ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

R14

MECHANICAL ENGINEERING

For
B.TECH. FOUR YEAR DEGREE COURSE
(Applicable For the Batches Admitted From 2014-15)
(I-IV Year Syllabus)

CMR COLLEGE OF ENGINEERING & TECHNOLOGY, HYDERABAD (AUTONOMOUS)
Kandla Koya, Hyderabad-501 401

CMR COLLEGE OF ENGINEERING & TECHNOLOGY, HYDERABAD
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B Tech (Mechanical Engineering) Course Structure
(Applicable w e f A Y 2014-15)

Subject Code	Subject	L	T	P	C	Internal Marks	External Marks
**I Semester**
A1001	English -I	2	0	0	2	30	70
A1006	Linear Algebra & Calculus	4	1	0	4	30	70
A1013	Engineering Physics - I	4	0	0	4	30	70
A1016	Engineering Chemistry	4	0	0	4	30	70
A1301	Engineering Mechanics - I	3	1	0	3	30	70
A1302	Engineering Graphics	3	0	3	4	30	70
A1303	Engineering Workshop	0	0	3	2	25	50
A1003	English Language Communication Skills Lab	0	0	3	2	25	50
A1544	IT Workshop	0	0	3	2	25	50
	TOTAL	**20**	**2**	**12**	**27**		

Subject Code	Subject	L	T	P	C	Internal Marks	External Marks
**II Semester**
A1002	English - II	2	0	0	2	30	70
A1007	Advanced Calculus	4	1	0	4	30	70
A1014	Engineering Physics - II	3	0	0	3	30	70
A1018	Chemistry of Engineering Materials	3	0	0	3	30	70
A1539	'C' Programming & Datastructures	4	1	0	4	30	70
A1304	Engineering Mechanics - II	3	1	0	3	30	70
A1305	Engineering Graphics & AutoCAD	3	0	3	4	30	70
A1553	'C' Programming & Data Structures Lab	0	0	3	2	25	50
A1015	Engineering Physics Lab	0	0	3	2	25	50
A1019	Engineering Chemistry Lab	0	0	3	2	25	50
	TOTAL	**22**	**3**	**12**	**29**		

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Subject Code	Subject	L	T	P	C	Internal Marks	External Marks
	III Semester						
A1008	Mathematical Methods	4	1	0	4	30	70
A1307	Metallurgy & Material Science	4	0	0	4	30	70
A1308	Mechanics of Solids	4	1	0	4	30	70
A1309	Thermodynamics	4	1	0	4	30	70
A1310	Production Technology	4	0	0	4	30	70
A1020	Environmental Studies	4	0	0	4	30	70
A1311	Metallurgy & Mechanics of Solids Lab	0	0	3	2	25	50
A1312	Poduction Technology Lab	0	0	3	2	25	50
	TOTAL	**24**	**3**	**6**	**28**		

Subject Code	Subject	L	T	P	C	Internal Marks	External Marks
	IV Semester						
A1313	Fluid Mechanics & Hydraulic Machinery	4	1	0	4	30	70
A1314	Thermal Engineering-I	4	1	0	4	30	70
A1315	Kinematics of Machinery	4	1	0	4	30	70
A1010	Probability & Statistics	4	0	0	4	30	70
A1215	Basic Electrical & Electronics Engineering	4	1	0	4	30	70
A1316	Machine Drawing	0	0	6	4	30	70
A1317	Fluid Mechanics & Hydraulic Machinery Lab	0	0	3	2	25	50
A1216	Basic Electrical & Electronics Engineering Lab	0	0	3	2	25	50
A1005	Soft Skills and Professional Ethics	2	0	0	0		
	TOTAL	**22**	**4**	**12**	**28**		

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	V Semester						
Subject Code	Subject	L	T	P	C	Internal Marks	External Marks
A1318	Dynamics of Machinery	4	1	0	4	30	70
A1021	Managerial Economics & Financial Analysis	4	0	0	4	30	70
A1319	Design of Machine Members-I	4	1	0	4	30	70
A1320	Thermal Engineering –II	4	1	0	4	30	70
A1321	Engineering Metrology	4	0	0	4	30	70
A1322	Machine Tools	4	1	0	4	30	70
A1323	Thermal Engineering Lab	0	0	3	2	25	50
A1004	Advanced English Communication Skills Lab	0	0	3	2	25	50
A1011	Analytical Skills-I	2	0	0	0		
	TOTAL	26	4	6	28		

	VI Semester						
Subject Code	Subject	L	T	P	C	Internal Marks	External Marks
A1324	Design of Machine Members- II	4	1	0	4	30	70
A1325	Heat Transfer	4	1	0	4	30	70
A1326	Instrumentation & Control Systems	4	0	0	4	30	70
A1510	Object Oriented Programming through JAVA	4	1	0	4	30	70
A1327	Finite Element Methods	4	1	0	4	30	70
A1444	Microcontrollers & Applications	4	0	0	4	30	70
A1328	Machine Tools, Metrology & Measurements Lab	0	0	3	2	25	50
A1445	Microcontrollers & JAVA Programming Lab	0	0	3	2	25	50
A1012	Analytical Skills-II	2	0	0	0		
	TOTAL	26	4	6	28		

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Subject Code	Subject	L	T	P	C	Internal Marks	External Marks
VII Semester								
A1329	Operations Research	4	1	0	4	30	70
A1330	Power Plant Engineering	4	1	0	4	30	70
A1331	CAD/ CAM	4	1	0	4	30	70
A1332	Automobile Engineering	4	1	0	4	30	70
	Elective – I						
A1333	1. Mechanical Vibrations & Noise Engineering	4	0	0	4	30	70
A1334	2.Tribology						
A1335	3. Robotics						
	Elective – II						
A1336	1. Refrigeration & Air Conditioning	4	0	0	4	30	70
A1337	2. Jet Propulsion & Rocket Engineering						
A1338	3. Non-Conventional Sources of Energy						
A1339	Heat Transfer Lab & Theory of Machines Lab	0	0	3	2	25	50
A1340	Computer Assisted Production Drawing, CAD/CAM Lab	0	0	3	2	25	50
	TOTAL	24	4	6	28		

Industry Oriented Mini Project (Course Code A1348) will be carried out during (VI-VII) semester break.

Subject Code	Subject	L	T	P	C	Internal Marks	External Marks
VIII Semester								
	Elective – III						
A1341	1.Total Quality Management	4	0	0	4	30	70
A1342	2. Plant Layout & Material Handling						
A1343	3.Maintenance & Safety Engineering						
	Elective – IV						
A1344	1. Unconventional Machining Process	4	0	0	4	30	70
A1345	2. Production Planning & Control						
A1346	3. Rapid Prototyping						
A1022	Management Science	4	0	0	4	30	70
A1347	Seminar	0	0	3	2	100	0
A1348	Industry Oriented Mini Project	0	0	3	2	0	100
A1349	Comprehensive Viva	0	0	0	2	0	100
A1350	Main Project	0	12	0	10	60	140
	TOTAL	12	12	6	28		

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		L	T	P	C
B.Tech. Mech. Engg. I-Sem		2	0	0	2

(A1001) ENGLISH-I

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

UNIT –I
 ➢ Chapter entitled 'Wit and Humour' from 'Skills Annex' -Functional English to Success Published by Orient Black Swan, Hyderabad. **A Tea Party**
  • L-Listening For Sounds, Stress and Intonation
  • S-Greeting and Taking Leave, Introducing Oneself and Others (Formal and Informal Situations)
  • R- Reading for Subject/ Theme
  • W- Writing Paragraphs
  • G-Types of Nouns and Pronouns
  • V- Homonyms, homophones synonyms, antonyms

UNIT –II

 ➢ Chapter entitled '**Risk Management'** from "Skills Annex -Functional English for Success" Published by Orient Black Swan, Hyderabad
  • L – for main points and sub-points for note taking
  • S – giving instructions and directions; Speaking of hypothetical situations
  • R – reading for details
  • W – note-making, information transfer, punctuation
  • G – present tense
  • V – synonyms and antonyms

UNIT –III
 ➢ Chapter entitled "Cyber Age" from "Skills Annex -Functional English for Success" Published by Orient Black Swan, Hyderabad.
  • L – Listening for themes and facts
  • S – Apologizing, interrupting, requesting and making polite conversation
  • R- for theme and gist
  • W- Describing people, places, objects, events
  • G- Verb forms
  • V- noun, verb, adjective and adverb

UNIT –IV
 ➢ Chapter entitled 'Human Values and Professional Ethics' from "Skills Annex -Functional English for Success" Published by Orient Black Swan, Hyderabad
  • L -Listening for specific details and information
  • S- narrating, expressing opinions and telephone interactions
  • R -Reading for specific details and information

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- W- Writing formal letters and CVs
- G- Past and future tenses
- V- Vocabulary - idioms and Phrasal verbs

UNIT –V

➢ Chapter entitled 'Sports and Health' from "Skills Annex -Functional English for Success"
Published by Orient Black Swan, Hyderabad

- L- Critical Listening and Listening for speaker's tone/ attitude
- S- Group discussion and Making presentations
- R- Critical reading, reading for reference
- W-Project proposals; Technical reports, Project Reports and Research Papers
- G- Adjectives, prepositions and concord
- V- Collocations and Technical vocabulary Using words appropriately

TEXTBOOK PRESCRIBED:

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following text and course content, divided into six Units, is prescribed:

1 A Text book entitled **"Skills Annex", -Functional English to Success** Published by Orient Black Swan, Hyderabad

REFERENCE BOOKS:

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

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- ➢ **By undergoing this course, student will be able to** Become proficient in listening, speaking, reading and writing skills.
- ➢ Learn grammar by practice and usage (drill, contextualized clues etc.,)
- ➢ Learn and improve vocabulary through activities, contextual words and vocabulary games
- ➢ Collect the information through lectures and reading texts and study material
- ➢ Master the mechanics of reading-skimming, scanning, intensive and extensive reading. They will also learn to describe, write official letters and produce creative writing.

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B.Tech. Mech. Engg. I-Sem   L T P C
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(A1006) LINEAR ALGEBRA & CALCULUS

UNIT-I
Linear Algebra-I: Matrices and Linear Systems of Equations: Real matrices :- Symmetric, Skew-symmetric, Orthogonal, Linear Transformation- Orthogonal Transformation. Complex matrices: Hermitian, Skew- Hermitian and Unitary. Elementary row transformations- Rank – Echelon form, Normal form- Solution of Linear Systems – Direct Methods (Gauss Elimination, Gauss Jordan)-LU-Decomposition.

UNIT-II
Linear Algebra-II: Eigen Values, Eigen Vectors- Properties, Cayley –Hamilton Theorem(without proof) – Inverse and Powers of a matrix by cayley-Hamilton theorem- Diagonolization of matrix.Calculation of Powers of matrix- Modal and spectral matrices. Quadratic forms- Reduction of quadratic form to canonical form-rank- positive, Negative definite-semi definite-Index-Signature.

UNIT-III
Sequences – Series : Basic definitions of Sequences and Series- Convergence and divergence – Comparison test- Ratio test – Integral test- Cauchy's root test- Raabe's Test – Absolute and Conditional Convergence .

UNIT-IV
Functions of Single& Several Variables: Rolle's Theorem –Lagrange's Mean value Theorem – Cauchy's Mean value theorem- Generalized Mean value theorem (all theorems without proof), Functions of Several Variables- Functional dependence –Jacobian- Maxima and Minima of functions of two variables with constraints and without constraints.

UNIT-V
Applications of Single Variable & Multiple Integrals: Radius, Centre and Circle of Curvature- Evolutes and Envelopes.
Multiple integrals – double integral – Change of variables – Change of order of integration and Triple integrals.

TEXT BOOKS:

1. Kreyszig's Engineering Mathematics – I by Dr. A. Ramakrishna Prasad, 2014 yr Edition John Wiley Publications.
2. Advanced Engineering Mathematics by R.K. Jain &S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics by Kreyszig, 8th Edition, John Wiley & Sons Publishers
2. Higher Engineering Mathematics by B.S. Grewal, 36th Edition, Khanna Publishers.
3. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, CRC Press Taylor & Francis Group.
4. Mathematics for Engineering and Scientists. Alan Jeffrey, 6th Edi, 2013, Chapman & Hall / CRC
5. Engineering Mathematics – I by T.K.V. Iyengar, B. Krishna Gandhi & Others, 2013 Yr. Edition S.Chand.
6. Engineering Mathematics – I by D.S. Chandrasekhar, Prison Books Pvt. Ltd.
7. Engineering Mathematics – I by G. ShankerRao& Others I.K. International Publications.

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(A1013) ENGINEERING PHYSICS- I

UNIT-I

Optics: Interference: Introduction, interference in thin films (reflected light), Newton rings.
Diffraction: Introduction, Fraunhofer diffraction due to single slit, double slit and N-slits, Diffraction grating experiment, Rayleigh criterion and resolving power of grating.
Polarisation: introduction, Malus law, Brewster,s law, double refraction, construction and working of Nicol's prism, polaroids, quarter wave and half wave plates.

UNIT-II

Crystallography: Ionic bond, covalent bond, metallic bond, hydrogen bond, Vander-Waal's bond, calculation of cohesive energy ionic crystal, space Lattice, unit cell, lattice parameters, seven crystal system, Bravais lattices, atomic radius, co-ordination number and packing factors of SC, BCC, FCC structures, Structures of CsCl, NaCl and Diamond.
Crystal planes and directions, Miller indices, inter planar spacing of orthogonal crystal
X-ray Diffraction: Bragg's law, X- ray diffraction methods: powder method, applications of X- ray diffraction

UNIT-III

Defects in Solids Point defects: vacancies, substitutional impurities, interstitial impurities, Frenkel and Schottky defects; qualitative treatment of line defects (Edge and Screw dislocations), Burger's vector, surface defects.

Statistical Mechanics Maxwell-Boltzman, Bose-Einstein and Fermi-Dirac statistics (qualitative treatment), concept of electron gas, density of states, Fermi distribution function - the effect of temperature on the distribution and Fermi energy.

UNIT-IV

Principles of Quantum Mechanics: Waves and particles, de-Broglie Hypothesis, matter waves, Davisson and Germer's experiment, G.P. Thomson experiment, Heisenberg's uncertainty principle, Schrödinger's time independent wave equation - physical significance of the wave function – infinite square well potential.

Band Theory of Solids: Assumptions of classical and quantum free electron theory of metals and their limitations, origin of energy band formation in solids, electron in a periodic potential: Bloch theorem, Kronig- Penny model (qualitative treatment), E-K curve, concept of effective mass of an electron, classification of materials into conductors, semiconductors & insulators.

UNIT-V

Semiconductor Physics: Introduction, Fermi level in intrinsic and extrinsic semiconductors, calculation of carrier concentration in intrinsic and extrinsic semiconductors, direct & indirect band gap semiconductors, Hall effect.

Physics of Semiconductor Devices: Formation of PN junction, open circuit pn junction, energy diagram of PN diode, diode equation, I-V Characteristics of PN junction diode, LED photo diode and solar cell.

TEXT BOOKS:
1. Engineering Physics by P K Palani Samy, Scitech Publications.
2. Applied Physics for Engineers by Dr.P.MadhusudanaRao, Academic Publishing Company.
3. Solid State Physics by S.O. Pillai (Main edition) – New Age Publishers.

REFERENCE BOOKS:
1. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker by John Wiley & Sons
2. Introduction to Solid State Physics – C. Kittel (Wiley Eastern).
3. Modern Physics by K. *Vijaya Kumar*, S. Chandralingam, *S*. Chand & Co.
4. Engineering Physics by R.K.Gaur and S.L.Gupta; Dhanpat Rai and Sons.

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(A1016) ENGINEERING CHEMISTRY

UNIT I

WATER TECHNOLOGY: Sources of water – Impurities in water – Hardness of water – Temporary and Permanent Hardness – Units. Estimation of temporary and permanent hardness of water – EDTA method; Numerical problems; Potable Water treatment – Specifications; Steps involved in treatment - Sedimentation – Coagulation – Filtration – Sterilisation – Desalination of Brackish Water – Reverse Osmosis and Electro dialysis.

Industrial   water treatment – Boiler Troubles – Scales   and   Sludges; Caustic Embrittlement; Boiler Corrosion; Priming and Foaming. Hot lime and Cold lime soda process; Numerical Problems;   Zeolite Process and Ion Exchange Process. Internal conditioning methods like – Phosphate, Carbonate, Calgon, Colloidal, Radioactive, Electrical and Sodium aluminate conditioning.

UNIT II

BATTERY TECHNOLOGY: Electrode Potential – Determination of Single Electrode Potential;galvanic cells; Primary Cell – Dry or Leclanche Cell, Secondary Cell – Lead acid storage Cell ; Ni – Cd batteries, , Fuel Cell – Hydrogen Oxygen Fuel Cell. Methanol – Oxygen fuel cell.
Solar – Photoelectric cells – Applications of solar cells.

UNIT III

CORROSION AND ITS CONTROL: Causes and effects of corrosion. Theories of Corrosion – Chemical & Electrochemical corrosion; Types of corrosion (Galvanic, Waterline, Pitting and Inter granular); Pilling bed-worth Rule. Factors affecting rate of corrosion – Nature of metal and Nature of Environment – Corrosion control methods – Cathodic protection (sacrificial anodic and impressed current).

UNIT IV

PROTECTIVE COATINGS: Surface coatings: Metallic coatings & methods of application of metallic coating – Hot dipping   (Galvanization & Tinning);   Cementation, Metal Cladding; Electroplating   (copper plating); Electroless plating (Ni Plating); Organic coatings – Paints – Constituents and their functions. Varnishes, Enamels & Lacquers.

UNIT V

 PHASE RULE: Definitions of terms - Phase, Component and Degree of Freedom. Phase Rule Equation. Phase diagrams – One Component System – Water System; Two Component System – Silver Lead System; Cooling Curves. Iron – Carbon Phase Diagram; Heat treatment of steel. Hardening. Annealing, and Normalizing.

TEXT BOOKS:

1. Engineering chemistry by B.Rama Devi & Ch. Venkata Ramana Reddy; Cengage Learning, 2012
2. Engineering Chemistry P.C.Jain and M.Jain, Dhanapat Rai & Sons
3. Engineering chemistry by Dr.Bharathi kumari,Dr.Jyotsna
4. Engineering chemistry by Thirumala chary,E.Laxminyarana ,SCITECHPublicationa(India) p ltd

REFERENCE BOOKS:

1.   A Textbook of Engineering Chemistry, S.S.Dara, S.Chand & Co.
2.   A Textbook of Engineering Chemistry, Sashi Chawla, Dhanapath Rai & Sons
3.   Engineering Chemistry, B.K.Sharma Et al

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(A1301) ENGINEERING MECHANICS-I

OBJECTIVE: This course introduces the basic principles of engineering mechanics with emphasis on their analysis and application to practical engineering problems.

UNIT-I
Introduction to Mechanics : Basic Concepts, system of Forces Coplanar Concurrent Forces -Components in Space -Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

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
Centroid and Center of Gravity: Introduction – Centroids of lines – Centroids of area - Centroids of Composite figures - Theorem of Pappus -Centre of Gravity of Bodies – Centroids of Volumes – Center of gravity of composite bodies.

