JNTUA COLLEGE OF ENGINEERING (Autonomous)-ANANTAPURAMU
Course Structure
DEPARTMENT OF MECHANICAL ENGINEERING

I Year B.Tech. ME-I Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	English-I	3	1	0	3
2	THEORY	Mathematics-I	3	1	0	3
3	THEORY	Environmental Studies	3	1	0	3
4	THEORY	Engineering Drawing-I	1	1	3	3
5	THEORY	Engineering Chemistry	3	1	0	3
6	PRACTICA L	Communication Skills Lab	0	0	3	3
7	PRACTICAL	Chemistry Lab	0	0	3	2
8	PRACTICAL	Engineering Workshop/IT Workshop	0	0	3	2
9		NSS/NCC				
		Total	**13**	**5**	**12**	**21**

I Year B.Tech ME- II Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	Technical English-II	3	1	0	3
2	THEORY	Mathematics -II	3	1	0	3
3	THEORY	Computer programming	1	1	3	3
4	THEORY	Engineering Physics	3	1	0	3
5	THEORY	Engineering Drawing-II	3	1	0	3
6	THEORY	Engineering Mechanics	3	1	0	3
7	PRACTICAL	Computer programming Lab	0	0	3	2
8	PRACTICAL	Engineering Physics Lab	0	0	3	2
		Total	**16**	**6**	**9**	**22**

II Year B.Tech. ME- I Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	Thermodynamics	3	1	0	3
2	THEORY	Mathematical Methods	3	1	0	3
3	THEORY	Electrical and Electronics Engineering	3	1	0	3
4	THEORY	Mechanics of Solids	3	1	3	3
5	THEORY	Machine Drawing	1	1	3	3
6	THEORY	Material Science and Metallurgy	4	0	0	3
7	PRACTICAL	Electrical and Electronics Engineering Lab	0	0	3	2
8	PRACTICAL	Mechanics of Solids Lab & Material Science Lab	0	0	3	2
9		Human Values & Professional Ethics	2	0	0	0
		Total	**20**	**4**	**13**	**22**

II Year B.Tech. ME- II Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	Design of Machine Members-I	3	1	0	3
2	THEORY	Fluid Mechanics & Hydraulic Machinery	3	1	0	3
3	THEORY	Kinematics of Machinery	3	1	0	3
4	THEORY	Thermal Engineering-I	3	1	0	3
5	THEORY	Probability and Statistics	3	1	0	3
6	THEORY	Manufacturing Technology	3	1	0	3
7	PRACTICAL	Fluid Mechanics & Hydraulic Machinery Lab	0	0	3	2
8	PRACTICAL	Manufacturing Technology Lab	0	0	3	2
9		Computer Aided Drafting Lab	0	0	3	0
		Total	**18**	**6**	**9**	**22**

III Year B.Tech. ME- I Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	Dynamics of Machinery	3	1	0	3
2	THEORY	Managerial Economics and Financial Analysis	3	1	0	3
3	THEORY	Machine Tools	3	1	0	3
4	THEORY	Design of Machine Members – II	3	1	0	3
5	THEORY	Thermal Engineering - II	3	1	0	3
6	THEORY	Automobile Engineering	3	1	0	3
7	PRACTICAL	Thermal Engineering Lab	0	0	3	2
8	PRACTICAL	Machine Tools Lab	0	0	3	2
9		Automotive Act & Practice	0	0	3	0
		Total	18	6	9	22

III Year B.Tech. ME- II Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	Industrial Engineering & Management	3	1	0	3
2	THEORY	Engineering Metrology	3	1	0	3
3	THEORY	Refrigeration & Air Conditioning	3	1	0	3
4	THEORY	Operations Research	3	1	0	3
5	THEORY	Heat Transfer	3	1	0	3
6	THEORY	CAD/CAM	3	1	0	3
7	PRACTICAL	Heat Transfer Lab	0	0	3	2
8	PRACTICAL	CAD/CAM Lab	0	0	3	2
9		Advanced Communication Skills Lab	0	0	3	0
		Total	18	6	9	22

