORT MANAGEMENT

UNIT - I

Historical Back ground : Introduction, the growth of a network, trams, trolley buses, private cars' subsidies.

The Infrastructure : Road-Approach Road, Highways National, State, District, traffic condition, relief of congestion, pedestrians, zebra lines, margins, shopping centres. Bus-stops, shelters. Bus stations. Garages layout of premises, equipment, use of machinery, conveyance of staff, facilities for passengers. Maintenance -preventive, breakdown, overhauling -major, minor.

UNIT - II

Organisation and Management : Forms of ownership, principle of transport, management -internal organisation, centralised condition, decentralised condition (Engineering, traffic and administration), staff administration: Industrial relation, administration, recruitment and training, welfare, health and safety.

UNIT - III

Public relations divisions : Dissemination of information, maintaining goodwill- handling complaints, traffic advisory, committees- local contractors co-operation with the press news and articles- facilities for visitors- forms of publicity importance of quality -inter departmental liaison advertisements, signs, notice and directions general appearance of premises, specialized publicity.

UNIT - IV

Prevention of accidents : Emphasis of safe driving-annual awards bonus encouragement vehicle design platform, layout, location of steps, scheduled route hazards records elimination of accident prone devices.

Route planning : Source of traffic, town planning, turning points, stopping places, shelters survey of route preliminary schedule test runs elimination of hazards factors affecting. Frequency direction of traffic flow estimated traffic possibility single verses double deck.

UNIT - V

Timing, bus working and schedules : Time table layout uses of flat graph method of presentation preparation of vehicle and crew schedule preparation of the duty roster, co-operation with employers use of the vehicle running numbering determination of vehicle efficiency, checking efficiency of crew, duty arrangements.

UNIT - VI

Fare collections systems : Principles of collection the way bill, bell punch system reduced ticket stocks willk brew system T.I.M and straight /M/C/S. The verometer lenson parason coach tickets exchanges, box system personal and common stock flat fare platform control.

UNIT - VII

The fare structure : Basis of fares historical background effects of competition and control calculating average zone system straight and tapered scale elastic and inelastic demand coordination of fares concessions fares changes for workman. Anomalies double booking inter availability through booking and summation private hire charges.

UNIT -VIII

Operating cost and types of vehicles: Classification costs, average speed running costs supplementary costs depreciation obsolescence, life of vehicles sinking fund factor affecting post per vehicles mile incidence of wages and overheads 100 seats miles basis, average seating capacity vehicles size and spread overs, types of vehicle economic considerations authorization of trolley, bus services, statutory procedure taxes and hire cars.

TEXT BOOKS :

1. BUS OPERATION -L.D.KITCHEN, LUFFE & Sons
2. BUS & COACH OPERATION -REX W. FAUKS, Butterworth Version of 1987

REFERENCES :

1. COMPENDIUM OF TRANSPORT TERMS CIRT,PUNE
2. M.V. ACT 1988 CENTRAL LAW AGENCY, ALLAHBAD
3. THE ELEMENTS OF TRANSPORTATION -R.J. EATON
4. GOODS VEHICLE OPERATION -By C.S. DUBBAR 5. ROAD TRANSPORT LAW- L.D. KITCHEN
5. Road Transport Law –L.D.Kitchen
6. COMPENDIUM OF TRANSPORT TERMS CIRT,PUNE(Report
7. M.V.ACT 1988, PUB Central Law Agency, Allahabad.

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IV Year B.Tech. A.M.E. - II Semester

T P C
4+1 0 4

**(AU 05062) AUTOMOTIVE POLLUTION AND CONTROL
(ELECTIVE – III)**

UNIT - I

Laws and Regulation : Historical background, regulatory test procedures (European cycles), exhaust gas pollutants(European rail road limits), particulate pollutants, European statutory values, inspection of vehicles in circulation (influence of actual traffic conditions and influence of vehicle maintenance)

Analysis of pollutants : Carbon and Nitrogen Compounds -(CO,CO2 Nox), Ammonia and Amines, Hydrocarbons, volatile compounds, evaporative losses, analysis of particulates.

UNIT - II

Pollutants from SI engines, Mechanism & formation of HE, CO, and NOX in SI engines. Engine and operating variables affecting pollutants in SI engines.

UNIT - III

Pollution for CI engines, Mechanism of formation of He, CO, NOx, and soot in CI engines. Factor affecting emissions in CI engines.

UNIT - IV

Lean burn & stratified charge engines, Multipoint fuel injection and Gasoline direct injection methods. Common rail fuel injection in diesel engines. Exhaust gas recirculation.

UNIT - V

Post combustion treatments: Introduction, exhaust gas composition before treatment, catalytic converters, oxidation and three way types thermal reactors, installation of catalysts in exhaust lines, NOX treatment in diesel engines, particulate traps for diesel engines, particulate trap regeneration.

UNIT - VI

Economic challenges: Introduction, cost of improvement to SI engines, cost of injection systems, cost of improvement in Diesel engines, economic consequences of introducing the catalyst, additional costs incurred by diesel traps. cost of periodic inspection of pollution control systems and evaporative control systems.