UNIT-IV
Area moments of Inertia: Introduction – Definition of Moment of Inertia -Polar Moment of Inertia – Radius of gyration - Transfer Theorem for moment of inertia – Moments of inertia by integration - Moments of Inertia of Composite Figures, Product of Inertia, Transfer Formula for Product of Inertia.

UNIT-V
Mass Moment of Inertia: Introduction - Moment of Inertia of Masses – Radius of gyration - Transfer Formula for Mass Moments of Inertia – Mass moments of inertia by integration - Mass moment of inertia of composite bodies.

TEXT BOOKS:

1. Singer's Engineering Mechanics Statics and Dynamics , K. Vijaya Kumar Reddy, J. Suresh Kumar, BS Publications, 3rd Edition(SI Units)Fifth impression 2013
2. Engg. Mechanics / Timoshenko & Young

REFERENCE BOOKS:

1. Engg. Mechanics/ Irving Shames, G. Krishna Mohan Rao, Prentice Hall
2. Engg. Mechanics Umesh Regl / Tayal.
3. A text of Engineering Mechanics /YVD Rao/ K. Govinda Rajulu/ M. Manzoor Hussain, Academic Publishing Company
4. Text Book in Applied Mechanics / Malhotra, Subramanian, Gahlot and Rathore / New Age.
5. Engg. Mechanics / KL Kumar / Tata McGraw Hill..
6. Engg. Mechanics / S.S. Bhavikati & K.G. Rajasekharappa

COURSE OUTCOMES:
➢ **By undergoing this course, students will be** Able to find the resultants of any force systems and determine equivalent force systems.
➢ Able to solve the problems associated with friction surfaces
➢ Able to obtain the centroid, first moment and second moment of an area

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                                                                  3   0   3   2

(A1302) ENGINEERING GRAPHICS
(Common to MECH & CIVIL ENGG Branches)

OBJECTIVE: The objective of this subject is to provide the basic concepts about Engineering Drawing. Detailed concepts are given in projections, technical drawing, dimensioning and specifications.

UNIT – I
Introduction to Engineering Drawing :
Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, involutes.

UNIT-II
 Scales – Plain, Diagonal, Vernier and comparative scales.

UNIT- III
Orthographic Projections:
Principles of Orthographic Projections – Conventions – Projections of Points and Lines.

UNIT-IV
Projection of Planes: regular geometric figures.-Auxiliary Planes.

UNIT-V
Projection of Solids: Projection of regular solids, cube, prisms, pyramids, cone –use of Auxiliary Views.
Sections and Sectional Views: Right regular solids - prism, cylinder, pyramid, cone – use of Auxiliary views.

TEXT BOOKS:

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and Graphics Rane and Shah/ Pearson Edu.

REFERENCE BOOKS:

1. A Text Book of Engineering Drawing / Dhawan R K / S. Chand
2. Engineering Graphics With Auto CAD / James D Bethune / Pearson Edu.
3. Engineering Graphics / K R Mohan / Dhanpat Rai.
4. Text book on Engineering Drawing / KL Narayana/ P Kannaih / Scitech

OUTCOMES:

➢ **By undergoing this course, students will be** Able to understand the conventions and the methods of engineering drawing.
➢ Able to understand and draw the projections of points, lines, planes and solids in different types of projections.
➢ Able to draw the surface sheath of solids by development of surfaces and prepare drawings of solids and their inter penetrations.

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B.Tech. Mech. Engg. I-Sem   **L   T   P   C**
                                                                      0   0   3   2

(A1303) ENGINEERING WORKSHOP
(COMMON TO ALL BRANCHES)

I   Trade for Exercise:
(Two experiments each from any six trades of the following)
1. Carpentry
2. Fitting
3. Tin-smithy
4. House-wiring
5. Foundry
6. Plumbing
7. Welding
8. Black smithy

II   Trades for Demonstration and Exposure:

1. Power tools
2. Machine tools

TEXT BOOK:

1. Workshop Manual, Second edition/ P Kannaiah and K L Narayana/ Scitech publishers

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B.Tech. Mech. Engg. I-Sem   **L   T   P   C**
                                                                                                0   0   3   2

(A1003) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

OBJECTIVES:

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

Exercise – I

- **CALL Lab**: Introduction to Phonetics – Speech Sounds – Vowels and Consonants
- **ICS Lab**: Ice-Breaking activity and JAM session Articles, Prepositions, Word formation- Prefixes & Suffixes, Synonyms & Antonyms

Exercise – II

- **CALL Lab:** Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.
- **ICS Lab:** Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing Others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette. Concord (Subject in agreement with verb) and Words often miss pelt-confused/misused

Exercise – III

- **CALL Lab**: Minimal Pairs- Word accent and Stress Shifts- Listening Comprehension.
- **ICS Lab**: Descriptions- Narrations- Giving Directions and guidelines. Sequence of Tenses, Question Tags and One word substitutes.

Exercise – IV

- **CALL Lab**: Intonation and Common errors in Pronunciation.
- **ICS Lab**: Extempore- Public Speaking Active and Passive Voice, –Common Errors in English, Idioms and Phrases

Exercise – V

- **CALL Lab**: Neutralization of Mother Tongue Influence and Conversation Practice
- **ICS Lab**: Information Transfer- Oral Presentation Skills Reading Comprehension.

OUTCOMES:

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

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(A1548) IT WORKSHOP

OBJECTIVES: The IT Workshop for engineers is a training lab course spread over 42 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel and Power Point.

PC Hardware:

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

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

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

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

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

Internet & World Wide Web:

Week 6 - Task 1 : **Orientation & Connectivity Boot Camp :** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

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

Week 7 -Task 3: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Productivity tools

LaTeX and Word:

Week 8 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007/ equivalent (FOSS) tool word: Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the three tasks and features that would be covered in each, using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

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

Week 9 - Task 2: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Week 10 - Task 3 : Creating a Newsletter : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel:

Week 11 - Excel Orientation: The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the two tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

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

Week 12 - Task 2 : Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting

LaTeX and MS/equivalent (FOSS) tool Power Point:

Week 13 - Task1: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Power point.Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

Week 14 - Task 2: Second week helps students in making their presentations interactive. Topic covered during this week includes: Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

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

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

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OUTCOMES:

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

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

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

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(A1002) ENGLISH – II

OBJECTIVES:

- ➢ Take part in a discussion about the business
- ➢ Listen to an explanation and respond
- ➢ Write a formal letter
- ➢ Read company literature

UNIT I
- ➢ Chapter entitled 'Mokshagundam Visvesvaraya' from "Epitome of Wisdom", Published by Maruthi Publications, Hyderabad.
  - L-Conversations – Introducing each other, Talk ing about a course.
  - S- Opinion based questions
  - R- Reading for Subject/ Theme - The Palm island
  - W- Writing Paragraphs
  - G- Joining ideas by conjunctions, Adverbs
  - V- Prefixes and suffixes

UNIT –II
- ➢ Chapter entitled 'Three days To See' from "Epitome of Wisdom", Published by Maruthi Publications, Hyderabad.
  - L – Conversations – Planning for an outing
  - S – Debate
  - R- 'Physically challenged athletes
  - W- Report writing
  - G- Expressing yourself with modal auxiliary verbs
  - V- Collective nouns – Synonyms, Prefixes

UNIT –III
- ➢ Chapter entitled 'Leela's Friend' by R.K. Narayan from "Epitome of Wisdom", Published by Maruthi Publications, Hyderabad

  - L – for main points and sub-points for note taking
  - S – Presentations
  - R – reading for details
  - W – note-making, information transfer, punctuation
  - V – Guessing the words, using an appropriate word, Phrasal verbs

UNIT –IV
- ➢ Chapter entitled 'The Last Leaf' from "Epitome of Wisdom", Published by Maruthi Publications, Hyderabad
  - L -Listening for specific details - 'Speech on Environmental conservation'
  - S- Group Discussions - narrating, expressing opinions
  - R –Choose how to start your day
  - W- Writing a Precis
  - G- Relating objects by using preposions, Ergative verbs
  - V- Vocabulary - idioms

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UNIT –V
➤ Chapter entitled 'The Convocation Speech' by N.R. Narayanmurthy' from "Epitome of Wisdom",
Published by Maruthi Publications, Hyderabad
- L- Speech on 'How do you make a teacher great?'
- S- Role play – Interviewing famous personalities
- R- Critical reading, reading for reference – 'What is meant by Entrepreneurship?'
- W-Essay writing
- G- Focussing with passive voice
- V- One word substitutes

TEXT BOOK:

1. **"Epitome of Wisdom",** Maruthi Publications, Hyderabad.
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REFERENCE BOOKS:

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

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(A1007) ADVANCED CALCULUS

UNIT-I

 Differential equations of first order and their applications: Over view of Differential equations – exact, Linear and Bernoulli's. Applications to Newton's Law of cooling, Law of Natural growth and decay, Orthogonal trajectories.

UNIT-II

Higher order Linear differential equations and their applications: Linear differential equations of second and higher order with constant coefficients.RHS term of the type $f(x) = e^{ax}, \sin ax, \cos ax and x^n, e^{ax}V(x), x^nV(x),$ method of variation of parameters. Applications to bending of beams, Electrical circuits, Simple harmonic motion.

UNIT-III

Laplace Transform and its applications to Ordinary Differential Equations: 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-IV

 Fourier Series: Determination of Fourier coefficients – Fourier Series – even and odd function – Fourier Series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

UNIT-V

Vector Calculus: Vector Differential Calculus: Scalar & vector point functions, Gradient – Divergence – Curl with geometrical & Physical interpretation. Directional derivatives, Vector differential operators &their related properties.

Vector Integral Calculus: Line integral – Work done – scalar potential function, surface integrals – Flux of Vector valued function, Volume integrals.
Vector integral theorems: Gauss's Divergence theorem, Green's theorem, Stoke's Theorem (Statement and their verification).

TEXT BOOKS:

1. Kreyszig's Engineering Mathematics – I by Dr. A. Ramakrishna Prasad, 2014yr Edition John Wiley Publications.
2. Advanced Engineering Mathematics by R.K. Jain &S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.

REFERENCE BOOKS:

1. Kreyszig's Mathematical Methods by Dr. A. Ramakrishna Prasad, 1st Edition John Wiley Publications.
2. Advanced Engineering Mathematics by Kreyszig, 8th Edition, John Wiley & Sons Publishers
3. Higher Engineering Mathematics by B.S. Grewal, 36th Edition, Khanna Publishers.
4. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, CRC Press Taylor & Francis Group.
5. Mathematics for Engineering and Scientists. Alan Jeffrey, 6th Edi, 2013, Chapman & Hall / CRC
6. Engineering Mathematics – I by T.K.V. Iyengar, B. Krishna Gandhi & Others, 2012 Yr. Edition S.Chand.
7. Engineering Mathematics – I by D.S. Chandrasekhar, Prison Books Pvt. Ltd.
8. Engineering Mathematics – I by G. ShankerRao& Others I.K. International Publications.

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(A1014) ENGINEERING PHYSICS-II

UNIT-I

Lasers: Characteristics of lasers, spontaneous and stimulated emission of radiation, Einstein's coefficients and relation between them, population inversion, lasing action in ruby laser, Helium-Neon laser, semiconductor diode laser, applications of lasers.

Fiber Optics: Principle of optical fiber, construction of fiber, acceptance angle and acceptance cone, numerical aperture, types of optical fibers: step index and graded index profiles, attenuation in optical fibers, optical fiber communication, optical fiber sensors.

UNIT-II

Dielectric Properties: Electric dipole, dipole moment, dielectric constant, polarizability, electric susceptibility, displacement vector, electronic, ionic, orientation and space charge polarizations and derivation of polarizabilities, internal fields in solids, Clausius - Mossotti equation, piezo-electricity, ferro- electricity and pyro-electricity.

UNIT-III

Magnetic Properties & Superconducting Properties: Permeability, field intensity, magnetic field induction, magnetization, magnetic susceptibility, origin of magnetic moment, Bohr Magneton, classification of dia, para and ferro, ferri and anti-ferro magnetic materials on the basis of magnetic moment, domain theory of ferro magnetism on the basis of hysteresis curve, soft and hard magnetic materials.

Superconductivity: Introduction, critical field, Meissner effect, effect of magnetic field, type-I and type-II superconductors, BCS theory (qualitative), applications of superconductors.

UNIT-IV

Electromagnetic Theory: Review of steady and varying fields – Conduction and displacement current – Maxwell's equations in integral and differential forms – Electromagnetic wave equations in free space, dielectric and conducting media – Poynting theorem.

UNIT-V

Nanotechnology: Origin of nanotechnology, nano scale, surface to volume ratio, quantum confinement, bottom-up fabrication: sol-gel, precipitation, combustion methods; top-down fabrication: chemical vapour deposition, physical vapour deposition, pulsed laser vapour deposition methods, characterization by XRD & TEM; properties and applications.

Acoustics: Basic requirements 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 remedies.

Ultrasonics: Introduction, production of ultrasonics using piezoelectric method –magnetostriction method-applications.

TEXT BOOKS:

1. Engineering Physics by P K Palani Samy, Scitech Publications.
2. Applied Physics for Engineers by Dr.P.MadhusudanaRao, Academic Publishing Company.
3. Solid State Physics by S.O. Pillai (Main edition) – New Age Publishers.

REFERENCE BOOKS:

1. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker by John Wiley & Sons
2. Introduction to Solid State Physics – C. Kittel (Wiley Eastern).
3. Modern Physics by K. Vijaya Kumar, S. Chandralingam: S. Chand & Co.
4. Engineering Physics by R.K.Gaur and S.L.Gupta; Dhanpat Rai and Sons.

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(A1018) CHEMISTRY OF ENGINEERING MATERIALS

UNIT I

HIGH POLYMERS: Types of polymerization (addition, condensation and copolymerization).

Plastics: Thermoplastic and Thermosetting resins, Compounding and fabrication of plastics (compression and injection moulding). Preparation, properties, Engineering applications of PVC, Teflon and Bakelite.
Fibers: Characteristics of fibers – preparation, properties and uses of Nylon – 6,6 and Dacron – Fibre Reinforced Plastics (FRP) – applications.
Rubbers: Natural rubber and its vulcanization.
Elastomers: Buna – s, Butyl rubber and Thiokol rubber.
Conducting Polymers: Polyacetylene, Polyaniline, Mechanism of conduction doping, applications of conducting polymers.
Bio-degradable polymers: Preparation and applications of Polyvinyl acetate and Polylactic acid.

UNIT II

MATERIAL CHEMISTRY: Nanomaterials: Introduction, preparation   by sol-gel and chemical vapour deposition methods. Applications of nanomaterials - Superconductors, Semiconductors, Insulators and its applications.
Cement – Chemical composition of cement, Manufacture of Portland cement, Setting and Hardening of cement, Various reactions involved.

UNIT III

FUEL TECHNOLOGY: Gaseous Fuels: Classification of fuels – characteristics of fuels-calorific value-units. Determination - Bomb calorimeter - Dulong's formula.
Solid fuels- Coal; Classification of coal by rank-Analysis of coal-Proximate and Ultimate analysis and its significance; Coke - Manufacture of Coke- Beehive Oven and Otto Hoffmann's by Product Oven process.
Liquid fuels: Refining of Petroleum-,Cracking-types,fixed bed catalytic cracking.Petroleum products used as Fuels-Gasoline-Knocking and Octane Number of Gasoline, Synthetic Petrol- Bergius and Fischer Tropsch method. Diesel – Cetane number ,High speed and Low speed diesel oils ; LPG and Natural gas.

UNIT IV

Classification with examples – Characteristics of a good lubricant, Mechanism of lubrication (thick film, thin film and extreme pressure); Properties of lubricants; Viscosity – Cloud point & pour point; Flash point & Fire point, Saponification number-Carbon residue, Emulsification number, Precipitation number, Neutralisation number

UNIT V

SURFACE CHEMISTRY: Adsorption – Types of Adsorption, Isotherms – Freundlich and Langmuir adsorption isotherm, applications of adsorption.
Colloids: Classification of colloids; Mechanical – Brownian movement. Electrical – Electrophoresis, Electro-osmosis. Iso electric point. Optical – Tyndall effect. Micelles. Applications of colloids in industry.

TEXT BOOKS:

1. Engineering chemistry by B. Rama Devi & Ch. Venkata Ramana Reddy; Cengage Learning, 2012
2. Engineering Chemistry P.C .Jain and M.Jain, Dhanapat Rai & Sons
3. Engineering chemistry by Dr.Bharathi kumari, Dr.Jyotsna
4. Engineering chemistry by Thirumala chary,E.Laxminyarana ,SCITECHPublicationa(India) p ltd

REFERENCE BOOKS:

1. A Textbook of Engineering Chemistry, S.S.Dara, S.Chand & Co.
2. A Textbook of Engineering Chemistry, Sashi Chawla, Dhanapath Rai & Sons
3. Engineering Chemistry, B.K.Sharma Et al

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(A1539) 'C' PROGRAMMING & DATA STRUCTURES

OBJECTIVES:

1. Understand computer basic's, algorithms, flowcharts and write simple 'C' programs, data
   types and operators, Console I/O functions, Decision making statements and loops.
2. Understand the concepts of functions and pointers.
3. Understand the concepts of strings and various string handling functions and Arrays.
4. Understand the concepts related to structures and able to differentiate between structure and union, Storing of large data using files.
5. Understand and analyze various searching and sorting algorithms, data structures such as stacks and queues.

UNIT – I
Introduction to Computers- Elements of computer processing, Hardware and software, Computing Environments, Computer Languages, SDLC, Problem solving-algorithms, Pseudo code, and flowcharts.
Introduction to C Language- History, Structure of a C program, Simple C Program, Compilation process (program development).Identifiers, Data Types, Variables, Constants, Console I/O (printf, scanf), Operators – Arithmetic, Relational, Logical, Conditional, Increment/Decrement etc, Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, pre-processor directives, Simple C Programming examples.

UNIT-II
Decision Statements and loops- Introduction, IF statement- Simple IF Statement, the IF ELSE Statement, Nesting of IF ELSE Statement, The ELSE IF Ladder. The Switch Statement, Repetition statements - for, While, do-while statements, Jump statements, Simple C Programming examples.
Functions-Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion-recursive functions, Limitations of recursion, example C programs, Command line arguments.

UNIT-III
Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples.
Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

UNIT-IV
Structures and Union: Declaring and initializing a structure, Accessing the members of a structure, Nested structures, self referential structures, Declaring and initializing a union. Enumerated types, typedef, bit fields.
Files- Concept of a file, streams, text files and binary files, Differences between text and binary files, Modes of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling), C program examples.

UNIT-V
Searching and Sorting – Sorting- selection sort, bubble sort. Searching - linear and binary search methods.
Data Structures – Introduction to Data Structures, Stacks –Operations, array representations of stacks, stack applications, Queues – Operations, array representations of queues.

TEXT BOOKS:

1   C programming- A Problem-Solving Approach by Behrouz A.Forouzan,
2   How to Program, E.V.Prasad,Richard F.GilbergC Paul Deitel and Harvey Deitel,   PH.
3   Computer Programming and Data Structures by E Balagurusamy, Tata McGraw   Hill.
4   Yedidyah Langsam , Moshe J. Augenstein and Aaron M. Tenenbaum, Data Structures using C and C++. 2 ed, Pearson Education.
5   C Programming& Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.