IV Year B.Tech. ME- I Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	Finite Element Methods	3	1	0	3
2	THEORY	Renewable Energy Sources	3	1	0	3
3	THEORY	Instrumentation & Control Systems	3	1	0	3
4	THEORY	Automation & Robotics	3	1	0	3
5	THEORY	Open Elective	3	1	0	3
6	THEORY	MOOC	3	1	0	3
7	PRACTICAL	Instrumentation & Metrology Lab	0	0	3	2
8	PRACTICAL	Computer Aided Engineering Lab	0	0	3	2
9		Project Part-A -Seminar	-	-	-	2
		Total	18	6	6	24

Open Elective
Entrepreneurship
Total Quality Management
Energy Ecology & Environment

IV Year : II Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	Production & Operations Management	3	1	0	3
2	THEORY	Power Plant Engineering	3	1	0	3
3	THEORY	E-I	3	1	0	3
4	THEORY	E-II	3	1	0	3
5		Comprehensive Viva -Voice	0	0	3	3
6		Project Part-B	0	0	15	10
		Total	12	4	18	25

Elective-I	Elective-II
Modern Manufacturing Methods	Tribology
Jet Propulsion and Rocket Engineering	Computational Fluid Dynamics
Mechanical vibrations	Energy Management

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Course Structure

DEPARTMENT OF MECHANICAL ENGINEERING

I Year B.Tech. ME-I Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	English-I	3	1	0	3
2	THEORY	Mathematics-I	3	1	0	3
3	THEORY	Environmental Studies	3	1	0	3
4	THEORY	Engineering Drawing-I	1	1	3	3
5	THEORY	Engineering Chemistry	3	1	0	3
6	PRACTICA L	Communication Skills Lab	0	0	3	3
7	PRACTICAL	Chemistry Lab	0	0	3	2
8	PRACTICAL	Engineering Workshop/IT Workshop	0	0	3	2
9		NSS/NCC				
		Total	**13**	**5**	**12**	**21**

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I- Year B.Tech. M.E. I-Sem	**T**	**P**	**C**
	3	**0**	**3**

ENGLISH-I

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1. INTRODUCTION:

English is an international language as well as a living and vibrant one. People have found that knowledge of English is a passport for better career, better pay, advanced knowledge and for communication with the entire world. As it is a language of opportunities in this global age, English is bound to expand its domain of use everywhere. The syllabus has been designed to enhance communication skills of the students of engineering and technology. The prescribed books serve the purpose of preparing them for everyday communication and to face the global competitions in future.

The first text prescribed for detailed study focuses on LSRW skills and vocabulary development. The teachers should encourage the students to use the target language. The classes should be interactive and student-centered. They should be encouraged to participate in the classroom activities keenly.

The text for non-detailed study is meant for extensive reading/reading for pleasure by the students. They may be encouraged to read some select topics on their own, which could lead into a classroom discussion. In addition to the exercises from the texts done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

2. OBJECTIVES:

1. To enable the students to communicate in English for academic and social purpose
2. To enable the students to acquire structure and written expressions required for their profession.
3. To develop the listening skills of the students
4. To inculcate the habit of reading for pleasure
5. To enhance the study skills of the students with emphasis on LSRW skills

UNIT –II

Chapter entitled *Inspiration* from "Using English"
Chapter entitled 'My Struggle for an Education' from "New Horizons"

L- Listening to details

S- Apologizing, Interrupting, Requesting and Making polite conversations
R-note making strategies
W- Paragraph-types- topic sentences, unity, coherence, length , linking devices
G-Auxiliary verbs and question tags
V- synonyms-antonyms, homonyms , homophones, homographs, words often confused

UNIT –III

Chapter entitled *Sustainable Development* from "Using English"
Chapter entitled 'The Autobiography of Abraham Lincoln' from "New Horizons"