UNIT - VII

Instrumentation for pollution measurements: NDIR -analysers, thermal conductivity and flame ionization detectors, analysers for Nox, gas chromatograph. Orsat apparatus, smoke meters- spot sampling and continuous indication types like Bosch, Hartridge. Particulate measuring systems. Dilution tunnels– full flow and partial flow.

UNIT - VIII

SI and CI engine fuel requirements. Knock in SI and CI engines. Knock rating of SI and CI Engine fuels. Alternative fuel like Hydrogen, Natural gas, LPG, Vegetable oil and biodiesel, their production, properties, storage and performance as engine fuels.

TEXT BOOKS :

1. Bosch – Gawnline fuel injection – Bosch Publications
2. Bosch – Diesel fuel Injection – Bosch Publications

REFERENCES:

1. Automobiles and Pollution -PaulDegebert(SAE).
2. Diesel engine operation manual- V.L Maleev, CBS Pub
3. I.C. Engines -E.F. Obert, Harper& Row
4. Engine emission -Springer and Patterson, Plenum Press
5. Heins Aelsth – Internal Combustion Engines – SAE Publications.

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IV Year B.Tech. A.M.E. - II Semester

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**(AU 05569) VEHICLE BODY ENGINEERING AND SAFETY
(ELECTIVE -III)**

UNIT-I

Structural materials : Aluminium alloy sheet, extrusion and casting, Austenitic and Ferritic stainless steels, alloy steels, Different types of composites, FRP & metal Matrix Composites, Structural timbers - properties designing in GRP and high strength composites different manufacturing techniques of composites, Thermo plastics, ABS and styrenes, Load bearing plastics, semirigid PUR foams and sandwich panel construction

UNIT -II

Shaping and packaging : Product design and concepts, Aesthetics and industrial design, formal aesthetics and shape, computer aided drafting, surface development, interior ergonomics, ergonomics system design, dash- board instruments, advances in electronic display, CV legal dimension, CV-cab ergonomics, mechanical package layout.

UNIT -III

Aerodynamics : Basics, aerofoils, aerodynamics drag lift, pitching, yawing and rolling moments, determination of aerodynamic coefficients (wind tunnel testing), racing car aerodynamics, bluff body aerodynamics, local air flows.

Unit-IV

Load Distribution : Types of load carrying structures- closed, integral, open, flat types, Calculation of loading cases- static, asymmetric, vertical loads, Load distribution, stress analysis of structure, body shell analysis.

Unit- V

Body Fitting and I Controls : Driver's seat, window winding mechanism, Door lock mechanism, other interior mechanisms, driver's visibility' and tests for, visibility, minimum space, requirements and methods or improving space in cars, electric wiring and electronic control systems, advanced body electronics, networking or body systems controls.

UNIT -VI

Noise, Vibration, Harshness : Noise and vibration basics, body structural vibrations, chassis bearing vibration, designing against fatigue, rubber as an isolator, CV body mountings, automatic enclosures, sandwich panels, structure dynamics applied, surely under impact, Impact protection basics, design for crash worthiness, occupant and cargo restraints, Passive restraint systems, slide impact analysis, bumper system, energy absorbant foams, laws of mechanisms applied to safety.

Vans, trucks and buses : Types of mini coach with trailers, single and double deckers, design criteria based on passenger capacity, goods to be transported and distance to be Covered, constructional details: weights and dimensions, conventional and integral type.

UNIT-VIII

Vehicle stability : Steering geometry vehicle and a curvilinear path, and lateral stability, effects of tyre factors, mass distribution and engine location on stability.

TEXT BOOKS:

1. Body Engineering -Sydney F Page
2. Vehicle body engineering -Giles J Pawlowski,

REFERENCES :

1. Automotive chassis -P.M. Heldt, chilton & Co
2. Handbook on vehicle body design -SAE Publications.

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IV Year B.Tech. A.M.E. - II Semester

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(ME 05054) AUTOMATION IN MANUFACTURING

(ELECTIVE - III)

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 automation, buffer storage, partial automation, Implementation of automated flow lines.

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 - VIII

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 Prototyping.

TEXT BOOK :

1. Automation, Production Systems and Computer Integrated Manufacturing : M.P. Groover / Pearson Edu.

REFERENCES :

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

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IV Year B.Tech. A.M.E. - II Semester

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(ME 05108) CAD / CAM

(ELECTIVE - IV)

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, constraint based 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

Material requirement planning, manufacturing resources planning, DNC, AGV, ASRS, Flexible manufacturing systems – FMS equipment, system layouts, FMS control.

UNIT - VIII

CIM : Integration, CIM implementation, major functions in CIM, Benefits of CIM, Lean manufacturing, Just-in-time.