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REFERENCE BOOKS:

1. Kanetkar, Yashavant, Let Us C, BPB.
2. The C Programming Language by Brain W.Kernighan, Dennis M.Ritchie.
3. Programming in C, 2/e By Ashok Kamthane.
4. Absolute beginner's guide to C, Greg M. Perry, Edition 2, Publisher: Sams Pub., 1994.
5. C & Data structures – P. Padmanabham, Third Edition, B.S. Publications.
6. Mark Allen Weiss, *Data structure and Algorithm Analysis in C.* Addison Wesley Publication.

ELECTRONIC MATERIALS, WEBSITES:

1. http://en.wikiversity.org/wiki/Topic:C
2. www.cprogramming.com
3. https://www.youtube.com/user/mycodeschool
4. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

OUTCOMES:

1. Understand the algorithms, flowcharts implementation of simple 'C' programs, data types and operators and Console I/O functions. Implement the decision control statements, loop control statements and case control structures.
2. Declare and implement the pointers and functions.
3. Declare and implement the arrays and strings.
4. Understand the structures declaration, initialization and implementation, understand the file operations, Character I/O, String I/O, File pointers and importance of pre-processor directives.
5. Understand the searching and sorting algorithms, and to solve the problems using data structures such as stacks and queues using arrays.

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(A1304) ENGINEERING MECHANICS-II

OBJECTIVE: This course is to introduce the basic principles of engineering mechanics with emphasis on their analysis and application to practical engineering problems.

UNIT-I

Kinematics of a Particle: Motion of a particle – Rectilinear motion – motion curves – Rectangular components of curvilinear motion– Kinematics of Rigid Body - Types of rigid body motion -Angular motion - Fixed Axis Rotation

UNIT-II

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

UNIT-III

Work Energy- Method: Work Energy equations for translations. Work Energy   Applications to Particle Motions. Work Energy applied to connected systems. Work Energy applied to fixed axis rotation and plane motions.

UNIT-IV

Virtual Work and Impulse Momentum: Introduction- Principle of Virtual work and uses of Principle of Virtual Work. Impulse and Momentum- Applications

UNIT-V

Mechanical Vibrations: Definitions and Concepts- Simple Harmonic Motion- Free Vibrations- Simple Pendulum, Compound Pendulum and Torsion Pendulum. Free Vibrations without Damping (General Cases).

TEXT BOOKS:

1. Singer's Engineering Mechanics Statics and Dynamics , K. Vijaya Kumar Reddy, J. Suresh Kumar, BS Publications, 3rd Edition(SI Units)Fifth impression 2013
2. Engg. Mechanics / Timoshenko & Young

REFERENCE BOOKS:

1. Engg. Mechanics/ Irving Shames, G. Krishna Mohan Rao, Prentice Hall
2. Engg. Mechanics Umesh Regl / Tayal.
3. A text of Engineering Mechanics /YVD Rao/ K. Govinda Rajulu/ M. Manzoor Hussain, Academic Publishing Company
4. Text Book in Applied Mechanics / Malhotra, Subramanian, Gahlot and Rathore / New Age.
5. Engg. Mechanics / KL Kumar / Tata McGraw Hill.
6. Engg. Mechanics / S.S. Bhavikati & K.G. Rajasekharappa

OUTCOMES: By undergoing this course, students will be able to,

1. Understand and analyze kinetics of a particle.
2. Understand and apply work enrgy principles to practical problems.
3. Understand concepts of vibration.

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(A1305) ENGINEERING GRAPHICS& AUTO CAD
(Common to MECH & CIVIL Branches)

OBJECTIVES:

1. The objective of this subject is to provide the basic concepts about Engineering Drawing. Detailed concepts are given in projections, technical drawing, dimensioning and specifications

2. It is ideal to master the fundamentals of engineering drawing first and to later use these fundamentals for a particular application, such as computer aided drafting. Engineering. Drawing is the language of engineers, by studying this course engineering and technologystudents will eventually be able to prepare drawings of various objects being used in technology.

UNIT - I

Development of Surfaces: Development of right, Regular solids – prisms, cylinder, pyramids, cone and their parts, frustum of solids.

UNIT-II

Intersection of Solids: Intersection of cylinder Vs cylinder, cylinder Vs prism, cylinder Vs cone.

UNIT – III

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-IV

Transformation of Projections: Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions
Perspective Projections: Perspective view : points, lines and plane figures, vanishing point methods(General Method only)

UNIT-V

Computer Aided Drawing: Introduction, starting the software, types of coordinate systems, tool bars & menu bars, General Software commands, Orthographic & Isometric Projection -Simple drawings.
(Practice on AutoCAD; Examination on writing command sequence/ script files only)

TEXT BOOKS:

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and Graphics Rane and Shah/ Pearson Edu.
3. Engineering Drawing And Graphics + AutoCAD, K Venugopal, New Age International.

REFERENCE BOOKS:

1. A Text Book of Engineering Drawing / Dhawan R K / S. Chand
2. Engineering Graphics with Auto CAD / James D Bethune / Pearson Edu.
3. Engineering Graphics / K R Mohan / Dhanpat Rai.
4. Text book on Engineering Drawing / KL Narayana/ P Kannaih / Scitech
5. Computer Aided Engineering Drawing / S.Tryumbaka Murthy/ I.K.Internatinal

OUTCOMES:

➢ Able to draw the surface sheath of solids by development of surfaces and prepare drawings of solids and their inter penetrations.

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(A1560) 'C' PROGRAMMING & DATA STRUCTURES LAB

	WEEK WISE PROGRAMS
Week 1	Basic DOS Commands
Week 2	a)Write a simple C program to Print "Hello World" b) Write a simple C program Declaring Variable and Printing its Value c) Write a simple C Program to Calculate Area and Circumference of Circle
Week 3	a) Write a simple C program to implement basic arithmetic operations - sum, difference, product, quotient and remainder of given numbers. b)Write a C program using Assignment Operator. c) Write a C program using Logical Operator.
Week 4	a)Write a C Program to Demonstrate the increment and decrement operators. b)Write a C Program to multiply given number by 4 using bitwise operators c)Write a C Program to demonstrate Ternary condition/conditional operator.
week 5	a) Write a C programs - to find the largest and smallest of 2 numbers(if – else), to find the largest and smallest of 3 numbers(Nestedif – else), roots of quadratic equation(else – if ladder). b)The total distance traveled by vehicle in 't' seconds is given by distance=ut+1/2at^2 where 'u' and 'a' are the initial velocity and acceleration. Write a c program to find the distance traveled at regular intervals of time given the values of'u' and 'a'.The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'. c)Write a c program ,which takes two integer operands and one operator from the user,performs the operation and the prints the result.(consider the operators +,-,*,/,% and use switch statement).
week 6	a)Write a C program to find the sum of individual digits of a positive integer b) A Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 1.Subsequent terms are found by adding the preceding two terms in the sequence .Write a c program to generate the first n terms of the sequence. c) Write a c program to generate all the prime numbers between 1 and n ,where n is a value supplied by the user.
week 7	a)Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x2+x3+………….+xn b) Write a C program to generate Pascal's triangle. c) Write a C program to construct a pyramid of numbers

week 8	a)Write a programs that use both recursive and non-recursive functions
	  i)To find the factorial of a given integer.(non- recursive)
	  ii)To find the GCD of two given integers.(Non-recursive)

week 9	a)Write a c program to find both the largest and smallest number in a list of integers.

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	b)write a c program that uses functions to perform the following:
	   i)Addition of Two Matrices.
	   ii)Multiplication of Two Matrices.

week 10	a) Write a c program that uses functions to perform the following operations: i)To insert a sub-string in given main string from a given position. ii) To delete n Characters from a given position in a given string. b)Write a C program to determine if the given string is a palindrome or not

week 11	Write a C program that uses functions to perform the following operations:
	        i) Reading a complex number
	        ii) Writing a complex number
	        iii) Addition of two complex numbers
	        iv) Multiplication of two complex numbers
	(Note: represent complex number using a structure.)

week 12	a)Write a C program which copies one file to another b) Write a C program to reverse the first n characters in a file. (Note: The file name and n are specified on the command line).
week 13	a)Write a C program that implements the following sorting methods to sort a given list of integers in ascending order i) Bubble sort ii)Selection sort b) Write C programs that use both recursive and non recursive functions to perform the following searching operation for a Key value in a given list of integers : i)Linear search ii)Binary search
week 14	**a)** Write C programs that implement Stack (its operations) using Arrays **b)** Write C programs that implement Queue (its operations) using Arrays

OUTCOMES:

1. To understand the various steps in program development.
2. To understand the basic concepts in C Programming Language.
3. To understand different modules that includes conditional and looping expressions.
4. To understand how to write modular and readable C Programs.
5. To write programs in C to solve problems using arrays, structures and files.
6. To understand the behavior of data structures such as stacks, queues.
7. To understand and analyze various searching and sorting algorithms.
8. To write programs in C to solve problems using data structures such as arrays.

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(A1015) ENGINEERING PHYSICS LAB

OBJECTIVES:

- ➢ The objective of the course is that the student will have exposure to various experimental skills which is very essential for an Engineering student.
- ➢ The experiments are selected from various area of Physics like Physical Optics, Lasers, Fiber Optics, Sound,
- ➢ Mechanics, Electricity & Magnetism and Basic Electronics.
- ➢ Also the student is exposed to various tools like Screw gauge, Vernier Callipers, Physics Balance , Spectrometer and Microscope.

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

REFERANCE BOOK:

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

OUTCOMES:

1 The student is expected to learn from this laboratory course the concept of error and its analysis. It also allows the student to develop experimental skills to design new experiments in Engineering.
2 With the exposure to these experiments the student can compare the theory and correlate with experiment.

(A student will perform any ten experiments among the above)

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(A1019) ENGINEERING CHEMISTRY LAB

I Inorganic chemistry experiments by Analytical methods.

Water Analysis:

1. Estimation of Hardness of water by EDTA method
2. Estimation of Alkalinity of water.

II. Instrumentation.

3. Estimation of Copper by colorimetric Method.
4. Conductometric Titration of a strong acid vs a strong base
5. Potentiometric Titration of a strong acid vs a strong base

III.Identification and preparation of organic compounds

6. Preparation of ASPIRIN
7. Preparation of Thiokol Rubber

IV.Physical chemistry experiments

8. Determination of Viscosity of a Liquid.
9. Determination of Surface Tension of a liquid.
10. Adsorption of acetic acid on activated charcoal
11. Determination of melting point and Boiling point of given solids and liquids

V.Cement Analysis

12. Determination of Ferric iron in cement by Colorimetry

REFERENCE BOOK:

1   Larorotorymaual of engg chemistry by Mukkantietal, VGS publications

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(A1008) MATHEMATICAL METHODS

Unit – I

Solutions of Linear & Non-Linear equations : Introduction to Algebraic and Transcendental Equations, Bisection Method, Method of False Position (Regula – False Method), Iteration Method, Newton – Raphson's Method, Errors in Polynomial.Gauss Jacobi's iterative method, Gauss-Seidel Method.

Unit – II

Interpolation& Curve fitting: Forward , Backward & Central Differences, Symbolic Relations, Newton's Forward & Backward Interpolation, Gauss's Forward & Backward Interpolation, Lagrange's Interpolation & Problems.
Fitting straight line, Fitting Non-Linear curve, Curve fitting by sum of Exponentials, Non-Linear Weighted least squares approximation.

Unit –III

Numerical Differentiation, Integrations & Solutions of ODE : Numerical Differentiation, Derivatives using forward & backward difference formula, Derivatives using central difference formula, Trapezoidal Rule, Simpson's 1/3 Rule, 3/8 Rule.
Introduction to Numerical solutions of ODE, Taylor's series method, Picard's method of Successive Approximations, Euler's method, Euler's Modified method, Runga-Kutta method , Predictor and Corrector method, Milne's Predictor and Corrector method, Adams-Moulton method.

Unit – IV

Partial differential equations: Introduction and Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions solutions of first order linear (Lagrange) equation and non-linear equations (Charpit's method).Method of separation of variables for second order equations – applications of Partial differential equations – Two dimensional wave equation.Heat equation.

Unit – V

 Fourier transforms & Z-transforms: Fourier integral theorem – Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – Inverse transforms – Finite Fourier transforms.
Z-transforms, inverse Z-transforms, properties, Damping rule, shifting rule, initial and final value theorems, convolution theorem, solution of difference equations by Z-transforms.

TEXT BOOKS:

1. Kreyszig's Mathematical Methods by Dr. A. Ramakrishna Prasad, 2014 yr Edition John Wiley Publications.
2. Advanced Engineering Mathematics by R.K. Jain &S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics by Kreyszig, 8th Edition, John Wiley & Sons Publishers
2. Higher Engineering Mathematics by B.S. Grewal, 36th Edition, Khanna Publishers.
3. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, CRC Press Taylor & Francis Group.
4. Mathematics for Engineering and Scientists. Alan Jeffrey, 6th Edi, 2013, Chapman & Hall / CRC
5. Introductory Methods of Numerical Analysis , S.S.Sastry, 4h Edition, Prentce Hall of India Pvt. Ltd.
6. Mathematical Methods by T.K.V. Iyengar, B. Krishna Gandhi & Others, 2013 Yr. Edition S.Chand.
7. Mathematical Methods by D.S. Chandrasekhar, Prison Books Pvt. Ltd.
8. Mathematical Methods by G. ShankerRao& Others I.K. International Publications.

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(A1307) METALLURGY & MATERIAL SCIENCE

OBJECTIVE: At some point of time or the other an engineering problem involves issues related to material selection. Understanding the behavior of materials, particularly structure-property correlation, will help selecting suitable materials for a particular application.

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

UNIT -II

Equilibrium Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cu-Sn and Fe-Fe$_3$C.

UNIT -III

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 plan carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

UNIT – IV

Heat treatment of Alloys: Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.
Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT – V

Ceramic materials: Crystalline ceramics, glasses, cermaets, abrasive materials, nonomaterials – definition, properties and applications of the above.
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

REFERENCE BOOKS:

1. Science of Engineering Materials / Agarwal
2. Materials Science / Vijendra Singh
3. Elements of Material science / V. Rahghavan
4. An introduction to material science / W.g.vinas & 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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OUTCOMES:

By undergoing this course, student will be able to

➢ Understand the relationship between crystal structure and microstructure of materials and mechanical properties.
➢ Identify, analyze and interpret the phases and microstructure of common ferrous and non-ferrous materials.
➢ Understand and identify suitable heat treatment process for common engineering applications for ferrous and non-ferrous materials.
➢ Understand structure, properties and processing methods for ceramic materials and composite materials.

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(A1308) MECHANICS OF SOLIDS

OBJECTIVE: The objectives of this course are to introduce students to continuum mechanics, elasticity theory and solid mechanics. The course is intended for students who are thinking about advanced studies in engineering.

UNIT-I

Simple Stresses and Strains : Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and 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 cantilver, simply supported and overhanging beams subjected to point loads , U.D.L, Uniformly Varying Loads and combination of these loads – Point of contraflexure – 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 of bending stresses – section modules of rectangular and circular sections (Solid and Hollow), I,T,Angle and Channel sections – Design of simple beam sections.
Shearing Stresses: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

UNIT-IV

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.

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

UNIT-V

Principal Stresses and Strains: Introduction- Stresses on an inclined section of a bar under axial loading- compound stresses- Normal and tangential stresses on an inclined plane for biaxial stresses- Two perpendicular normal stresses accompanied by a state of simple shear- Mohr's circle of stresses- Principal stresses and strains- Analytical and graphical solutions.
Theories of Failure: Introduction- various theories of failure- Maximum Principal stress theory, Maximum shear stress theory,Maximum Principal strain theory, Strain energy theory, Shear strain energy(Von mises) theory

TEXT BOOKS:

1. Strength of Materials by Andrew Pytel and Ferdinond L. Singer Longman
2. Strength of Materials by Jondar : Galgotia Publications
3. Mechanics of materials by Dr B C Punmia; Laxmi Publications

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REFERENCES BOOKS:

1. Strength of Materials by Bansal, Lakshmi Publications
2. Strenght of Mateirals by S. Tumoshenko
3. Strength of Materials by R.S. Khurmi; S. Chand & Co. 2005

OUTCOMES:

➢ **By undergoing this course, student will be able to** Learn elastic behavior of materials subjected to axial stresses/ Loads.
➢ Analyze for shear forces, shearing stresses, bending moment, flexural stresses and deflections on a beam subjected to different kinds of lateral loads
➢ Analyze for forces in pin jointed plane frames by appropriate method of analysis
➢ Design and analyze pressure vessels, both thin& thick cylinders subjected to internal and external pressure loads.

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(A1309) THERMODYNAMICS

Note: Use of Steam tables and Psychrometry chart is permitted in examination

OBJECTIVES:

To familiarize:
1. Basic concepts and first law of thermodynamics
2. Volumetric properties of pure fluids
3. Second law of thermodynamic
4. The concept of vapor/liquid equilibrium
5. The concept of chemical equilibrium

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, Exact & Inexact Differentials, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale

UNIT II

PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation.Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump , Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics

UNIT – III

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. 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

UNIT IV

Deviations from perfect Gas Model – Vader Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables. Mixtures of perfect Gases – Mole Fraction, Mass friction 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

UNIT - V

Psyhrometry: 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.

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

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TEXT BOOKS:

1. Engineering Thermodynamics / PK Nag /TMH, III Edition
2. Thermodynamics / C.P.Arora.

REFERENCE BOOKS:

1. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles /TMH
2. Fundamentals of Classical Thermodynamics – G. Van Wylan & R.E. Sonntag – John Wiley Pub.
3. Thermodynamics – J.P.Holman / McGrawHill

OUTCOMES:

➢ **By undergoing this course, student will be able to** Understand the basic concepts of thermodynamics.
➢ Understand and apply laws of thermodynamics to different systems.
➢ Understand and analyze properties of pure substances and gas mixtures
➢ Analyze air standard cycles and refrigeration cycles.

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(A1310) PRODUCTION TECHNOLOGY

UNIT – I

Casting: Steps involved in making a casting – Advantage of casting and its applications; Patterns- Types - Pattern making, , Materials used for patterns, pattern allowances and their construction; Properties of moulding sands and cores. Methods of Melting - Crucible melting and cupola operation – Defects in castings;

Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design.Solidification of casting – Solidificaion of pure metal – Nucleation and grain growth, casting design considerations

UNIT – II

Welding: Classification – Types of welds, welded joints and welding electrodes; Gas welding - Types, Gas Cutting. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding, Soldering and Brazing.

UNIT – III

Inert Gas Welding - TIG Welding, MIG welding, Friction welding, Induction welding, Explosive welding, Laser Welding; Heat affected zone in welding. Welding defects – causes and remedies. Destructive and non- destructive testing of welds.