L- Listening to themes and note taking
S- Giving instructions and Directions, making suggestions, Accepting ideas, fixing a time and Advising
R- Reading for details -1
W- Resume and cover letter
G- Tenses – Present tense, Past tense and Future tense
V-Word formation and One-Word Substitutes

UNIT –IV

Chapter entitled *Relationships* from "Using English"
Chapter entitled ' T*he Happy Prince* from "New Horizons"

L- Listening to news
S- Narrating stories, Expressing ideas and opinions and telephone skills
R- Reading for specific details and Information
W- Technical Report writing-strategies, formats-types-technical report writing
G- Voice and Subject – Verb Agreement
V- Idioms and prepositional Phrases

UNIT –V

Chapter entitled Science and Humanism from "Using English"
Chapter entitled 'If'from "New Horizons"
L- Listening to speeches
S- Making Presentations and Group Discussions
R- Reading for Information
W- E-mail drafting
G- Conditional clauses and conjunctions
V- Collocations and Technical Vocabulary and using words appropriately

4.EXPECTED OUTCOME:
The students will get the required training in LSRW skills through the prescribed texts and develop communicative competence

Prescribed Books:

1. **Using English (for detailed study)** published by Orient Black Swan, 2013
2. **New Horizons** published by Pearson, 2013

SUGGESTED READING:

1. **Raymond Murphy's English Grammar with CD,** Murphy, Cambridge University Press, 2012.

2. **English Conversation Practice –**Grant Taylor, Tata McGraw Hill, 2009.
3. **Communication Skills, Sanjay Kumar & Pushpalatha** Oxford University Press, 2012.
4. **A Course in Communication Skills**- Kiranmai Dutt & co. Foundation Books, 2012.
5. **Current English grammar and usage-**S M Guptha, PHI, 2013.
6. **Modern English Grammar-**Krishna SWAMI .McMillan, 2009.
7. **Powerful Vocabulary Builder**- Anjana Agarwal New Age International Publishers, 2011.
8. **Writing with a Purpose, Tickoo and Sasi Kumar, OUP, 2011**
9. **Strengthen Your Writing, Orient Blackswan**

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MATHEMATICS – I
(Common to All Branches)

Objectives

- To train the students thoroughly in Mathematical concepts of ordinary differential equations and their applications in electrical circuits, deflection of beams, whirling of shafts.
- To prepare students for lifelong learning and successful careers using mathematical concepts of differential and Integral calculus, ordinary and partial differential equations.
- To develop the skill pertinent to the practice of the mathematical concepts including the students abilities to formulate the problems, to think creatively and to synthesize information.

UNIT – I

Exact, linear and Bernoulli equations. Applications to Newton's law of cooling, law of natural growth and decay, orthogonal trajectories.

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax}, sin ax, cos ax, polynomials in x, e^{ax} V(x), xV(x), method of variation of parameters. Applications to oscillatory electrical circuits, Deflection of Beams, whirling of shafts.

UNIT – II

Taylor's and Maclaurin's Series - Functions of several variables – Jacobian – Maxima and Minima of functions of two variables, Lagrange's method of undetermined Multipliers with three variables only. Radius of curvature, center of curvature, Involutes, evolutes and envelopes..

UNIT – III

Curve tracing – Cartesian, polar and parametric curves. Length of curves.

UNIT – IV

Multiple integral – Double and triple integrals – Change of Variables – Change of order of integration. Applications to areas and volumes, surface area of solid of revolution in Cartesian and polar coordinates using double integral.

UNIT – V

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Method of separation of variables – Solutions of one dimensional wave equation, heat equation and two-dimensional Laplace's equation under initial and boundary conditions.

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - I, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.

REFERENCES:

1. Engineering Mathematics Volume-I, by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publication.
2. Engineering Mathematics, Volume - I, by G.S.S.Raju, CENGAGE publisher.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.
4. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
5. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

Outcomes:

- The students become familiar with the application of differential and integral calculus, ordinary and partial differential equations to engineering problems.

- The students attain the abilities to use mathematical knowledge to analyze and solve problems in engineering applications.