TEXT BOOK :

1. CAD / CAM Principles and Applications – 2nd edition, P. N. Rao, Tata Mc. Graw Hill

REFERENCES :

1. CAD / CAM Theory and Practice / Ibrahim Zeid / TMH
2. CAD / CAM / CIM / Radhakrishnan and Subramanian / New Age
3. Principles of Computer Aided Design and Manufacturing / Farid Amirouche / Pearson
4. Computer Numerical Control Concepts and programming / Warren S Seames / Thomson.
50. CAD / CAM by CSP Rao – Hi-Tech Publishers.

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IV Year B.Tech. A.M.E. - II Semester

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(EE 05404) MICROPROCESSORS AND MICRO CONTROLLERS

(ELECTIVE - IV)

UNIT-I

8086 ARCHITECTURE : Functional Diagram, Register Organization, Addressing modes, Instructions, Functional schematic, Minimum and Maximum mode operations of 8086, 8086 Control signal interfacing, Timing Diagrams.

UNIT-II

ASSEMBLY LANGUAGE PROGRAMMING OF 8086 : Assembly Directives, Macro's, Simple Programs using Assembler, Implementation of FOR Loop, WHILE, REPEAT and IF-THEN-ELSE Features, String Manipulation, Procedures.

UNIT-III

I/O INTERFACE : Parallel data transfer screen, Programmed I/O, Interrupt Driven I/O, 8255 PPI, Various modes of operations and interface of I/O devices to 8086, A/D, D/A Converter Interfacing, Stepper/Motor Interfacing.

UNIT-IV

INTERFACING WITH ADVANCED DEVICES : 8086 System bus structure, Memory and I/O Interfacing with 8086, Interfacing through various IC Peripheral Chips, 8257 (DMA Controller), 8259 (Interrupt Priority Control), Memory Interface using RAMS, EPROMS and EEPROMS.

UNIT-V

COMMUNICATION INTERFACE : Serial Communication Standards, USART Interfacing RS-232, IEEE-488, 20mA Current Loop, Prototyping and Trouble shooting, Software Debugging tools, MDS.

UNIT-VI

INTRODUCTION TO MICRO CONTROLLERS : Overview of 8051 Micro Controller, Architecture, I/O ports and Memory Organization, Addressing modes and Instruction set of 8051, Simple Programs using Stack Pointer, Assembly language programming.

UNIT-VII

8051 INTERRUPTS COMMUNICATION : Interrupts, Timer/Counter and Serial Communication, Programming Timer Interrupts, Programming External HW Interrupts, Programming the serial communication interrupts, Interrupt Priority in the 8051, Programming 8051 Timers, Counters and Programming.

UNIT - VIII

INTERFACING AND INDUSTRIAL APPLICATIONS : Applications of Micro Controllers, Interfacing 8051 to LEDs, Push button, Relay's and Latch Connections, Keyboard Interfacing, Interfacing Seven Segment Display, ADC and DAC Interfacing.

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IV Year B.Tech. A.M.E. - II Semester

T P C
4+1 0 4**(CS 05137) COMPUTER GRAPHICS****(ELECTIVE - IV)****TEXT BOOKS :**

1. Kenneth J Ayala, " The 8051 Micro Controller Architecture, Programming and Applications", Thomson Publishers, 2nd Edition.
2. Kenneth J Ayala, "The 8086 Micro Processors Architecture, Programming and Applications", Thomson Publishers, 2005.

REFERENCES :

1. Ajay V. Deshmukh, "Microcontrollers – theory applications", Tata McGraw-Hill Companies – 2005.
2. D.V.Hall, "Micro Processor and Interfacing ", Tata McGraw-Hill
3. Ray and BulChandi, " Advanced Micro Processors ", Tata McGraw-Hill.

UNIT - I

Introduction, Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices (p.nos 22-90 of text book -1).

UNIT - II

Output primitives : Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms, Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms (p.nos 103-123,137-145, 147-150, 164-171 of text book -1, p.nos: 72-99 of text book-2).

UNIT - III

2-D geometrical transforms : Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems. (p.nos 204-227 of text book-1).

UNIT - IV

2-D viewing : The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland-Hodgeman polygon clipping algorithm (p.nos 237-249, 257-261 of text book -1, p.nos. 111-126 of text book-2).

UNIT - V

3-D object representation : Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces, Basic illumination models, polygon rendering methods. (p.nos 324-331,340-342, 347-364, 516-531, 542-546 of text book -1, p.nos 473-529,721-739 of text book-2).

UNIT - VI

3-D Geometric transformations : Translation, rotation, scaling, reflection and shear transformations, composite transformations.

3-D viewing : Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping (p.nos 427-443, 452-481 of text book -1).

UNIT-VII

Visible surface detection methods : Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods (p.nos 489-505 of text book -1, Chapter 15 of text book-2).

UNIT-VIII

Computer animation : Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications. (p.nos 604-616 of text book -1, chapter 21 of text book-2).

TEXT BOOKS :

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

REFERENCES :

1. "Computer Graphics", second Edition, Donald Hearn and M.Pauline Baker, PHI/Pearson Education.
2. "Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc-Graw hill edition.
3. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
4. "Principles of Interactive Computer Graphics", Neuman and Sroul, TMH.
5. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.
6. Computer Graphics, Steven Harrington, TMH