UNIT – IV

Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth.
Rolling fundamentals – Theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements.
Stamping, Forming and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – Wire drawing and Tube drawing – Coining – Hot and cold spinning.
Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – V

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion
Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers; Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

TEXT BOOK:

1. Manufacturing Technology / P.N. Rao/TMH

REFERENCE BOOKS:

1.   Production Technology / R.K. Jain
2.   Metal Casting / T.V Ramana Rao / New Age
3.   Principles of Metal Castings / Rosenthal.
4.   Welding Process / Parmar /
5.   Production Technology /Sarma P C /
6.   Manufacturing Engineering and Technology/Kalpakjin S/ Pearson Edu.

OUTCOMES:

 ➢ **By undergoing this course, student will be able to** Understand the casting process in manufacturing of different types products.
 ➢ Understand the principle and operation of different welding processes required for fabrication.
 ➢ Understand the different metal forming processes.
 ➢ Understand the types of plastics and their processing methods.

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(A1020) ENVIRONMENTAL STUDIES

UNIT - I

Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness.
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 - II

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem:
a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT - III

Biodiversity and Its Conservation: Introduction - Definition: genetic, species andecosystem 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-sports 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 - IV

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 - V

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.
Human Population and the Environment: Population growth, variation among nations. Population explosion - Family Welfare Programme. -Environment and human health. -Human Rights. -Value Education. -

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HIV/AIDS. -Women and Child Welfare. -Role of information Technology in Environment and human health. –Case Studies.

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 cosystemspond,
river, hill slopes, etc.

TEXT BOOKS:

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

REFERENCE BOOK:

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

OUTCOMES:

➢ **By undergoing this course, student will be able to** Understand the basics of biotic and abiotic things present in the environment and their effects on environment.
➢ Understand the effects of technological / scientific developments on environment
➢ Assess the impacts on environment and strategic management of environment as stipulated by the local legislative rules and regulations
➢ Understand the concepts of sustainable growth related to human life

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B.Tech. Mech. Engg. III-Sem	**L**	**T**	**P**	**C**

B.Tech. Mech. Engg. III-Sem   **L   T   P   C**
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(A1311) METALLURGY & MECHANICS OF SOLIDS LAB

METALLURGY LAB:

1. Preparation and study of crystal structures

2. Preparation and study of the microstructure of pure metals like iron, copper and Aluminum

3. Preparation and study of the microstructure of Mild steels, low carbon steels, High carbon steels

4. Study of the microstructures of Cast Irons

5. Study of the microstructures of non ferrous alloys

6. Study of the microstructures of heat treated steels

7. Hardenability of steels by Jomney end quench test

8. To find out the hardness of various treated and un treated steels

9. Study of microstructure in Heat Affected Zone(HAZ) of welded joint

10. Study of Hardness variation across Heat Affected Zone(HAZ) of welded joint

MECHANICS OF SOLIDS LAB:

1. Direct tension test

2. Bending test: simple supported beam and cantilever beam

3. Hardness test: Brinells hardness and Rockwell hardness

4. Test on springs

5. Compression test on cube

6. Impact test: Izod and Charpy tests

7. Torsion test: circular bars

8. Punch shear test

9. Proof of Maxwell reciprocal theorem

10. Strain energy due to impact load

OUTCOMES:

➢ **By undergoing this course, student will be able to** Prepare metallic specimens for metallographic examination.
➢ Identify, analyze and interpret the phases and microstructure of common ferrous and non-ferrous materials.
➢ Conduct mechanical tests for the evaluation of mechanical properties.
➢ Understand, analyze and interpret mechanical behaviour of materials under various loading conditions.

(Student will perform six exercises from each of above two labs)

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(A1312) PRODUCTION TECHNOLOGY LAB

Metals Casting Lab:

1. Moulding   -   2 Exercises
2. Melting & Casting   -   Demonstration
3. Pattern Marking   -   1 Exercise

Welding Lab:

1 Arc Welding:
    a) Effect of polarity on welds strength & Heat affected zone
    b) Effect of current on weld strength and Heat affected zone
2 Spot Welding – Effect of current on weld strength.
3 Gas welding and brazing exercises.

Mechanical Press Working:

1 Blanking & Piercing operation & Study of simple Compound and progressive press tools.
2 Hydraulic Press: Deep Drawing and Extrusion Operations.
3 Bending and other operations.

Processing of Plastics:

1 Injection Moulding
2 Blow Moulding

OUTCOMES:

➢ **By undergoing this course, student will be able to** Understand the casting process in manufacturing of different types products.
➢ Understand the principle and operation of different welding processes required for fabrication.
➢ Understand the different metal forming processes.
➢ Understand the types of plastics and their processing methods.

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B.Tech. Mech. Engg. IV-Sem   **L   T   P   C**
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(A1313) FLUID MECHANICS & HYDRAULIC MACHINERY

OBJECTIVES:

The purpose of this course is to learn the Fluid properties and fundamentals of fluid statics and fluid flow
- To introduce the concepts of flow measurements and flow through pipes
- To introduce the concepts of momentum principles
- To impart the knowledge on pumps and turbines

UNIT I

Fluid Statics: Dimensions and Units: physical properties of fluids-specific gravity, viscosity, surface tension-vapour pressure and their influence on fluid motion-atmospheric, gauge and vaccum pressure- measurement of pressure- piezometer, U-Tube and Differential Manometers.

UNIT II

Fluid kinematics: stream line, path line and steak line and stream line, classification of flows steady & un steady, uniform & non uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three dimensional flow.

Fluid dynamics: Surface & body forces Euler's & Bernouli's equations for flow along a stream line, moment equation and its applications on force on pipe bend. Measurement of flow: pitot tube, venture meter and orifice meter, flow nozzle.

UNIT III

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

Boundary layer concepts: Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivations) boundary layer in transition, separation of boundary layers submerged objects-drag and lift .

UNIT IV

Basics and hydraulic turbine turbo machinery: Hydro dynamic force on jets on stationary and moving plate, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency , flow over radial vanes.

Classification of turbines, heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine, and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design-draft tube theory-functions and efficiency.

UNIT V

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

Centrifugal pumps: Classification, working, work done-barometric head-losses and efficiencies specific speed-performance characteristic curves, NPSH.

Reciprocating pumps: Working, discharge, slip, indicator diagrams.

TEXT BOOKS:

1. Hydraulics, Fluid mechanics and hydraulic machinery by MODI and SETH
2. Fluid mechanics and hydraulic machines by Rajput

REFERENCE BOOKS:

1. Fluid mechanics and fluid power engineering by D.S.Kunar, Kotaria and sons.
2. Fluid mechanics and machinery by D. Rama Durgaiah, New age international.
3. Hydraulic machines by Banga and Sharma, Khanna publishers

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OUTCOMES:

➢ **By undergoing this course, student will be able to** Understand the basic properties of fluids.
➢ Analyze the kinematics of fluids and dynamics of fluid flows.
➢ Understand the boundary layer theory and impact of jets.
➢ Understand different types of turbines and pumps.

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(A1314) THERMAL ENGINEERING – I

Note: Use of Refrigeration tables is permitted in examination.

UNIT – I

I.C. Engines: Classification - Working principles of Four & Two stroke engine, SI & CI engines, Valve and Port Timing Diagrams, Engine systems – Carburetor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition- Battery and magneto systems, Cooling- air & water cooling systems Lubrication system- mist, dry and wet sump lubrication.

UNIT – II

Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effect of engine variables – Abnormal combustion, pre-ignition and knocking in SI Engines – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types of SI engines.
Four stages of combustion in CI engines – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence in Diesel engine – open and divided combustion chambers and fuel injection– Diesel fuel requirements and fuel rating

UNIT III

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.
Classification of compressors – Fans, blowers and compressors – positive displacement and dynamic types – reciprocating and rotary types.

UNIT – IV

Reciprocating Compressors: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance volume, staged compression, under cooling, saving of work, minimum work condition for staged compression
Rotary Compressor (Positive displacement type): Roots Blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.
Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

UNIT – V

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.
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

TEXT BOOKS:

1. I.C. Engines / V. Ganesan- TMH
2. Thermal Engineering / Rajput / Lakshmi Publications.
3. Thermal Engineering / P.K.Nag

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REFERENCE BOOKS:

1. IC Engines – Mathur & Sharma – Dhanpath Rai & Sons.
2. Engineering fundamentals of IC Engines – Pulkrabek / Pearson /PHI
3. Thermal Engineering / Rudramoorthy - TMH
4. Thermodynamics & Heat Engines / B. Yadav/ Central Book Depot., Allahabad
5. I.C. Engines / Heywood /McGrawHIll.
6. Thermal Engineering – R.S. Khurmi & J.K.Gupta – S.Chand

OUTCOMES:

➢ **By undergoing this course, student will be able to** Understand the working principles of internal combustion engines.
➢ Understand and differentiate combustion phenomena between SI Engines & CI engines.
➢ Calculate the performance parameters of internal combustion Engines.
➢ Understand the working of compressors and analyze for their performance.

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B.Tech. Mech. Engg. IV-Sem

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(A1315) 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 – Types of constrained motion – completely, partially or successfully and incompletely constrained .
Mechanism and Machines – Mobility of Mechanisms : Grubler's criterion, classification of machines – kinematics chain – inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains, Mechanical Advantage.

UNIT – II

Kinematics: Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method.
Plane motion of body: Instantaneous center of rotation- centrodes and axodes – Three centers in line theorem – Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method.
Kliens construction - Coriolis acceleration - determination of Coriolis component of acceleration
Analysis of Mechanisms: Analysis of slider crank chain for displacement, velocity and acceleration of slider – Acceleration diagram for a given mechanism.

UNIT – III

Straight-line motion mechanisms: Exact and approximate copied and generated types – Peaucellier - Hart - Scott Russel – Grasshopper – Watt -Tchebicheff's and Robert Mechanism - Pantographs
Steering gears: Conditions for correct steering – Davis Steering gear, Ackerman's steering gear.
Hooke's Joint: Single and double Hooke's joint –velocity ratio – application – problems.

UNIT – IV

Cams: Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion - Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.
Analysis of motion of followers: Tangent cam with Roller follower – Circular arc cam with concave and convex flanks.

UNIT – V

Higher pair: Friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion – velocity of sliding. Forms of teeth, cycloidal and involutes profiles – phenomena of interferences – Methods of avoiding interference. Condition for minimum number of teeth to avoid interference – expressions for arc of contact and path of contact of Pinion & Gear and Pinion & Rack Arrangements– Introduction to Helical – Bevel and worm gearing
Gear Trains: Introduction – Types – Simple – compound and reverted gear trains – Epicyclic gear train. Methods of finding train value or velocity ratio of Epicyclic gear trains. Selection of gear box - Differential gear for an automobile

TEXT BOOKS:

1. Theory of Machines /S.S.Rattan/ Tata McGraw Hill Publishers.
2. Kinematics & Dynamics Of machinery/Norton/TMH

REFERENCE BOOKS:

1. Theory of Machines / Thomas Bevan/CBS
2. Theory of Machines / Shigley / Oxford
3. Mechanism and Machine Theory / JS Rao and RV Duggipati / New Age

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OUTCOMES:

➢ **By undergoing this course, student will be able to** Learn and analyze the mobility concepts of machines & mechanisms.
➢ Analyze for velocity &acceleration on various mechanisms
➢ Design cam profiles and analyze for resulting follower motions on specified contours
➢ Design and analyze various power transmission drives

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(A1010) PROBABILITY& STATISTICS

UNIT-I

Probability& Random variables: Sample space and events- Probability - The axioms of probability - Some Elementary theorems - Conditional probability –Bayee's theorem. Random variables -discrete and continuous.Moment generating function of probability distribution.

UNIT-II

Distribution& Estimation: Binomial, Poison &normal distributions, Normal distribution related properties. Moment generating functions of the above three distributions and hence finding the mean and variance.Sampling distributions - sampling distributions of means (known and unknown). Point estimation - interval estimations Bayesian estimation

UNIT-III

Test of Hypothesis: Test of hypothesis Large samples, Null hypothesis- Alternative hypothesis type-I & II errors-critical region confidential interval for mean testing of single variance. Difference between the mean.Confidential interval for the proportions.Tests of hypothesis for the proportions single and difference between the proportions
Small samples: Confidence interval for the t-distribution- tests of hypothesis - t -distributions, F-distribution, χ^2-distribution.

UNIT-IV

Correlation regression & ANOVA : Coefficient of correlation- regression coefficient- the lines of regression - the rank correlation

ANOVA for one-way, two-way classifications

UNIT-V

Queuing Theory& Time series analysis: Arrival theorem- Pure Birth and Death Process M/M/1 Model.
Utility of time series analysis, components of time series.Preliminary adjustments before analyzing time series

TEXT BOOKS:

1. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Publishing House,Delhi.
2. Fundamentals of Mathematical Statistics , Gupta & Kapoor, S.Chand.

REFERENCE BOOKS:

1. Probability & Statistics, T. K. V. Iyengar, B. Krishna Gandhi and Others, 2014 Yr Edition S. Chand.
2. Probability & Statistics, D. K. Murugeson& P. Guru Swamy, Anuradha Publishers
3. Probability & Statistics for engineers by G.S.S. BhismaRao, Scitech publications.
4. Probability & Statistics, by William Mendenhall & others Cengage pub.
5. Higher engineering mathematics by B S Grewal, Khanna pub.
6. A first course in probability & statistics by BLSPrakasarao. World scientific.
7. Probability & Statistics for Engineers, Miller and John E. Freund, Prentice Hall of India.

OUTCOMES:

  ➢ **By undergoing this course, student will be able to** Understand probability & interpret probability by modeling sample spaces.
  ➢ Understand descriptive statistics and statistical inferences
  ➢ Draw inferences about the hypothesis statements on sampling
  ➢ Practice two sets of variables having relation by using correlation methods.
  ➢ Acquire the skill of using queuing techniques & framing Markov chains

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(A1215) BASIC ELECTRICAL & ELECTRONICS ENGINEERING

OBJECTIVE: This course introduces the concepts of electrical DC and AC circuits, basic law's of electricity, instruments to measure the electrical quantities, different methods to solve the electrical networks, construction operational features of energy conversion devices i.e. DC and AC machines, transformers. It also emphasis on basics of electronics, semiconductor devices and their characteristics and operational features

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

UNIT-II

DC Machines: Principle of operation of DC Generator & motor – 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.
AC Machines: Principle of operation of induction motor – slip – torque characteristics – applications. Principle of operation of alternators – regulation by synchronous impedance method

UNIT–IV

Diodes: P-n junction diode, symbol, V-I Characteristics, Diode Applications, and Rectifiers – Half wave, Full wave and Bridge rectifiers (simple Problems).
Transistors: PNP and NPN Junction transistor, Transistor as an amplifier, SCR characteristics and applications.

UNIT-V

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. Basic concepts of Electrical Engineering, PS Subramanyam, BS Publications.
2. Basic Electrical Engineering, S.N. Singh, PHI.
3. Electronic Devices and Circuits, S.Salivahanan, N.Suresh Kumar, A.Vallavaraj,Tata McGraw-Hill Companies
4. Electronic Devices and Circuits, K. Lal Kishore,BS Publications

REFERENCE BOOKS:

1. Basic Electrical Engineering, Abhijit Chakrabarthi, Sudipta nath, Chandrakumar Chanda, Tata-McGraw-Hill.
2. Principles of Electrical Engineering, V.K Mehta, Rohit Mehta, S.Chand Publications.
3. Basic Electrical Engineering, T.K.Nagasarkar and M.S. Sukhija, Oxford University Press.
4. Fundamentals of Electrical Engineering, RajendraPrasad, PHI. Basic Electrical Engineering by D.P.Kothari , I.J. Nagrath, McGraw-Hill.
5. Millman's Electronic Devices and Circuits,J. Millman, C.C.Halkias, and Satyabrata Jit, Tata McGraw-Hill
6. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky,PEI/PHI.
7. Introduction to Electronic Devices and Circuits, Rober T. Paynter,PE.
8. Integrated Electronics, J. Millman and Christos C. Halkias, Tata McGraw-Hill companies.
9. Electronic Devices and Circuits, Anil K. Maini, Varsha Agarwal,Wiley India Pvt. Ltd.

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OUTCOMES:

➢ **By undergoing this course, student will be able to** Understand and analyze electrical circuits, networks, network elements & instruments.
➢ Understand the construction& working principle of dc and ac machines
➢ Understand semiconductor diode characteristics, principle of operation & its applications.
➢ Understand the construction & operation of transistors & their applications
➢ Understand the charge characteristics in electric & magnetic fields using CRO

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(A1316) MACHINE DRAWING

Question Paper Pattern: Question paper has two parts. Part one has five questions out of which answer three (each 10 marks). Part two has one question (assembly with three views) and it is to be answered compulsorily (it carries 50 marks)

Part I: Machine Drawing Conventions:
Need for drawing conventions – introduction to ISI conventions

1. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
2. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
3. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
4. Title boxes, their size, location and details - common abbreviations and their liberal usage.

Drawing of Machine Elements and simple parts

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

Part II: Assembly Drawings:

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

11. Steam engine parts – stuffing boxes, cross heads, Eccentrics.
12. Machine tool parts: Tail stock, Tool Post, Machine Vices.
13. Other machine parts - Screws jacks, Petrol engine connecting rod, Plummer block
14. Simple designs of 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 BOOK:

1. Machine drawing –K.L.Narayana/ Wiley Eastern.

REFERENCE BOOKS:

1. Machine Drawing – P.S.Gill.
2. Machine Drawing – Junnarkar N.D./ Pearson Edu.

OUTCOMES:
- **By undergoing this course, student will be able to** Understand and draw conventional representation of materials and machine elements.
- Understand different types of fasteners.
- Understand and draw different types of riveted joints, couplings and bearings.
- Understand and draw assembly drawings of engine parts, machine parts and valves.

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(A1317) FLUID MECHANICS & HYDRAULIC MACHINERY LAB

OBJECTIVE: To find the performance of pump like centrifugal pump, reciprocating pump, Gear pump. To find the coefficient of discharge of orifice meter and venturimeter. Conducting the characteristic curves of Kaplan turbine, Francis turbine and Pelton wheel.

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Performance test on single stage centrifugal pump
8. Performance test on reciprocating pump
9. Impact of jet on vanes
10. Performance and Specific speed test on Pelton wheel (or Turbo Wheel)
11. Performance and specific speed test on Francis Turbine
12. Performance and specific speed test on Kaplan Turbine
13. Performance test on multi stage pump
14. Suitability test on centrifugal pump
15. Drag and Lift Coefficients of an Aerofoil model.
16. Any ten of the above experiments are to be covered.

OUTCOMES:

➢ **By undergoing this course, student will be able to** Understand the performance of hydraulic machines through experimentation.
➢ Find the coefficient of discharge of Venturi meter &Orifice meter through experimentation.
➢ Determine the Major losses and Minor losses in fluid flow due to pipe friction through experimentation.
➢ Understand and prove the principle of Bernoulli's theorem through experimentation.

(Student will perform any 12 experiments)

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(A1216) BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

ELECTRICAL LAB

 1. Verification of KCL and KVL.

2. Magnetization characteristics of D.C. Shunt generator.

3. Speed control of DC motor.

4. Swinburne's Test on DC shunt machine.

5. Brake test on DC shunt motor.

6. OC and SC tests on Single-phase transformer.

7. Brake test on 3-phase Induction motor.

8. Regulation by an alternator by synchronous impedance method.

ELECTRONICS LAB

1. PN Junction Diode Characteristics (Forward bias, Reverse bias)

2. Transistor CE Characteristics (Input and Output)

3. Study of CRO.

4. Class A Power Amplifier

5. Zener Diode Characteristics

6. Transistor CE Characteristics

7. Rectifier without Filters (Full wave & Half wave)

8. Rectifier with Filters (Full wave & Half wave).

Note: Total 10 experiments are to be conducted.