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ENVIRONMENTAL STUDIES

OBJECTIVE: *To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.*

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:

UNIT – II

ECOSYSTEMS : Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological sucession – 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)

BIODIVERSITY AND ITS CONSERVATION : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-soports 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 – III

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 wates – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV

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

UNIT – V

HUMAN POPULATION AND THE ENVIRONMENT : Population growth, variation among nations. Population explosion – Family Welfare Proggramme. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

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 – river, hill slopes, etc..

TEXT BOOKS :

(1) Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
(2) Environmental Studies by Palaniswamy – Pearson education
(3) Environmental Studies by R.Rajagopalan, Oxford University Press.

REFERENCES :

(1) Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Pubilications.
(2) Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
(3) Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
(4) Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited.
(5) Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

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ENGINEERING DRAWING-I
(MECHANICAL)

UNIT-I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance Drawing Instruments and their Use – BIS Conventions in drawing and Lettering.

Curves used in practice:

a) Conic sections including the Rectangular Hyperbola
b) Cycloid, Epicycloid and Hypocycloid –normals and Tangents
c) Involute of a circle –Normals and Tangents
d) Helices –multi start on cylinder and cone

UNIT –II

Principles of orthographic projections – First and Third angle projections Projection of points. Projections of lines inclined to one plane.

UNIT –III

Projection of lines inclined to both reference planes – traces.

UNIT –IV

True length, true angles of projected lines –use of auxiliary planes –profile view, point view. Projection of regular planes inclined to both planes, true shapes.

UNIT –V

Projection of solids inclined to both planes.

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhat, Charotar Publishers
2. Engineering Drawing, K.L. Narayana& P. Kannaih, Scitech Publishers, Chennai.

REFERENCES:

1. Engineering Drawing, Johle, Tata McGraw-Hill Publishers.
2. Engineering Drawing, Shah and Rana,2/e, Pearson Education
3. Engineering Drawing and Graphics, Venugopal/New age Publishers
4. Engineering Graphics, John&john.

Suggestions:

Student is expected to buy a book mentioned under 'Text books' for better understanding.
Student should prepare rough sketches for all the problems given at the end of each chapter to improve his / her imaginations.
Student should also practice Auto CAD or any other drawing software to help understanding better.

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Engineering Chemistry

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English Communication Skills (ELCS) Lab

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

OBJECTIVES:

- To train students to use language effectively in everyday conversations, to participate in group discussions, to help them face interviews, and sharpen public speaking skills
- To expose the students to a varied blend of self-instructional learner-friendly modes of language learning through computer-aided multi-media instruction.
- To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To help the second language learners to acquire fluency in spoken English and neutralize mother tongue influence
- To train students to use language appropriately for interviews, group discussion and public speaking

SYLLABUS:

UNIT- I

Phonetics – Introduction to Sounds of Speech – Vowels – Consonants – Phonetic Transcription & Orthographic Transcription

UNIT – II

Syllabification – Word Stress – Rules of word stress – Intonation – Falling tone and Rising tone

UNIT – III

Situational Dialogues – Role-play – Expressions in various situations – Self Introduction – Introducing others – Greetings – Apologies – Requests – Social and Professional etiquettes – Telephone Etiquettes

UNIT – IV

JAM – Describing object/person/place/situation – Giving directions

UNIT – V

Debates and Group Discussions

EXPECTED OUTCOMES :

- Becoming active participants in the learning process and acquiring proficiency in spoken English of the students
- Speaking with clarity and confidence thereby enhancing employability skills of the students

MINIMUM REQUIREMENT FOR ELCS LAB:

The English Language Lab shall have two parts:

1. Computer Assisted Language Learning (CALL) Lab:

   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.

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

System Requirement (Hardware component):
Computer network with LAN with minimum 60 multimedia systems with the following specifications:

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

SUGGESTED SOFTWARE:

1. Clarity Pronunciation Power – Part I (Sky Pronunciation)
2. Clarity Pronunciation Power – part II
3. K-Van Advanced Communication Skills
4. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
5. *DELTA's key to the Next Generation TOEFL Test: Advanced Skills Practice.*
6. Lingua TOEFL CBT Insider, by Dreamtech
7. English Pronunciation in Use (Elementary, Intermediate, Advanced) CUP
8. Cambridge Advanced Learners' English Dictionary with CD.

REFERENCE BOOKS:

1. **A Textbook of English Phonetics for Indian Students** 2nd Ed T. Balasubramanian. (Macmillian),2012.
2. **A Course in Phonetics and Spoken English**, Dhamija Sethi, Prentice-Hall of India Pvt.Ltd
3. **Speaking English Effectively**, 2nd Edition Krishna Mohan & NP Singh, 2011. (Mcmillan).
4. **A Hand book for English Laboratories**, E.Suresh kumar, P.Sreehari, Foundation Books,2011
5. **English Pronunciation in Use. Intermediate & Advanced** ,Hancock, M. 2009. CUP
6. **Basics of Communication in English** ,Soundararaj, Francis. 2012.. *New Delhi: Macmillan*
7. **Spoken English** (CIEFL) in 3 volumes with 6 cassettes, OUP.
8. **English Pronouncing Dictionary**, Daniel Jones Current Edition with CD.Cambridge, 17th edition, 2011

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Engineering Workshop Lab

1. TRADES FOR EXERCISES :

At least 2 exercises In each :

1. Carpentry
2. Fitting
3. House-wiring
4. Black Smithy
5. Tin smithy
6. Power Tools Demonstration

TEXT BOOK:

1. Work shop Manual / P.Kannaiah/ K.L.Narayana/ Scitech Publishers.

Objective : The objective of this subject is to provide the basic concepts about different manufacturing processes and use of various workshop tools the exposer to the Power tools used in the inclusion

Codes / Tables : Nil

Question Paper pattern : Test in any two out of 6 trades.

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DEPARTMENT OF MECHANICAL ENGINEERING

I Year B.Tech ME- II Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	Technical English-II	3	1	0	3
2	THEORY	Mathematics -II	3	1	0	3
3	THEORY	Computer programming	1	1	3	3
4	THEORY	Engineering Physics	3	1	0	3
5	THEORY	Engineering Drawing-II	3	1	0	3
6	THEORY	Engineering Mechanics	3	1	0	3
7	PRACTICAL	Computer programming Lab	0	0	3	2
8	PRACTICAL	Physics Lab	0	0	3	2
		Total	**16**	**6**	**9**	**22**

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	3	**0**	**3**

TECHNICAL ENGLISH -II

PREAMBLE:

In the increasingly globalized world, technical communication and presentation skills are assuming great importance. Industries and employers constantly complain that young engineers have adequate technical knowledge, but no communication and presentation skills. Success is defined these days in terms of possessing these skills. The syllabus has been designed to develop communicative competencies of the students.

OBJECTIVES:

1. To develop awareness in students of the relevance and importance of technical communication and presentation skills.
2. To prepare the students for placements
3. To provide students with interactive practice sessions to make them internalize these skills

OUTCOME

Turning out the students with a clear concept of communication and presentation skills, getting them ready for placements and equipping them with readiness to implement them at work place.

UNIT 1:
Basics of Technical Communication – Introduction – Objectives & Characteristics of Technical Communication – Importance and need for Technical communication - LSRW Skills – Barriers to effective communication
UNIT II
Informal and Formal Conversation - Verbal and Non-verbal communication –Kinesics, Proxemics, Chronemics, Haptics, Paralanguage
UNIT III
Written communication – Differences between spoken and written communication – Features of effective writing –Advantages and disadvantages of spoken and written communication
UNIT IV
Presentation Skills – Nature and importance of oral presentation – Defining the purpose – Analyzing the audience - Planning and preparing the presentation, organizing and rehearsing the presentation –Individual and group presentations - Handling stage fright
UNIT V
Interview Skills – The Interview process –Characteristics of the job interview – Pre-interview preparation techniques – Projecting the positive image – Answering Strategies