OUTCOMES:

- ➢ **By undergoing this course, student will be able to** Test AC& DC machines to evaluate their performance and learn to control their working.
- ➢ Evaluate performance of transformers through OC and SC tests.
- ➢ Learn working and behavioral characteristics of transistors, rectifiers, amplifiers and oscillators through experimentation
- ➢ Understand programming and working of microprocessor

(A student will perform five experiments from Electrical Lab and five experiments from Electronics Lab)

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(A1005) SOFT SKILLS AND PROFESSIONAL ETHICS

MODULE 1: BUSINESS COMMUNICATION SKILLS

- English Language Enhancement
- The Art of Communication

OBJECTIVE

- The student will gain a functional understanding of basic English Grammar
- Practice language skills to eliminate errors in pronunciation and   sentence construction
- Understand and enhance interpersonal communication proces

MODULE 2: INTRAPERSONAL & INTERPERSONAL RELATIONSHIP SKILLS

- Intrapersonal Relationships
- Interpersonal Relationships – To be an Effective Team Player

OBJECTIVE

- The student will understand the importance of and the various skills involved in developing enriching interpersonal relationships
- Be more aware of his/her own self – confidence, values
- Understand and handle emotions of self and others.
- Understand the necessity and importance of working together as a team
- Learn how to go about being a good team player and form an effective team
- Have put their team building skills to test in the various activities to understand where they stand and improve themselves with each succeeding activity.

MODULE 3: CAMPUS TO COMPANY

- Corporate Dressing
- Corporate Grooming
- Business Etiquette
- Communication Media Etiquette

OBJECTIVE

- The student will understand what constitutes proper grooming and etiquette in a professional environment.
- Have some practical tips to handle him/her in a given professional setting.
- Have practiced the skills necessary to demonstrate a comfort level in executing the same.

MODULE 4: GROUP DISCUSSIONS, INTERVIEWS AND PRESENTATIONS

- **Group Discussions**
- **Interviews**
- **Presentations**

OBJECTIVE

- The student will be able to appreciate the nuances of the Group Decision-making process.
- Understand the skills tested and participate effectively in Group Discussions.
- Learn the basics of how to make an effective presentation and have numerous practice presentations in small groups and larger audiences.
- Attend any type of interview with the confidence borne out of knowledge gained and practice sessions.

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MODULE 5: ENTREPRENEURIAL SKILLS DEVELOPMENT

- Goal Setting
- Entrepreneurial Skills – Awareness and Development

OBJECTIVE

- The student will be able to set specific measurable goals for themselves in their personal and/or professional life.
- Understand the skills and the intricacies involved in starting an entrepreneurial venture.

REFERENCE BOOK:

1. UNLEASH the power within….Soft Skills – Training Manual (Infosys Campus Connect)

Course Outcomes :

1. Understand the basics of english grammer and enhance interpersonal communication process.

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(A1318) DYNAMICS OF MACHINERY

OBJECTIVE: Dynamics of machines essentially deals with different forces acting on the machine (including inertial forces) and their effect on the machine components.

UNIT – I

Precession: Gyroscopes – effect of precession – motion on the stability of moving vehicles such as motorcycle – motorcar – aeroplanes and ships.
Static and Dynamic Force Analysis: Static force analysis of planar mechanisms – Analytical Method – Dynamic Force Analysis – D'Alembert's principle, Dynamic Analysis of 4-link mechanism, Slider Crank Mechanism.

UNIT – II

Turning Moment Diagram and Flywheels: Engine Force Analysis – Piston Effort, Crank Effort, etc., Inertia Force in Reciprocating Engine – Graphical Method - Turning moment diagram –fluctuation of energy – flywheels and their design - Inertia of connecting rod- inertia force in reciprocating engines – crank effort and torque diagrams.
Governors: Types of governors - Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung with auxiliary springs. Sensitiveness, Isochronism and hunting **–** stability – effort and power of the governors.

UNIT – III

Friction: Pivots and collars – uniform pressure, uniform wear – friction circle and friction axis; Lubricated surfaces – boundary friction – film lubrication. Clutches – Types – Single plate, multi-plate and cone clutches.
Brakes And Dynamometers: Types of brakes- Simple block brake, band and block brake-internal expanding shoe brake-effect of braking of a vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

UNIT – IV

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

UNIT – V

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

TEXT BOOKS:

1. Theory of Machines, S.S.Rattan.
2. Theory of Machines, R.S.Khurmi

REFERENCE BOOKS:

1. Theory of Machines, Shigley, Mc Graw Hill Publishers
2. Theory of Machines, Thomas Bevan, CBS Publishers
3. Theory of Machines, R.K.Bansal (Lakshmi publications)
4. Mechanism and Machine Theory, JS Rao and RV Duggipati, New Age

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OUTCOMES:

➢ **By undergoing this course, student will be able to** Analyze for dynamic forces in mechanisms and rotating masses.
➢ Synthesize four bar planar mechanisms.
➢ Construction, working and dynamic force analysis of gyroscopes, brakes, dynamo meters, governors and flywheels.
➢ Learn to find vibration phenomenon of lumped mass systems.

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(A1021) MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS

OBJECTIVE: The aim of this to equip the students with fundamental concepts of economics, budgeting, management & accounts. It helps them to understand the intricacies of business units. The study of this subject strengthens them to star an enterprise on their own accord.

Unit I

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

Unit II

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

Unit III

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

Unit IV

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

Unit V

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

TEXT BOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, TMH, 2012.
2. Vijay Kumar & Appa Rao Managerial Ecoconomics & Financial Analysis, Cengage 2011.
3. J. V. Prabhakar Rao & P.V. Rao Managerial Ecoconomics & Financial Analysis, Maruthi Publishers, 2011.

REFERENCE BOOKS:

1.   Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2012.
2.   H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson, 2012.
3.   Lipsey & Chrystel, Economics, Oxford University Press, 2009
4.   Domnick Salvatore: Managerial Economics In a Global Economy, Thomson, 2012.
5.   Narayanaswamy: Financial Accounting-A Managerial Perspective, PHI, 2012.
6.   S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2012.
7.   Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2012.
8.   Dwivedi: Managerial Economics, Vikas, 2012.

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9. Kasi Reddy Sraswathi, MEFA PHI Learning, 2012.
10. Shailaja & Usha : MEFA, University Press, 2012.

OUTCOMES :

➢ **By undergoing this course, student will be able to** Understand demand, supply, elasticity of demand, demand forecasting methods and effects managerial decisions on them.
➢ Understand cost analysis, pricing , pricing policies and Break Even Analysis
➢ Understand capital budgeting and business related economic environment
➢ Understand, analyze and prepare financial accounting.

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(A1319) DESIGN OF MACHINE MEMBERS - I

NOTE: Only PSG Design Data books is permitted in the Examinations. The design must not only satisfy strength criteria but also rigidity criteria.

OBJECTIVES: The emphasis this course is on machine design: the design and creation of devices that consist of interrelated components used to modify force and/or motion.

UNIT – I

Introduction: General considerations in the design of Engineering Materials and their properties – selection –Manufacturing consideration in design. BIS codes of steels. Factor of safety, Design for strength and rigidity – preferred numbers

UNIT – II

Fate loading: 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, Bolted and welded joints: Design of Rivetted joints, Design of bolted joints, Design of welded joints, Joints with eccentric loading in all the above three cases.

UNIT – IV

Cotters and Knuckle Joints: Cottered joints-spigot and socket, sleeve and cotter, jib and cotter joints-Knuckle joints.

UNIT – V

Shafts: Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – Shaft sizes – BIS code. Use of internal and external circlips, Gaskets and seals (stationary & rotary), Design of Keys.
Shaft Couplings: Rigid couplings – Muff, Split muff and Flange couplings. Flexible couplings – Bushed Pin Flange coupling .

TEXT BOOKS:

1. Machine design / P. Kannaiah/ Scitech Publishers
2. Machine design/pandya & shah
3. Machine Design/ V. Bandari/ TMH Publishers

REFERENCE BOOKS:

1. Machine Design , Soundararajan/ Murthy and Shanmugam
2. Design of Machine Elements/V.M. Faires
3. Machine design/ Schaum Series.
4. Mechanical Engineering Design/JE Shigley
5. PSG design data book

OUTCOMES:

➢ **By undergoing this course, student will be able to** Select suitable material and design the component for Strength, Rigidity and fluctuating stresses.
➢ Select and design suitable joints for a given application.
➢ Select and design suitable shaft and shaft coupling for power transmission system.
➢ Select suitable spring and design it for a given application.

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(A1320) THERMAL ENGINEERING – II

Note: Use of Steam tables is permitted in examination

UNIT – I

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.

UNIT – II

Steam Nozzles : Stagnation Properties- Function of nozzle – Applications and 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 – III

Steam Turbines: Classification ofsteam turbines
Impulse turbine: Mechanical details – Velocity diagram – Effect of friction – Power developed, Axial thrust, Blade or diagram efficiency – Condition for maximum efficiency.   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.
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 IV

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.
Gas Turbines: Simple gas turbine – Ideal cycle, essential components – Parameters of performance – Actual cycle – Regeneration, Inter cooling and Reheating –Closed and Semi-closed cycles – Merits and Demerits

UNIT – V

Jet Propulsion: Principle of Operation –Classification of jet propulsive engines – Working Principles with schematic diagrams and representation on T-S diagram - Thrust, Thrust Power and Propulsion Efficiency –
Turbo jet engines : Needs and Demands met by Turbo jet – Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation – Methods.
Rockets: Application – Working Principle – Classification – Propellant Type – Thrust, Propulsive Efficiency – Specific Impulse – Solid and Liquid propellant Rocket Engines.

 TEXT BOOKS:

1. Thermal Engineering / Rajput / Lakshmi Publications
2. Gas Turbines – V.Ganesan /TMH
 3. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot
 4. Thermal Engineering / Ajoy Kumar/ Narosa

REFERENCE BOOKS:

1. Gas Turbines and Propulsive Systems – P.Khajuria & S.P.Dubey - /Dhanpatrai Pub
2. Thermal Engineering – Ballaney / Khanna Pub.
3. Gas Turbines / Cohen, Rogers and Saravana Muttoo / Addison Wesley – Longman
4. Thermal Engineering – R.S. Khurmi & J.S.Gupta / S.Chand Pub.

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OUTCOMES:

➢ **By undergoing this course, student will be able to** Understand the basic principles of thermodynamic cycles and their practical modifications.
➢ Evaluate the performance of Boilers , steam condensers and steam nozzles
➢ Understand working of turbines and analyze for their performance.
➢ Understand jet propulsion and its applications.

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(A1321) ENGINEERING METROLOGY

OBJECTIVE: Engineering metrology is subject which cannot be ignored or taken for granted. Without metrology there can be no manufacturing. So metrology is as important as manufacturing. Metrology is the science which deals with the measurements. From engineering point of view; it's the science which deals with the measurement of lengths, angles, form or shape & surface texture and the instruments used to measure the parameters and their operation.

UNIT – I

Systems of Limits and Fits: Introduction, normal size, tolerance limits, deviations, allowance, fits and their types – unilateral and bilateral tolerance system, hole and shaft basis systems – interchangeability and selective assembly. Indian Standard system – International Standard system.

UNIT – II

Linear Measurement: Length standard: line and end standard, slip gauges – calibration & manufacture of the slip gauges, Dial indicator, micrometers.
Measurement of Angles and Tapers: Different methods – Bevel protractor – angle slip gauges – spirit levels – Sine bar – Use of Rollers and Balls to determine the tapers.

UNIT – III

Limit Gauges: Taylor's principle; Types of gauges - plug, ring, snap, taper, profile and position gauges - Design of GO and NO GO gauges
Optical Measuring Instruments: Tool maker's microscope and its uses – collimators, optical projector – optical flats and their uses, interferometer.
Flat Surface Measurement: Measurement of flat surfaces – instruments used: straight edges, surface plates, optical flat and auto collimator.

UNIT – IV

Surface Roughness Measurement: Differences between surface roughness and surface waviness – Numerical assessment of surface finish: CLA, R.M.S Values, R_z values- Methods of measurement of surface finish: profilograph, Talysurf- ISI symbols for indication of surface finish.
Measurement through Comparators: Comparators: Mechanical, Electrical and Electronic Comparators, Pneumatic comparators and their uses in mass production.
Screw Thread Measurement: Element of measurement – errors in screw threads – measurement of effective diameter, angle of thread and thread pitch, profile thread gauges.

UNIT -V

Gear Measurement: Gear measuring instruments, Gear tooth profile measurement, Measurement of diameter, pitch pressure angle and tooth thickness.
Machine Tool Alignment Tests: Requirements of Machine Tool Alignment Tests, Alignment tests on lathe, milling, drilling machine tools. Preparation of acceptance charts.
Coordinate Measuring Machines: Types of CMM, Role of CMM, and Applications of CMM.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. BIS Standards on Limits & Fits, Surface Finish, Machine Tool Alignment etc.
2. Fundamentals of Dimensional Metrology 4e / Connie Dotson / Thomson

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OUTCOMES:
By undergoing this course, student will be able to
- ➢ Understand the system of limits and fits.
- ➢ Understand linear and angular measurements and assess surface flatness & roughness by using different measuring instruments.
- ➢ Understand importance of comparators in mass production and measurement of screw thread parameters using different measuring techniques.
- ➢ Understand surface texture, its properties and different surface treatment methods.

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(A1322) MACHINE TOOLS

UNIT – I

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

UNIT – II

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

UNIT – III

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

UNIT – IV

Milling machine – Principles of working – specifications – classifications of milling machines – Principal features of horizontal, vertical and universal milling machines – machining operations Geometry of milling cutters – methods of indexing – Accessories to milling machines, kinematic scheme of milling machines.
Manufacturing of Gears- Gear milling, Gear Hobbing, Gear broaching.

UNIT –V

Grinding machine – fundamentals – theory of grinding – classification of grinding machines – cylindrical and surface grinding machine-Tool and cutter grinding machine – special types of grinding machines, Different types of abrasives – bonds specification of a grinding wheel and selection of a grinding wheel,Kinematic scheme of grinding machines.
Lapping, honing and broaching machines – comparison of grinding, lapping and honing. Kinematic schemes of Lapping, Honing and Broaching machines. Constructional features of speed and feed Units, machining time calculations

TEXT BOOKS:

1. Principles of Machine Tools, Bhattacharya A and Sen.G.C. New Central Book Agency.
2. Production Technology by R.K. Jain and S.C. Gupta.

REFERENCE BOOKS:

1. Production Technology by H.M.T. (Hindustan Machine Tools)
2. Workshop Technology – Vol.-II, B.S. Raghui Vamsi
3. Elements of Work Shop Technology – Vol. II, Hajra Choudry, Media Promoters.
4. Fundamentals of Metal Machining and Machine Tools, Geofrey Boothroyd, McGraw Hill

OUTCOMES:
By undergoing this course, student will be able to
   ➢ To understand the types of chips and analyze for cutting forces in machining.
   ➢ Understand the principle & machining operations performed on different machines.
   ➢ Understand finishing operations on a machined product.
   ➢ Understand principles of jigs and fixtures.

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(A1323) THERMAL ENGINEERING LAB

OBJECTIVE: To understand the working principles of IC Engines, Compressors, Refrigeration and Air Conditioning Systems.

EXPERIMENTS:

1. Flash and Fire Points (Open cup & Closed cup method)

2. Viscosity determination by Redwood & Saybolt methods

3. Bomb/ Junkers Gas Calorimeter.

4. I.C. Engines Valve / Port Timing Diagrams

5. I.C. Engines Performance Test for 4 Stroke SI engines

6. I.C. Engines Performance Test for 2 Stroke SI engines

7. I.C. Engines Morse, Retardation, Motoring Tests

8. I.C. Engines Heat Balance – CI/SI Engines

9. I.C. Engines effect of A/F Ratio in a SI engine

10. Performance Test on Variable Compression Ratio Engine

11. IC engine Performance Test on a 4S CI Engine

12. Performance Test on Reciprocating Air – Compressor Unit

13. Dis-assembly / Assembly of Engines

14. Study of Boilers

(A student will perform any 10 experiments out of the above during this semester)

OUTCOMES:

By undergoing this course, student will be able to
  ➢ Understand principles of experimental methods in thermal engineering   problems.
  ➢ Understand and compare experimental results with theoretical predictions.
  ➢ Understand, conduct and interpret results of experiments conducted on I.C. engines
  ➢ Understand, conduct and interpret results of experiments on compressor

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(A1004) ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

OBJECTIVES:
This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

➢ To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.

➢ Further, they would be required to communicate their ideas relevantly and coherently in writing.

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

1. **Functional English** –

- Starting a conversation
- responding appropriately and relevantly
- using the right body language

2. **Roleplay in different situations.**

3. **Vocabulary building**

- synonyms and antonyms,
- word roots,
- one-word substitutes,
- prefixes and suffixes,
- study of word origin,
- analogy,
- idioms and phrases verbs

4. **Group Discussion** –

- dynamics of group discussion,
- intervention,
- summarizing,
- modulation of voice,
- body language,
- relevance, f
- fluency and coherence.

5. **Interview Skills** –

- concept and process,
- pre-interview planning,
- opening strategies,
- answering strategies,

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- Interview through tele and video-conferencing.

6. Resume and Technical Report writing –

- structure and presentation,
- planning,
- defining the career objective,
- projecting ones strengths and skill-sets,
- summary, formats and styles,
- Letter-writing.
- **Reading comprehension** – reading for facts, guessing meanings from context, scanning, skimming, inferring meaning and critical reading.

Minimum Requirement:

The English Language Lab shall have:

- The Computer aided Language Lab for 60 students with 60 systems,

- One master console, LAN facility and English language software for self- study by learners.

- The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

- System Requirement (Hardware component):

- Computer network with Lan with minimum 60 multimedia systems with the following specifications:
  P – IV Processor
  d) Speed – 2.8 GHZ
  e) RAM – 512 MB Minimum
  f) Hard Disk – 80 GB
  Headphones of High quality

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Suggested Software:

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

- Clarity Pronunciation Power – part II

- Oxford Advanced Learner's Compass, 7th Edition

- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.

- Lingua TOEFL CBT Insider, by Dreamtech

- TOEFL & GRE(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

- The following software from 'train2success.com'

  ✓ Preparing for being Interviewed,

  ✓ Positive Thinking,

  ✓ Interviewing Skills,

  ✓ Telephone Skills,

  ✓ Time Management

  ✓ Team Building,

  ✓ Decision making

DISTRIBUTION AND WEIGHTAGE OF MARKS English Language Laboratory Practical Examination:

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.

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

OUTCOMES :

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

- To take part in social and professional communication.

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(A1011) ANALYTICAL SKILLS – I

Quantitative Aptitude

- ➢ Number System
- ➢ LCM and HCF
- ➢ Averages
- ➢ Simple Equations
- ➢ Ratios & Proportions
- ➢ Partnerships
- ➢ Percentages
- ➢ Profit & Loss
- ➢ Time & Work
- ➢ Time & Distance
- ➢ Simple and compound interest
- ➢ Permutations & Combinations
- ➢ Probability

REFERENCE BOOK:

1. QuantativeApptitude by R.S. Agarwal.

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(A1324) DESIGN OF MACHINE MEMBERS-II

NOTE: Design Data Book is permitted. Design of all components should include design for strength and rigidity apart from engineering performance requirements.

UNIT – I

Bearings: Types of Journal bearings – Lubrication – Bearing Modulus – Full and partial bearings – Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design. Ball and roller bearings – Static load – dynamic load – equivalent radial load – design and selection of ball & roller bearings.

UNIT – II

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

UNIT – III

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

UNIT – IV

Design of Power Screws: Design of Screw – design of nut – compound screw – differential screw – ball screw.
Belts & Pulleys: Transmission of power by Belt and Rope ways, Transmission efficiencies, Belts – Flat and V types – Ropes - pulleys for belt and rope drives.

UNIT – V

Design of Gears: Spur gears & Helical gears – Load concentration factor – Dynamic load factor. Surface compressive strength – Bending strength – Design analysis of spur gears – Estimation of centre distance – module and face width – check for plastic deformation.

TEXT BOOKS:

1. Machine Design / T.V. Sundaraja Murthy & N. Shanmugam
2. Machine tool design/ Mehta / TMH

REFERENCE BOOKS:

1. Machine Design / P.Kannaiah / Scitech
2. Machine Design Volume II / S.Md.Jalaludeen
3. Data Books : (I) P.S.G. College of Technology (ii) S.Md.Jalaludeen
4. Machine Design / Pandya & Shah / Charotar
5. Design of machine tools / S.K.Basu.

OUTCOMES :

By undergoing this course, student will be able to
   ➢ Select suitable bearing based on load conditions.
   ➢ Design Internal Combustion engine parts.
   ➢ Select and design power transmission systems for given application.
   ➢ Select suitable power screw and design them for power transmission.

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(A1325) HEAT TRANSFER

OBJECTIVE: Describe three different modes of heat transfer, analyze and solve heat transfer problems, and design a shell-and-tube heat exchanger.

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

UNIT – II

One Dimensional Steady State Conduction Heat Transfer: Homogeneous slabs, hollow cylinders and spheres- Composite systems– overall heat transfer coefficient – Electrical analogy – Critical radius of insulation, Variable Thermal conductivity – systems with heat sources or Heat generation-Extended surfaces and fins
One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance – Significance of Biot and Fourier Numbers –Chart solutions of transient conduction systems.

UNIT – III

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 Π 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 – Integral Method as approximate method -Application of Von Karman Integral Momentum Equation for flat plate with different velocity profiles.
Forced convection: Development of Hydrodynamic and thermal boundary layer and use of empirical relations for Flat plates and Cylinders.
 Free Convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate - Use of empirical relations for Vertical plates and pipes.

UNIT – IV

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.

UNIT V

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.
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

TEXT BOOKS:

1. Fundamentals of Heat Transfer –Incropera& Dewitt/John wiley
2. Fundamentals of Enggineering, Heat & Mass Transfer-R.C.Sachdeva/NewAge.
3. Heat& Man Transfer-D.S.Kumar/S.K.Kataria& sons

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REFERENCE BOOKS:

1. Heat Transfer – A Practical Approach – Yunus Cengel, Boles / TMH
2. Heat Transfer / HOLMAN/TMH
3. Engineering Heat and Mass Transfer – Sarit K. Das / Dhanpat Rai Pub
4. Heat and Mass Transfer – R. Yadav /CPH
5. Essential Heat Transfer - Christopher A Long / Pearson Education
6. Heat Transfer-P.K.Nag /TMH
7. Heat Transfer –Ghoshdastidar/Oxford University press.

OUTCOMES :

By undergoing this course, student will be able to
- Understand different modes of heat Transfer and identify and solve Steady state one-dimensional Heat conduction problems.
- Understand, analyze and solve Transient heat conduction problems and forced convection problems.
- Understand, analyze and solve natural convection problems, heat exchangers and problems involving phase change.
- Understand, analyze and solve radiation heat transfer processes.

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(A1326) INSTRUMENTATION & CONTROL SYSTEMS

OBJECTIVES:
- To provide knowledge on the fundamentals of measurement science and measuring instruments.
- To provide a knowledge on the basics of control system theory.

UNIT – I

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

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

UNIT – II

Measurement of Temperature: Various Principles of measurement-Classification: Expansion Type: Bimetallic Strip- Liquid in glass Thermometer; Electrical Resistance Type: Thermistor, Thermocouple, RTD; Radiation Pyrometry: Optical Pyrometer; Changes in Chemical Phase: Fusible Indicators and Liquid crystals.

Measurement of Pressure: Different principles used- Classification: Manometers, Dead weight pressure gauge. Tester (Piston gauge), Bourdon pressure gauges, Bulk modulus pressure gauges Bellows – Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges, ionization pressure gauges, Mcleod pressure gauge.

UNIT – III

Measurement of Level: Direct methods – Indirect methods – Capacitive, Radioactive, Ultrasonic, Magnetic, Cryogenic Fuel level indicators – Bubbler level indicators.

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

Measurement of Speed: Mechanical Tachometers, Electrical tachometers, Non- contact type-Stroboscope

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

UNIT – IV

Stress-Strain measurements : Various types of stress and strain measurements –Selection and installation of metallic strain gauges- electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – Temperature compensation techniques, Use of strain gauges for measuring torque, Strain gauge Rosettes.

Measurement of Humidity: Moisture content of gases, Sling Psychrometer, Absorption Psychrometer, Dew point meter.

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

UNIT – V

Elements of Control Systems:
Introduction, Importance – Classification – Open and closed systems- Servomechanisms – Examples with block diagrams – Temperature, speed and position control systems- Transfer functions- First and Second order mechanical systems

TEXT BOOKS:

1. Principles of Industrial Instrumentation & Control Systems, Alavala, Cengage Learning
2. Instrumentation, Measurement & Analysis, B.C.Nakra & K.K.Choudhary, TMH
3. Mechanical Measurements & Controls by D.S. Kumar

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REFERENCE BOOKS:

1. Measurement Systems: Applications & design, E.O.Doebelin, TMH
2. Experimental Methods for Engineers / Holman
3. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.
4. Mechanical Measurements / Sirohi and Radhakrishna / New Age International

OUTCOMES:

By undergoing this course, student will be able to
➢ Understand generalized measurement systems, systems' response and error concepts.
➢ Understand direct methods of mechanical system parameters.
➢ Analyze indirect methods of mechanical system parameters.
➢ Understand and frame temperature, speed and position control system.

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(A1510) OBJECT ORIENTED PROGRAMMING THROUGH JAVA

OBJECTIVES:

- ➢ To understand object oriented programming concepts and applications in problem solving.
- ➢ Learn the Java programming language: its syntax, idioms, patterns, and styles.
- ➢ Become comfortable with object oriented programming: Learn to think in objects.
- ➢ Learn the essentials of the Java class library, and learn how to learn about other parts of the library when you need them.
- ➢ To learn the basics of java console and GUI based programs.
- ➢ Introduce event driven Graphical User Interface (GUI) programming.

UNIT I

Java Programming: History of java, comments, data types, variables, constants, scope and life time of variables, operators, hierarchy expressions, type conversions and casting, enumerated types, control for block scope, conditional statements, loops, break and continue statements, simple java stand alone programs, arrays, console input and output, formatting output, constructors, methods, parameter passing, static fields and methods, access controls, his reference, overloading methods and constructors, recursions, garbage collections, building strings, exploring strings class.

UNIT II

Inheritance: Inheritance hierarchies super and sub classes, member access rules, super keyword, and preventing inheritance: final classes and methods, the object class and its methods.
Polymorphism: dynamic binding, method overloading, abstract classes and methods. **Interface:** interface vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interfaces references, extending interface.
Packages: Defining, creating and accessing a package, understanding CLASSPATH, importing packages

UNIT III

Exception Handling: Dealing with errors, benefits of exception handling, the classification of exceptions, exception hierarchy, checked exceptions and unchecked exception, usage of try , catch, throw, throws, and finally, re-throwing exceptions, exception specification, built in exceptions, creating own exception sub classes.
Multithreading- difference between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter-thread communication, producer consumer pattern.

UNIT IV

Event Handling: Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, examples: handling a button click, handling mouse events, Adapter classes.
The AWT class hierarchy, Userinterface components-labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices, list panels-scrollpane, dialogs, menubar, graphics, layoutmanager-layout manager types-border, grid, flow, card and grid bag.

UNIT V

introduction to Swing, Swing vs. AWT, Hierarchy for Swing components, Containers-JFrame, JApplet, JDialog, JPanel, Overview of some swing components, JButton, JLabel, JTextField, JTextArea, simple Swing applications, Layout management- Layout manager types- border grid and flow.
Applets: Inheritance hierarchy for applets, differences between applets and applications, life cycle of an Applet, is passing parameters to applets, applet security issues.

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TEXTBOOKS:

1. Java the complete reference ,7th edition,Herbert schildt,TMH
2. Understanding oop with Java,updated edition,T.Budd,pearson education

REFERENCE BOOKS:

1. Java for programming, P.J.Dietel Pearson education (OR) Java: How to Program P.J.Dietel and H.M.Dietel, PHI
2. Object Oriented Programming through java, P.Radha Krishna, Universities Press.
3. Thinking in Java, Bruce Eckel, Pearson Education
4. Programming in Java, S.Malhotra and S.Choudhary, Oxford University Press.
5. Java Fundamentals- A Comprehensive introduction, Herbert schildtand Dale skrien, TMH

OUTCOMES:

➢ Understanding of OOP concepts and basics of java programming (Console and GUI Based)
➢ Understand the format and use of objects.
➢ Understand basic input/output methods and their use.
➢ The skills to apply OOP and java Programming in problem solving.
➢ Should have the ability to extend his/her knowledge of java programming future on his/her own.
➢ Understand object inheritance and its use.
➢ Understand development of JAVA applets vs. JAVA applications.

➢ Understand the use of various system libraries.

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(A1327) FINITE ELEMENT METHODS

OBJECTIVES:
- To equip the students with the Finite Element Analysis fundamentals.
- To enable the students to formulate the design problems into FEA.
- To introduce basic aspects of finite element technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems.

UNIT – I

Introduction to Finite Element Method for solving field problems. Stress and Equilibrium. Boundary conditions. Strain – Displacement relations. Stress – strain relations. One Dimensional Problems : Finite element modeling coordinates and shape functions. Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT – II

Analysis of Trusses: Stiffness Matrix for Plane Truss and Space Truss Elements, Stress Calculations
Analysis of Beams: Element stiffness matrix for two node, two degrees of freedom per node beam element, Load Vector, Deflection, Stresses

UNIT – III

Finite element modeling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions. Estimation of Load Vector, Stresses
Finite element modeling of Axi-symmetric solids subjected to Axi-symmetric loading with triangular elements.
Two dimensional four noded isoparametric elements and numerical integration.

UNIT – IV

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

UNIT – V

Dynamic Analysis: Formulation of finite element model, element - Mass matrices, evaluation of Eigen values and Eigen vectors for a stepped bar, truss and beam.
Finite element – formulation to 3 D problems in stress analysis, convergence requirements, Mesh generation techniques such as semi automatic and fully automatic use of softwares such as ANSYS, NISA ,NASTRAN, etc.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Finite Element Methods: Basic Concepts and applications, Alavala, PHI
2. Finite Element Method – Zincowitz / Mc Graw Hill
3. Introduction to Fininte element analysis- S.Md.Jalaludeen, Anuradha Publications, print-2012
4. Finite Element Analysis – P.Seshu / PHI
5. Finite Element Analysis – Hutton /TMH
6. Finite Element Analysis – Bathe / PHI
7. Finite Element Method – Krishna Murthy / TMH

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OUTCOMES:

By undergoing this course, student will be able to
 ➢ Understand the basic concepts and formulation of FINITE ELEMENT MODELS
 ➢ Prepare the stiffness matrix and analyze for displacements, stress and strain of one dimensional elements
 ➢ Analyze 2 D & 3D problems using iso-parametric elements
 ➢ Analyze and solve scalar field problems and dynamic analysis problems

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(A1444) MICROCONTROLLERS & APPLICATIONS

UNIT-I

Introduction to Microprocessors and Microcontrollers: Introduction to Microprocessor and Micro Controller, Number system and Binary arithmetic. Microprocessor Architecture (8085 and 8086) and Microcomputer System, memory map and addressing, memory classification, review of logic device for Interfacing, Memory Interfacing, Overview of 8086 Instruction Set, stacks and Interrupts.

UNIT-II

The 8051 Architecture: 8051 Microcontroller hardware, Program Counter and Data Pointer, A and B CPU registers, Flags and Program Status Word (PSW),Internal Memory : Internal RAM – Stack and Stack Pointer, Special Function Registers, Internal ROM, Input / Output Pins, ports and Circuits, External Memory, Timers and Counters, Serial data Input/ Output, interrupts.

UNIT-III

8051 Instruction set: Assembly Language Programming Process, Addressing Modes, Assembler Directives, Data Transfer, Arithmetic, Logical and Branch Instructions, Decimal Arithmetic, Interrupt Programming, Serial Data Communication.

8051 Programming: Basic Assembly Language Programming, Input/ Output Port Programming, 8051 Timer / Counter Programming, 8051 Serial Communication Programming , 8051 Interrupt Programming.

UNIT-IV

8051 Applications: Introduction, Interfacing Keyboards, Key pads, Interfacing Displays (Seven Segment Displays and LCD's), Interfacing A/D Convertors, Interfacing D/A Convertors, Interfacing Hardware Circuits for Multiple Interrupts, 8051 Interfacing with 8255, Interfacing Eternal Memory with 8051.

UNIT-V

Introduction to Advanced Architectures: ARM and SHARC, Processor and memory organization and Instruction level parallelism; Networked embedded System: Bus protocols, I2 bus and Can bus; Internet-Enabled Systems, Design Example-elevator Controller.

TEXT BOOKS:

1. K.J. Ayala "The 8051 Micro controller, Architecture, Programming 8- Applications "Thomson Delmar Learning
2. RS Gaonkar, "Microprocessors Architecture, Programming and Applications "Penram International.
3. 'Computers as Components- Principles of Embedded Computing System Design', Wayne Wolf, Elsevier (2nd Edition)

REFERENCE BOOKS:

1. M. A. Mazidi & J.G Mazidi." The 8051 Micro controller 8- Embedded System "Pearson Education.
2. B. Ram "Fundamentals of Microprocessors and Microcomputers "Dhanpat Rai and Sons.

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(A1328) MACHINE TOOLS, METROLOGY& MEASUREMENTS LAB

I. Machine Tools Lab

1. Machining on lathe

2. Measurement of cutting forces on lathe

3. Machining of holes(Pracice on reaming, use of drill jigs)

4. Machining of V-block using Shaping machine

5. Cutting of external/ internal slots using Slotting machine

6. Machining on Milling machine

7. Grinding of Tool angles

II. Metrology & Measurements Lab
A. Instrumentation lab

1. Study and calibration of Pressure Gauges

2. Study and calibration of transducers for temperature measurement.

3. Study and calibration of transducers for displacement measurement.

4. Study and calibration of photo and magnetic speed pickups for the measurement of speed.

5. Study and calibration of a rotometer for flow measurement.

B. Metrology lab

1. Measurement of lengths, heights, angles, diameters and bores.

2. Use of gear teeth vernier calipers for checking the chordal addendum and chordal height of the spur gear.

3. Machine tool alignment test on the lathe, milling and drilling machines.

4. Thread measurement using Tool maker's microscope and 2-wire/ 3-wire methods.

5. Surface roughness measurement by Tally Surf.

(A student will perform six experiments from section I and three each from section II A and II B)

OUTCOMES:

By undergoing this course, student will be able to
- Experimentally measure linear, angular dimensions, surface flatness & roughness by using different measuring instruments.
- Use tool makers' microscope to measure and examine complex profiles.
- Perform alignment tests on different machine tools.
- Perform machining operations on cylindrical and flat objects to obtain desired shapes using appropriate machine tools.

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(A1445) MICROCONTROLLERS & JAVA PROGRAMMING LAB

MICROCONTROLLERS LAB

1. Study of Development tools/ environment for Microcontroller Program.

2. Develop an embedded system for traffic light controller using Micro controller?

3. Write an ALP to interface stepper motor with 8051?

4. Write an Assembly language Program (ALP) to generate 10 kHz square wave?

5. Write an ALP to generate 10 kHz frequency using interrupts?

6. Write an ALP to interface one Microcontroller with other wring parallel communication?

7. Write an ALP to interface one Microcontroller with other wring serial communication?

8. Write an ALP to interfacing key board with 8051?

9. Write an ALP to interface ADC/ DAC with 8051?

10.   Write an ALP to interface LCD display to 8051?

JAVA PROGRAMMING LAB

OBJECTIVES:
- To make the student learn a object oriented way of solving problems.
- To teach the student to write programs in Java to solve the problems
- To introduce java compiler and eclipse platform
- To import hand on experience with java programming

Recommended Systems/Software Requirements:
- Intel based desktop PC with minimum of 166 MHZ or faster processor with atleast 64 MB RAM and 100 MB free disk space
- JDK Kit. Recommended

1
a.   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.
b.   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.
2
a.   Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
b.   Write a Java program to multiply two given matrices.
c.   Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use StringTokenizer class of java.util)
3
a.   Write a Java program that checks whether a given string is a palindrome or not.
Ex: MADAM is a palindrome.
b.   Write a Java program for sorting a given list of names in ascending order.
c.   Write a Java program to make frequency count of words in a given text.

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4
a.   Write a Java program that reads a 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.
b.   Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
c.   Write a Java program that displays the number of characters, lines and words in a text file.

5
a.   Write a Java program that:
i) Implements stack ADT. ii) Converts infix expression into Postfix form iii) Evaluates the postfix expression
6
a.   Develop an applet that displays a simple message.
b.   Develop an applet that receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named "Compute" is clicked.
7
a.   Write a Java program for handling mouse events.
8
a.   Write a Java program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.
b.   Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
9
a.   Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the textfields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an ArithmeticException Display the exception in a message dialog box.

OUTCOMES:

- Basics of java programming, multi-threaded programs and Exceptions handling.
- The skills to apply OOP in java programming in problem solving.
- Ability to access data from a DB with java programming.
- Use of GUI components (Console and GUI bases).

(Student will perform six experiments from each of the above two sections)

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(A1012) ANALYTICAL SKILLS – II

Logical Reasoning
- Analogy
- Classification
- Series & Sequence
- Coding & Decoding
- Directions
- Blood Relations
- Seating Arrangements
- Clocks and Calendars

Analytical Ability & Reasoning
- Cubes
- Logical Deductions
- Figure Analysis
- General Puzzles
- Data Sufficiency
- Data Interpretation

Business English
- Basics of Communication Skills
- Articles
- Tenses
- S+ V agreement
- Model Verbs
- Be/do/has/have Forms
- Question Forms

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(A1329) OPERATIONS RESEARCH

UNIT – I

Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications
ALLOCATION: Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method; 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.