Prescribed Books

1. **Effective Technical Communication,** Ashrif Rizvi, TataMcGrahill, 2011
2. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, O U Press 2009

Reference Books

1. Communication Skills by Pushpalatha & Sanjay Kumar, Oxford Univsesity Press
2. Books on **TOEFL/GRE/GMAT/CAT/ IELTS** by Barron's/DELTA/Cambridge University Press.2012.
3. **Soft Skills for Everyone,** Butterfield Jeff, Cengage Publications, 2011.
4. **Management Shapers Series** by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
5. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
6.**English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.**

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I- Year B.Tech. M.E. II-Sem	**T**	**P**	**C**
	3	**0**	**3**

MATHEMATICS - II

(Common to All Branches)

Objectives:

- Our emphasis will be more on conceptual understanding and application of Fourier series, Fourier, Z and Laplace transforms and vector calculus.

UNIT – I

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

UNIT – II

Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

UNIT – III

z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

UNIT – IV

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 – Laplace transform of Periodic function.

Differentiation and integration of transform – Application of Laplace transforms to ordinary differential equations of first and second order.

UNIT – V

Vector Calculus: Gradient – Divergence – Curl and their properties; Vector integration – Line integral - Potential function – Area – Surface and volume integrals. Vector integral theorems: Green's theorem – Stoke's and Gauss's Divergence Theorem (Without proof). Application of Green's, Stoke's and Gauss's Theorems.

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - II, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.

REFERENCES:

1. Engineering Mathematics, Volume - II, by G.S.S.Raju, CENGAGE publisher.
2. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.

3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

Outcomes:

- The student gains the knowledge to tackle the engineering problems using the concepts of Fourier series, various transforms and vector calculus.

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JNTUA COLLEGE OF ENGINEERING (Autonomous)-ANANTAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING

I-B.Tech. II- SEM	T	P	C
	4	0	3

Computer Programming
(Common to All Branches)

Course Objective

- To understand the core aspects of computer problem solving techniques
- To understand the programming language constructs
- To understand the programming paradigms
- To understand the compound data types
- To understand dynamic memory allocation concepts

Course Outcomes

- Able to design the flowchart and algorithm for real world problems
- Able to learn and understand new programming languages
- Able to construct modular and readable programs
- Able to write C programs for real world problems using simple and compound data types
- Adapt programming experience and language knowledge to other programming language contexts
- Employee good programming style, standards and practices during program development

Unit - I :

Introduction to Computers: Computer Systems, Computing Environment, Computer Languages, Creating and Running Programs, System Developments.

Introduction to the C Language: Introduction, C programs, Identifiers, Types, Variables, Constants, Input and Output, Programming Examples.

Introduction to Computer Problem Solving: Introduction , The Problem-Solving Aspect, Top-down Design, Bottom - up Approach, Flowcharts, Implementation of Algorithms, Program Verification, The Efficiency of Algorithms, The Analysis of Algorithms.

Unit – II:

Structure of C program: Expressions, Precedence and Associatively, Evaluating Expressions, Type Conversion, Statements, Sample Programs.

Selections and Making Decisions: Logical Data and Operators, Two way Selection, Multiway Selection.

Repetition: Concept of Loop, Pretest and Posttest Loops, Initialization and Updation, Event and Counter Controller Loop, Loops in C, Looping Applications.

Fundamental Algorithms: Exchanging the values between two variables, Counting, Summation of a set numbers, Factorial Computation, Sine Function Computation, Generation of the Fibonacci

Sequence, Reversing the digits of a integer, Basic conversions, Character to Number Conversion

Unit – III :

Factoring Methods: Finding Square root of a Number, The Smallest Deviser of an Integer, The GCD of two Integers, Generating Prime Numbers, Computing Prime Factor of an Integer, Computing the prime factors of an Integer, Generation of Pseudo Random Number, Raising the number to Large Power, Computing the n^{th} Fibonacci.