UNIT – III

Sequencing: Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines
Replacement: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

UNIT – IV

Theory of Games: Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games –m x 2 & 2 x n games - graphical method – m x n games - dominance principle.
Inventory: Introduction – Single item, Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

UNIT – V

Waiting Lines: Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.
Dynamic Programming: Introduction – Terminology- Bellman's Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

TEXT BOOKS:

1. Operation Research /J.K.Sharma/MacMilan.
2. Introduction to O.R /Taha/PHI

REFERENCE BOOKS:

1. Operations Research: Methods and Problems / Maurice Saseini, Arhur Yaspan and Lawrence Friedman
2. Operations Research /A.M.Natarajan, P.Balasubramaniam, A. Tamilarasi/Pearson Education.
3. Operations Research / Wagner/ PHI Publications.
4. Introduction to O.R/Hillier & Libermann (TMH).

OUTCOMES:

➢ **By undergoing this course, student will be able to** Understand the basic models, methods and techniques used in operations research, solve and analyze problems using linear programming.
➢ Classify optimization problems and understand methods for solving transportation problem, Assignment problem, sequencing problems, replacement problems
➢ Apply a variety of operations research techniques for solving nonlinear programming problems, and will acquire command over probabilistic operations research methods , dynamic programming techniques

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(A1330) POWER PLANT ENGINEERING

OBJECTIVE: This course is concerned with the types, construction, working principles and performance of different types of conventional and non-conventional power plants. The design, construction, operation and performance of various components of steam, gas and diesel power plant e.g. Condensers, cooling towers, fuel and air handling systems, steam generators, super heaters, intercoolers, re-heaters and regenerators, it also discusses the basics of nuclear energy and operation of nuclear power plants. The course also covers basics of plant economics and the impact of power plants on the environment.

UNIT – I

Introduction to the Sources of Energy: Resources and Development of Power in India.
Rankine cycle: Introduction, Methods to improve cycle performance- regeneration & reheating
Steam Power Plant: Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.
Combustion Process: Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

UNIT – II

Internal Combustion Engine Plant
 Diesel Power Plant: Plant layout with auxiliaries
Gas Turbine Plant: Introduction – classification - construction – Layout with auxiliaries –. Combined Cycle Power Plants
Direct Energy Conversion: Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.
Power From Non-Conventional Sources: Utilization of Solar- Collectors- Principle of Working, Wind Energy – types – HAWT, VAWT -Tidal Energy.

UNIT – III

Hydro Electric Power Plant: Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pondage – classification of dams and spill ways.
Hydro Projects and Plant: Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants.

UNIT – IV

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

UNIT – V

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

TEXT BOOKS:

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

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REFERENCE BOOKS:

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

OUTCOMES:

By undergoing this course, student will be able to
➢ Identify different sources of energy, Indian resource scenario and sustainability issues.
➢ Understand working of steam power plant and related issues.
➢ Learn and compare conventional and non conventional power plants
➢ Describe and calculate the various factors of plant load and economy.

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(A1331) CAD / CAM

OBJECTIVE: The student will be able to know about the software AUTOCAD and to know about its applications for drafting and assembling of various mechanical and engine components.

UNIT – I

Fundamentals of CAD,CAM, Automation , design process, Application of computers for design, Benefits of CAD, Computer configuration for CAD applications, Computer peripherals for CAD ,Design workstation, Graphic terminal, CAD software- definition of system software and application software ,CAD database and structure.
Geometric Modeling: 3-D wire frame modeling, wire frame entities and their definitions, Interpolation and approximation of curves, Concept of parametric and non-parametric representation of curves, Curve fitting techniques, definitions of cubic spline, Bezier, and B-spline.

UNIT-II

Surface modeling: Algebraic and geometric form, Parametric space of surface, Blending functions,parametrization of surface patch, Subdividing, Cylindrical surface, Ruled surface, Surface of revolution Spherical surface, Composite surface, Bezier surface. B-spline surface, Regenerative surface and pathological conditions.
Solid Modelling: Definition of cell composition and spatial occupancy enumeration, Sweep representation, Constructive solid geometry, Boundary representations.

UNIT – III

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

UNIT – IV

Group Technology: Part families, Parts classification and coding. Production flow analysis, Machine cell design.
Computer aided process planning: Difficulties in traditional process planning, Computer aided process planning: retrieval type and generative type, Machinability data systems.
Computer aided manufacturing resource planning: Material resource planning, inputs to MRP, MRP output records, Benefits of MRP, Enterprise resource planning, Capacity requirements planning

UNIT – V

Flexible manufacturing system: F.M.S equipment, FMS layouts, Analysis methods for FMS benefits of FMS.
Computer aided quality control: Automated inspection- Off-line, On-line, contact, Non-contact; Coordinate measuring machines, Machine vision.
Computer Integrated Manufacturing: CIM system, Benefits of CIM

TEXT BOOKS:

1. CAD/CAM Principles and Applications, P.N.Rao, TMH
2. CAD/CAM Concepts and Applications, Alavala, PHI

REFERENCE BOOKS:

1. CAD/CAM /Groover M.P., Pearson education
2. CAD / CAM Theory and Practice,/ Ibrahim Zeid,TMH
3. CAD / CAM / CIM, Radhakrishnan and Subramanian, New Age
4. Principles of Computer Aided Design and Manufacturing, Farid Amirouche, Pearson
5. Computer Numerical Control Concepts and programming, Warren S Seames, Thomson.

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OUTCOMES:

➢ **By undergoing this course, student will be able to** Understand the role of computers in modern design and manufacturing.
➢ Understand geometric modeling, solid modeling and feature based design modeling.
➢ Program NC/CNC systems by understanding the basic functions of NC/CNC machines
➢ Understand planning, monitoring and control strategies in modern manufacturing

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(A1332) AUTOMOBILE ENGINEERING

UNIT – I

Introduction :   Components of four wheeler automobile – chassis and body – power unit – power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, reboring, decarburization, Nitriding of crank shaft..
Emission from Automobiles – Pollution standards, National and international – Pollution Control – Techniques – Noise Pollution & control.

UNIT – II

Fuel System: S.I. Engine : Fuel supply systems, Mechanical and electrical fuel pumps – carburetor – types – air filters – petrol injection.
C.I. Engines :   Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, Alternative fuels for Automobiles-injection,Classification,Properties, Hybrid vehicles   injection timing, testing of fuel, pumps.

UNIT – III

Cooling System :   Cooling Requirements, Air Cooling, Liquid Cooling and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporating cooling – pressure sealed cooling – antifreeze solutions.
Ignition System: Electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

UNIT – IV

Electrical System : Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.
Transmission System: Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – Gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box , over drive torque converter. Propeller shaft – Hoatch – Kiss drive, Torque tube drive universal joint, differential rear axles – types – wheels and tyres.

UNIT – V

Steering System: Steering geometry – camber, castor, king pin rake, combined angle toe in, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.
Suspension System: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.
Braking System: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.

TEXT BOOKS:

1. Automobile Engineering ,Vol. 1 & Vol. 2/ Kripal Singh
2. Automobile Engineering, Vol. 1 & Vol. 2/ K.M Gupta,Umesh publication

REFERENCE BOOKS:

1. A System approach to Automotive Technology by Jack Erjavec YesDee publishing pvt Ltd.
2. Automobile Engineering / William Crouse
3. Automotive Mechanics / Heitner
4. Alternative fuels of Automobiles by P.RamiReddy, Frontline publications.

OUTCOMES:

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- ➤ **By undergoing this course, student will be able to** Understand the automobile engine construction engine ignition and cooling systems.
- ➤ Understand fuels, fuel systems, fuel emissions and their impact on environment.
- ➤ Understand electrical systems comprising controlling and monitoring instruments of an automobile.
- ➤ Understand mechanical transmission systems and control systems of an automobile.

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(A1333) MECHANICAL VIBRATIONS & NOISE ENGINEERING
ELECTIVE - I

UNIT- I

Single degree of Freedom systems - I: Undamped and damped free vibrations; forced vibrations coulomb damping; Response to excitation; rotating unbalance and support excitation; vibration isolation and transmissibility.

UNIT- II

Single degree of Freedom systems - II: Response to Non Periodic Excitations: unit impulse, unit step and unit Ramp functions; response to arbitrary excitations, The Convolution Integral; shock spectrum; System response by the Laplace Transformation method.

UNIT- III

Two degree freedom systems: Principal modes- undaped and damped free and forced vibrations; undamped vibration absorbers;
Multi degree freedom systems: Matrix formulation, stiffness and flexibility influence coefficients; Eigen value problem; normal modes and their properties; Free and forced vibration by Modal analysis; Method of matrix inversion; Torsional vibrations of multi- rotor systems and geared systems; Discrete- Time systems.

UNIT- IV

Continuous system: Free vibration of strings – longitudinal oscillations of bars- traverse vibrations of beams- Torsional vibrations of shafts.
Critical speeds of shafts: Critical speeds without and with damping, secondary critical speed.
Numerical Methods: Rayliegh's stodola's, Matrix iteration, Rayleigh- Ritz Method and Holzer's methods.
Vibration measuring instruments: Vibrometers, velocity meters & accelerometers

UNIT- V

Sound level and subjective response to sound: Subjective response to sound, frequency dependent human response to sound, sound-pressure dependent human response, the decibel scale, relationship among sound power, sound intensity and sound pressure level, relationship between sound power level and sound intensity, relationship between sound intensity level and sound pressure level, sound measuring instruments.

TEXT BOOKS:

1. Elements of Vibration Analysis by Meirovitch, TMH, 2001
2. Mechanical Vibrations and sound engineering, A.G.Ambekar, PHI

REFERENCE BOOKS:

1. Mechanical Vibrations by SS Rao, Pearson, 2009, Ed 4,
2. Mechanical Vibration – Rao V.Dukkipati & J Srinivas, PHI, 2010.
3. Mechanical Vibratins – V. Ram Murthy.
4. Vibration problems in Engineering by S.P. Timoshenko.
5. Mechanical Vibrations- S Graham Kellyk, Schaum's Outilines, TMH

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(A1334) 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. Hydrostatic lubrication: Hydrostatic step bearing, application to pivoted pad thrust bearing and other applications, hydrostatic lifts, hydrostatic squeeze films and its application to journal bearing.

UNIT – II

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 – III

Friction and power losses in journal bearings: Calibration of friction loss, friction in concentric bearings, bearing moduIus, Sommer-field number, heat balance, practical consideration of journal bearing design considerations.

UNIT – IV

Air lubricated bearing: Advantages and disadvantages, application to Hydrodynamic journal bearings, hydrodynamic thrust bearings. Hydrostatic thrust bearings. Hydrostatic bearing Analysis including compressibility effect. Study of current concepts of boundary friction and dry friction.

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

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

TEXT BOOKS:

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

REFERENCE BOOK:

1. Tribology – B.C. Majumdar

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(A1335) ROBOTICS
ELECTIVE – I

UNIT - I

Introduction: Automation and Robotics - an over view of Robotics -classification by coordinate system and control systems - Components of the Industrial Robotics: Degrees of freedom - End effectors: Mechanical gripper - Magnetic - Vacuum cup and other types of grippers - General consideration on gripper selection and design, Robot actuator and sensors.

UNIT - II

Motion Analysis: Basic rotation matrices - Composite rotation matrices - Euler Angles - Equivalent Angle and Axis - Homogeneous transformation -Problems. Manipulator Kinematics: D-H notations - Joint coordinates and world coordinates - Forward and inverse kinematics - problems.

UNIT - III

Differential Kinematics: Differential Kinematics of planar and spherical manipulators - Jacobians - problems. Robot Dynamics: Lagrange - Euler formulations - Newton-Euler formulations - Problems on planar two link manipulators.

UNIT IV

Trajectory Planning: Joint space scheme - cubic polynomial fit -Avoidance of obstacles - Types of motion: Slew motion - joint interpolated motion -straight line motion - problems**.**
Robot actuators and Feedback components: Actuators: Pneumatic.

UNIT V

Robot Application in Manufacturing: Material handling - Assembly and Inspection - Work cell design, work volume, Robot screan.

TEXT BOOKS:

1. Industrial Robotics/ Grover M P/ Pearson Edu.
2. Introduction to Robotic Mechanics and Control / JJ Craig/ Pearson/ 3rd edition.

REFERENCE BOOKS:

1. Robotics / Fuks/ Mc Graw Hill.
2. Robotic Engineering/Richard D. Richard D. Klaftez/ Prentice Hall.
3. Robot Analysis and intelligence / Asada and slotine / wiley Interscience.
4. Robot Dynamics &Control/ Mark W. Spong and M. Vidyasagar/ John Wiley& sons (ASIA) Pvt. Ltd.
5. Robotics and control / Mittal RK & Nagrath I J TMH.

OUTCOMES:

By undergoing this course, student will be able to
- Understand functioning of robots and their subsystem.
- Analyze robot motion and associated controls
- Analyze dynamics of robot actuators and manipulators.
- Learn about materials and hardware components used in robot manufacturing.

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(A1336) REFRIGERATION & AIR CONDITIONING
ELECTIVE - II

OBJECTIVE: In the subject of REFRIGERATION AND AIR CONDITIONING deals with the heating and cooling effects produced in domestic and industrial applications. These applications are widely used as they are used for the human comfort. These uses working fluid to produced the effect for which it is made for. These effects are shown with the help of many diagrams. It produces effect with the help of increase and decrease of pressure and temperature.

UNIT – I

Introduction to Refrigeration: - Necessity and applications – Unit of refrigeration and C.O.P. – Mechanical Refrigeration – Types of Ideal cycle of refrigeration.
Air Refrigeration: Bell Coleman cycle and Brayton Cycle, Open and Dense air systems – Actual air refrigeration system – Refrigeration needs of Air crafts- Air systems – Actual Air refrigeration system – Refrigeration needs of Air crafts – Application of Air Refrigeration, Justification – Types of systems – Problems.

UNIT – II

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

UNIT III

System Components: Compressors – General classification – comparison – Advantages and Disadvantages.
Condensers – classification – Working Principles
Evaporators – classification – Working Principles
Expansion devices – Types – Working Principles
Refrigerants – Desirable properties – common refrigerants used – Nomenclature – Ozone Depletion – Global Warming – Azeotropes and Zeotropes

UNIT IV

Vapor Absorption System: Calculation of max COP – description and working of NH3 – water system – Li – Br system. Principle of operation Three Fluid absorption system, salient features.
Steam Jet Refrigeration System: Working Principle and Basic Components, Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube.

UNIT – V

Introduction to Air Conditioning:
Psychometric Properties & Processes – Sensible and latent heat loads – Characterization – Need for Ventilation, Consideration of Infiltration – Load concepts of RSHF, ASHF, ESHF and ADP. Concept of human comfort and effective temperature –Comfort Air conditioning – Industrial air conditioning and Requirements – Air conditioning Load Calculations.
Air Conditioning systems: Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, deodorants, fans and blowers. Heat Pump – Heat sources – different heat pump circuits – Applications.

TEXT BOOKS:

1. A Course in Refrigeration and Air conditioning / SC Arora & Domkundwar / Dhanpatrai
2. Refrigeration and Air Conditioning/ Manohar Prasad/ New Age

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REFERENCE BOOKS:

1. Refrigeration and Air Conditioning / CP Arora / TMH.
2. Principles of Refrigeration - Dossat / Pearson Education
3. Basic Refrigeration and Air-Conditioning – Ananthanarayanan / TMH

OUTCOMES:

By undergoing this course, student will be able to

➢ Understand functions of various components of vapour compression refrigeration system, Air-Refrigeration system and steam jet refrigeration system and assess the performance of entire system.
➢ Understand the impact of refrigerants on the environment.
➢ Understand and analyze the vapor absorption refrigeration system as an alternate to vapour compression refrigeration system
➢ Calculate thermal load in for various air conditioning systems and conduct thermal design of a single-zone central air conditioning system

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(A1337) JET PROPULSION & ROCKET ENGINEERING
ELECTIVE-II

UNIT - I

Turbo Jet Propulsion System: Gas turbine cycle analysis – layout of turbo jet engine. Turbo machinery-compressors and turbines, combustor, blade aerodynamics, engine off design performance analysis.
Flight Performance: Forces acting on vehicle – Basic relations of motion – multi stage vehicles.

UNIT - II

Principles of Jet Propulsion and Rocketry: Fundamentals of jet propulsion, Rockets and air breathing jet engines – Classification – turbo jet , turbo fan, turbo prop, rocket (Solid and Liquid propellant rockets) and Ramjet engines.
Nozzle Theory and Characteristics Parameters: Theory of one dimensional convergent – divergent nozzles – aerodynamic choking of nozzles and mass flow through a nozzle – nozzle exhaust velocity – thrust, thrust coefficient, A_c / A_t of a nozzle, Supersonic nozzle shape, non-adapted nozzles, summer field criteria, departure from simple analysis – characteristic parameters – 1) characteristic velocity, 2) specific impulse 3) total impulse 4) relationship between the characteristic parameters 5) nozzle efficiency, combustion efficiency and overall efficiency.

UNIT - III

Aero Thermo Chemistry of The Combustion Products: Review of properties of mixture of gases – Gibbs – Dalton laws – Equivalent ratio, enthalpy changes in reactions, heat of reaction and heat of formation – calculation of adiabatic flame temperature and specific impulse – frozen and equilibrium flows.
Solid Propulsion System: Solid propellants – classification, homogeneous and heterogeneous propellants, double base propellant compositions and manufacturing methods. Composite propellant oxidizers and binders. Effect of binder on propellant properties. Burning rate and burning rate laws, factors influencing the burning rate, methods of determining burning rates.

UNIT - IV

Solid Propellant Rocket Engine: Internal ballistics, equilibrium motor operation and equilibrium pressure to various parameters. Transient and pseudo equilibrium operation, end burning and burning grains, grain design. Rocket motor hard ware design. Heat transfer considerations in solid rocket motor design. Ignition system, simple pyro devices.
Liquid Rocket Propulsion System: Liquid propellants – classification, Mono and Bi propellants, Cryogenic and storage propellants, ignition delay of hypergolic propellants, physical and chemical characteristics of liquid propellant. Liquid propellant rocket engine – system layout, pump and pressure feed systems, feed system components. Design of combustion chamber, characteristic length, constructional features, and chamber wall stresses. Heat transfer and cooling aspects. Uncooled engines, injectors – various types, injection patterns, injector characteristics, and atomization and drop size distribution, propellant tank design.

UNIT - V

Ramjet and Integral Rocket Ramjet Propulsion System: Fuel rich solid propellants, gross thrust, gross thrust coefficient, combustion efficiency of ramjet engine, air intakes and their classification – critical, super critical and sub-critical operation of air intakes, engine intake matching, classification and comparison of IIRR propulsion systems.

TEXT BOOKS:

1. Gas Turbines and propulsive systems-P.Khajuria& S.P.Dubey/Dhanpatrai publication.
2. Gas Dynamics & Space Propulsion- M.C.Ramaswamy / Jaico Publishing House.

REFERENCE BOOKS:

1. Gas Turbines /Cohen, Rogers & Sarvana Muttoo/Addision Wesley & Longman.
2. Gas Turbines-V.Ganesan /TMH.

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(A1338) NON-CONVENTIONAL SOURCES OF ENERGY
ELECTIVE-II

UNIT – I

Principles of Solar Radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power - Physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, Solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, solar radiation data.
Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT - II

Solar Energy Storage and Applications: Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications - solar heating/cooling techniques, solar distillation and drying, Photovoltaic energy conversion.
Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

UNIT - III

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

UNIT – IV

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.
Ocean Energy: OTEC, Principles, utilization, setting of OTEC plants, thermodynamic cycles. Tidal and Wave energy: Potential and conversion techniques, mini-hydel power plants, their economics.

UNIT –V

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

TEXT BOOKS:

1. Renewable Energy Resources / Tiwari and Ghosal / Narosa
2. Non- conventional Energy Sources / G.D. Rai
3.   Biological Energy Resources/ Malcolm Fleischer & Chris Lawis.

REFERENCE BOOKS:

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

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(A1339) HEAT TRANSFER LAB & THEORY OF MACHINES LAB

I. Heat Transfer Lab

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Thermal Conductivity of given metal rod.
5. Heat transfer in pin-fin
6. Experiment on Transient Heat Conduction
7. Heat transfer in forced convection apparatus.
8. Heat transfer in natural convection
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan Boltzman Apparatus.
12. Heat transfer in drop and film wise condensation.
13. Critical Heat flux apparatus.
14. Study of heat pipe and its demonstration.

II. Theory of Machine Lab

1. Study on four bar mechsnism and its inversions
2. Study on single slider and double slider mechanisms and inversions
3. Pantograph apparatus
4. Study of velocity ratio in simple, compound, reverted and epicyclic gear trains
5. Study on holding torque determination in epicyclic gear train apparatus.
6. Cam analysis apparatus
7. Coriolli's component of acceleration apparatus
8. Determination of sensitiveness of a governor
9. Static balancing using steel balls
10. Determination of the magnitude and orientation of the balancing mass in dynamic balancing
11. Determination of damped natural frequency of vibration of the vibrating system with different viscous oils
12. Study on rope brake dynamometer apparatus
13. Determination of steady state amplitude of a forced vibratory system
14. Determination of the magnitude of gyroscopic couple, angular velocity of precession and representation of vectors
15. Determination of natural frequency of given structure using FFT analyzer

(A student will perform six experiments from each of the above two sections)

OUTCOMES:

➢ **By undergoing this course, student will be able to** Understand principles of experimental methods in Heat transfer problems.
➢ Understand and compare experimental results with theoretical predictions.
➢ Understand, conduct and interpret results of experiments based on conduction, convection and radiation heat transfer problems.
➢ Understand, conduct and interpret results of experiments based on practical applications such as heat exchangers, fins, condensers, and heat pipe.

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(A1340) COMPUTER ASSISTED PRODUCTION DRAWING, CAD/CAM LAB

I. MODELLING

1. **Drafting:** Development of part drawings for various components in the form of orthographic and isometric views. Representation of dimensioning and tolerances.

   a) Conventional Representation Of Materials: Conventional representation of parts - screw joints, welded joints, springs, gears, electrical, hydraulic and pneumatic circuits - methods of indicating notes on drawings.

   b) Study on: Types of fits, exercises involving selection / interpretation of fits and estimation of limits from tables - Form And Positional Tolerances - Surface Roughness And Its Indication

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

2. **Part Modeling:** Generation of various 3D Models through Protrusion, revolve, sweep. Creation of various features. Study of parent child relation.

3. **Assembly:** Feature based and Boolean based modeling and Assembly Modeling.

II. ANALYSIS

4. Determination of deflection and stresses in 2D and 3D trusses and beams.

5. Determination of deflections, principal and Von-Mises stresses in plane stress, plane strain and Axi-symmetric components.

6. Determination of stresses in 3D and shell structures (at least one example in each case)

7. Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.

8. Steady state heat transfer analysis of plane and axi-symmetric components.

III. MANUFACTURING

9. Programming CNC turning centre for machining of cylindrical objects.

10. Programming CNC mill for machining falt surfaces.

11. Machining of simple components on CNC lathe and Mill by transferring NC Code / from CAM software.

(Student will perform atleast 3 from each of the above 3 categories and a total of 10 exercises among the above)

TEXT BOOKS:

1 Production and Drawing /K.L. Narayana & P. Kannaiah/ New Age
2 Machine Drawing with Auto CAD/ Pohit and Ghosh, PE

REFERENCE BOOKS:

Geometric dimensioning and tolerancing/James D. Meadows/ B.S Publications

1 Engineering Metrology/ R.K. Jain/Khanna Publications

OUTCOMES:

➢ **By undergoing this course, student will be able to** Understand the basic fundamentals that are used to create and manipulate geometric models in computer program**.**
➢ Model the 3D geometric information of machine components including assemblies, and automatically generate 2D production drawings
➢ Analyze deflections, stresses, natural frequencies, mode shapes and harmonic response of 2D and 3D Structures
➢ Write CNC programs for turning and milling machining operations.

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(A1341) TOTAL QUALITY MANAGEMENT
ELECTIVE-III

Objective: Total Quality Management (TQM) is an organisational process that actively involves every function and every employee in satisfying customers' needs, both internal and external. TQM works by continuously improving all aspect of work through structured control, improvement and planning activities that are carried out in concern with guiding ideology that focuses on Quality and Customer Satisfaction as the top priorities.

UNIT - I

Introduction: The concept of TQM, Quality and Business performance, attitude and involvement of top management, communication, culture and management systems.

Management of Process Quality- Definition of quality, Quality Control, a brief history, Product inspection vs Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling

UNIT -II

Customer Focus and Satisfaction: Process vs Customer, internal customer conflict, quality focus, Customer Satisfaction. Role of Marketing and Sales, Buyer — Supplier relationships

Bench Marking Evolution of Bench Marking, meaning of bench marking, benefits of bench marketing, the bench marking procedure. Pitfalls of bench marketing

UNIT- III

Organizing for TQM: The systems approach, organizing for quality implementation,making the transition from a traditional to a TQM organization, Quality Circles, seven Tools of TOM: Startification, check sheet, Scatter diagram. Ishikawa diagram, paneto diagram, Kepner &Tregoe Methodology

UNIT- IV

The Cost of Quality: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost information, Accounting Systems and Quality Management.

UNIT -V

ISO9000: Universal Standards of Quality: ISO around the world, the ISO9000 ANSI/ASQC Q- 90, Series Standards, benefits of ISO9000 certification, the third party audit, Documentation ISO9000 and services, the cost of certification implementing the system.

TEXT BOOKS:

1. Total Quality Management / Joel E Ross/Taylor and Franscis Limited.
2. Total Quality Managernent P.N.Mukherjee/PHI

REFERENCE BOOKS:

1. Beyond TQM/ Robert L Flood
2. Statistical Quality Control/ E L Grant
3. Total Quality Management: A Practical approach/ H. Lal
4. Quality Management/ Kanishka Bedi/ Oxford University Press/ 2011
5. Total Engineering Quality Management/ Sunil Sharma/ Macmillan

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(A1342) PLANT LAYOUT & MATERIAL HANDLING
ELECTIVE-III

UNIT-I

Introduction – classification of layout, advantages and limitations of different layouts, layout design procedures, overview of plant layout.

UNIT-II

Process layout and product layout: selection, specification, implementation and flow up, comparison of product and process layout.

UNIT- III

Heuristics for plant layout- ALDEP, CORELAP, CRAFT;
Group layout, fixed position layout- quadratic assignment model, branch and bound method.

UNIT IV

Introduction , material handling systems, material handling principles, classification of material handling equipment, relationship of material handling to plant layout. Basic material handling systems: selection, material handling methods- path, equipment, function oriented systems,

UNIT V

Methods to minimize cost of material handling – maintenance of material handling equipments, safety in handling. Ergonomics of material handling equipment. Design, miscellaneous equipments.

TEXT BOOK:

1. Aspects of material Handling/ Dr. KC Arora & Shinde, Lakshmi Publications.
2. Operations Management/ PB Mahapatra /PHI

REFERENCE BOOKS:

1. Faciliy Layout & Location an analytical approach/ RL Francis /LF Mc Linnis Jr, White / PHI
2. Production and Operations Management/ R Panneerselvam/ PHI
3. Introduction to Material handling/ Ray, Siddhartha/ New Age

OUTCOMES:

➢ **By undergoing this course, student will be able to** Understand, compare, design and analyze various plant layouts.
➢ Select appropriate material handling system suiting for a plant layout chosen
➢ Learn methods to minimize cost of material handling.
➢ Learn and design material handling equipment.

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(A1343) MAINTENANCE AND SAFETY ENGINEERING
ELECTIVE-III

UNIT-I

Introduction: need for maintenance, facts and figures, modern maintenance strategy for the 221st century, engineering maintenance objectives and maintenance in equipment life cycle, terms and definitions.
Maintenance Management and control: maintenance manual, maintenance, facility evaluation, functions of effective maintenance management, maintenance project control methods, and maintenance management control indices.

UNIT-II

Types of maintenance: preventive maintenance, elements of preventative, maintenance program, establishing preventative maintenance program PM program evaluation and improvement, PM measures, PM models, corrective maintenance, corrective maintenance types, corrective maintenance steps and downtime components, corrective maintenance measures, corrective maintenance models.
Inventory control in maintenance: inventory control objectives and basic inventory decisions, ABC inventory control methods, inventory control models two bin inventory control and safety stock, spares determination factors spares calculation methods.

UNIT-III

Quality and safety in maintenance: needs for quality maintenance processes, maintenance work quality, use of quality control charts in maintenance work sampling, post maintenance testing, reasons for safety problems in maintenance, guidelines to improve safety in maintenance work, safety officer's role in maintenance work, protection of maintenance workers.
Maintenance costing: reasons for maintenance costing, maintenance budget preparation methods and steps, maintenance labor cost estimation, material cost estimation, equipment life cycle maintenance cost estimation, and maintenance cost estimation models.

UNIT-IV

Reliability, reliability centered maintenance, RCM: Goals and principles, RCM process and Associated Questions, RCM program Components effectiveness measurement indicators, RCM benefits and reasons for its failures, reliability versus maintenance and reliability in support phase, bathtub hazard rate concept, reliability measures and formulas, reliability networks, reliability analysis techniques.

UNIT-V

Maintainability: maintainability importance and objective, maintainability in systems, life cycle, and maintainability design characteristics, maintainability functions and measures, common maintainability design errors.

TEXT BOOKS:

1. Reliability, Maintenance and Safety Engineering By Dr. A.K.Guptha/ Laxmi Publications
2. Industrial Safety Management by L.M.Deshmukh / TMH

REFERENCE BOOKS :

1. Maintenance Engineering & Management by R.C.Mishra/ PHI
2. Reliability Engineering by Elsayed/ Pearson
3. Engineering Maintenance A modern approach, B.S Dhallon, 2002, C.R.R Publishers.

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(A1344) UN-CONVENTIONAL MACHINING PROCESSES
ELECTIVE-IV

UNIT – I

Introduction: Need for un-convention machining methods, Classification of Un-conventional machining processes, considerations in process selection, materials, general characteristics and applications of un-conventional machining processes.

UNIT – II

Mechanical Material Removal Processes: Ultrasonic machining, Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining – basic principles, components, process variables, advantages and disadvantages, applications.

UNIT – III

Thermal Material Removal Processes: Electro Discharge Machining, Wire EDM, Laser Machining, Electron Beam Machining, Ion Beam Machining - basic principles, components, process variables, advantages and disadvantages, applications.

UNIT – IV

Chemical Material Removal Processes: Electro Chemical Machining, Electro Chemical Grinding, Electro Chemical Honing, and Electro Chemical Deburring - basic principles, components, process variables, advantages and disadvantages, applications.

UNIT-V

Micro Machining: Bulk micromachining, surface micromachining and LIGA process – General description, basic principles, components, process variables, advantages and disadvantages, applications.

TEXT BOOKS:

1. Advanced machining processes/ VK Jain/ Allied publishers
2. MEMS & Microsystems – Design and Manufacture by Tai-Ran Hsu, Tata McGraw Hill

REFERENCE BOOKS:

1. Modern Machining Process / Pandey P.C. and Shah H.S./ TMH
2. New Technology / Bhattacharya A/ The Institution of Engineers, India 1984.

OUTCOMES:

➢ **By undergoing this course, student will be able to** Understand need for modern metal removing processes.
➢ Learn metal removal by different abrasive principles.
➢ Learn metal removal by thermal processes.
➢ Learn metal removal by chemical processes.
➢ Learn metal removal machining processes by Ultrasonic and focused electron principles.

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(A1345) PRODUCTION PLANNING AND CONTROL
ELECTIVE-IV

UNIT – I

Introduction: Definition – Objectives of Production Planning and Control – Functions of production planning and control - Types of production systems - Organization of production planning and control department.
Forecasting – Definition- uses of forecast- factors affecting the forecast- types of forecasting- their uses - general principle of forecasting. Forecasting techniques- quantitative and qualitative techniques. Measures of forecasting errors.

UNIT – II

Inventory management: Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – Basic EOQ model- Inventory control systems –continuous review systems and periodic review systems, MRP I, MRP II, ERP, JIT Systems - Basic Treatment only.
Aggregate planning: Definition – aggregate-planning strategies – aggregate planning methods – transportation model.

UNIT –III

Line Balancing: Terminology, Methods of Line Balancing, RPW method, Largest Candidate method and Heuristic method.
Routing – Definition – Routing procedure – Factors affecting routing procedure, Route Sheet.

UNIT – IV

Scheduling –Definition – Scheduling Policies – types of scheduling methods – differences with loading – flow shop scheduling **–** job shop scheduling, line of balance (LOB) – objectives - steps involved.

UNIT – V

Dispatching: Definition – activities of dispatcher – dispatching procedures – various forms used in dispatching.
Follow up: definition – types of follow up – expediting – definition – expediting procedures-Applications of computers in planning and control.

TEXT BOOKS:

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

REFRENCE BOOKS:

1. Production Planning and Control- Text & cases/ SK Mukhopadhyaya /PHI.
2. Production and operations Management – R.Panneer Selvam – PHI
3. Operations Management by Chase/PHI
4. Management Science – A R Aryasri- 4e –TMH
5. Operations management – Heizer- Pearson

OUTCOMES:
➢ **By undergoing this course, student will be able to** Learn about the various functions in PPC to better manage manufacturing and perform demand forecasting using different techniques in the business enterprises.
➢ Understand, implementing the basic inventory control methods and techniques and the basic principles of MRP/ERP systems, JIT operations.
➢ Learn how to model decision problems in Routing and solving the appropriate decision model for planning and scheduling problems
➢ Understand concepts and principles of line balancing including aggregate planning and the dispatching procedure.

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(A1346) RAPID PROTOTYPING
ELECTIVE – IV

UNIT-I

Introduction: Introduction to Prototyping, Traditional Prototyping Vs Rapid Prototyping (RP). Need for time compression in product development. Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies. Classification of RP

RP Software: Need for RP software, MIMICS, Magics, SurgiGuide. 3-matic, 3D-Doctor. Simplant, Velocity2, VoXirn. SolidView, 3DViev etc,. Software, Preparation of CAD models, Problems with STL files. STL file manipulation, RP data formats: SLC. CLI, RPI, LEAF, IGES, HP/GL, CT, STEP.

UNIT-II

Photo polymerization RP Processes: Stereo lithography (SL). SL resin curing process, SL scan patterns, Micro stereo lithography. Applications of Photo polymerization Processes.

Powder Bed Fusion RP Processes: Selective laser Sintering (SLS). Powder fusion mechanism and powder handling, SLS Metal and ceramic part creation, Electron Beam melting (EBM). Applications of Powder Bed Fusion Processes

UNIT-III

Printing RP Processes: 3D printing (3DP), Research achievements in printing deposition, Technical challenges in printing, Printing process modelling, Applications of Printing Processes.

Beam Deposition RP Processes: Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD) , Processing- structure-properties, relationships, Benefits and drawbacks.

UNIT-IV

Extrusion-Based RP Systems: Fused Deposition Modelling (FDM), Principles, Plotting and path control, Applications of Extrusion-Based Processes

Sheet Lamination RP Processes: Laminated Object Manufacturing (LOM), Ultrasonic Consolidation (UC), Gluing, Thermal bonding, LOM and UC applications.

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

UNIT-V

Reverse Engineering: Reverse Engineering (RE) Methodologies and Techniques, Selection of RE systems, RE software, RE hardware, RE in product development

Errors in RP Processes: Pre-processing, processing post-processing errors, Part building errors in SLA, SLS, etc
RP Applications: Design. Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

TEXT BOOKS:

1   Chua Chee Kai., Leong Kah Fai., Chu Sing Lim. Rapid Prototyping: Principles and Applications in Manufacturing. World Scientific, 2010.
2   Ian Gibson., David W Rosen., Brent Stucker., Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer, 2010.
3   Rafiq Noorani, Rapid Prototyping: Principles and Applications in Manufacturing. John Wiley & Sons, 2006.

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(A1022) MANAGEMENT SCIENCE

UNIT: I

Introduction to Management & Organisation: Concepts of Management and organization- nature, importance and Functions of Management, Systems Approach to Management - Taylor's Scientific Management Theory – Fayol's Principles of Management – Maslow's theory of Hierarchy of Human Needs – Douglas McGregor's Theory X and Theory Y – Hertzberg Two Factor Theory of Motivation - Leadership Styles, Social responsibilities of Management. Designing Organisational Structures: Basic concepts related to Organisation - Departmentation and Decentralisation, Types and Evaluation of mechanistic and organic structures of organisation and suitability.

UNIT: II

Operations & Marketing Management: Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement – Business Process Reengineering Statistical Quality Control: control charts for Variables and Attributes, (simple Problems) and Acceptance Sampling, TQM, Six Sigma, Deming's contribution to quality. Objectives of Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records – JIT System, Supply Chain Management Functions of Marketing, Marketing Mix, and Marketing Strategies based on Product Life Cycle, Channels of distribution.

UNIT: III

Human Resources Management (HRM): Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs PMIR, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating – Capability Maturity Model (CMM) Levels – Performance Management System.

UNIT: IV

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

UNIT: V

Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Bench Marking and Balanced Score Card as Contemporary Business Strategies.

TEXT BOOKS:

1. Aryasri: *Management Science*, McGraw Hill, 2012.
2. Vijay Kumar and Appa Rao *Management Science*, Cengage, 2012.

REFERENCE BOOKS:

1. Kotler Philip & Keller Kevin Lane: Marketing Management, Pearson, 2012.
2. Koontz & Weihrich: *Essentials of Management*, McGraw Hill, 2012.
3. Thomas N.Duening & John M.Ivancevich *Management-Principles and Guidelines,* Biztantra, 2012.
4. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2012.
5. Samuel C.Certo: *Modern Management*, 2012.
6. Schermerhorn, Capling, Poole & Wiesner: *Management*, Wiley, 2012.
7. Parnell: *Strategic Management*, Cengage, 2012.
8. Lawrence R Jauch, R.Gupta &William F.Glueck: *Business Policy and Strategic Management*, Frank Bros.2012.