Functions: Introduction, User Defined Functions, Inter Function Communication, Standard Functions, Scope, Programming Examples.

Array Techniques: Array Order Reversal, Array Counting, Finding the Maximum Number Set, Removal Duplicates from an Ordered Array, Partitioning an Array, Finding k^{th} smallest Element, Longest Monotone Subsequence.

Arrays: Introduction, Two Dimensional Arrays, Multi Dimensional Arrays, Inter Function Communication, Array Applications, Exchange Sort, Binary Search, Linear Search.

Unit – IV :

Strings: String Concepts, C Strings, Sting Input/Output Functions, Arrays of Strings, String Manipulation Functions, String/Data Conversion.

Enumerated, Structure, and Union Types: The Type Definition, Enumerated Types, Structure, Unions, Programming Applications.

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators, Mask.

Unit – V :

Pointers: Introduction, Pointers for Inter Function Communication, Pointers to Pointers, Compatibility, Lvalue and Rvalue.

Pointer Applications: Array and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications.

Binary Input/output: Text Versus Binary Streams, Standard Library Functions for Files, Converting File Type.

Text Books :

1. How to Solve it by Computer by R.G. Dromey, Pearson
2. Computer Science, A Structured Programming Approach Using C by Behrouz A. Forouzan & Richard F. Gilberg, Third Edition, Cengage Learning

Reference Books :

1. Programming in C: A Practical Approach, Ajay Mittal, Pearson.
2. The C programming Language, B. W. Kernighan and Dennis M. Ritchi, Pearson Education.
3. Problem Solving and Programming Designs in C, J. R. Hanly and E.B. Koffman.,
4. Programming with C Rema Theraja, Oxford
5. Problem Solving with C, M.T.Somashekara, PHI
6. C Programming with problem solving, J.A. Jones & K. Harrow,Dreamtech Press
7. Programming with C, R.S.Bickar, Universities Press.

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Engineering Physics

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DEPARTMENT OF MECHANICAL ENGINEERING

I- Year B.Tech. M.E. II-Sem	**T**	**P**	**C**
	3	**0**	**3**

Engineering Drawing-II
(Mechanical)

Unit –I

Sections of solids: Sections and Sectional views of Regular solids –Prism, Cylinder, Pyramid, Cone – True shapes.

Development of Regular solids, sphere and transition piece.

Unit –II

Isometric projection: Isometric views of lines, plane figures, Compound solids, Spherical parts.

Unit –III

Conversion of Pictorial views to orthographic views –Conventions.

Unit –IV

Interpenetration of Solids – Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs cone, square prism Vs square prism.

Unit –V

Perspective projections –Planes and simple solids. Vanishing point Method only.

TEXT BOOKS:

3. Engineering Drawing, N.D. Bhat, Charotar Publishers
4. Engineering Drawing, K.L. Narayana& P. Kannaih, Scitech Publishers, Chennai.

REFERENCES:

5. Engineering Drawing, Johle, Tata McGraw-Hill Publishers.
6. Engineering Drawing, Shah and Rana,2/e, Pearson Education
7. Engineering Drawing and Graphics, Venugopal/New age Publishers
8. Engineering Graphics, John&john.

Suggestions:

Student is expected to buy a book mentioned under 'Text books' for better understanding.
Student should prepare rough sketches for all the problems given at the end of each chapter to improve his / her imaginations.
Student should also practice Auto CAD or any other drawing software to help understanding better.

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DEPARTMENT OF MECHANICAL ENGINEERING

I- Year B.Tech. M.E. II-Sem **T P C**
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ENGINEERING MECHANICS

OBJECTIVE: *This course will serve as a basic course by introducing the concepts of basic mechanics which will help as a foundation to various courses.*

UNIT – I

INTRODUCTION OF ENGINEERING MECHANICS – Basic concepts - System of Forces – Moment of Forces and its Application – Couples and Resultant of Force System – Equilibrium of System of Forces - Degrees of Freedom – Free body diagrams –Types of Supports – Support reactions for beams with different types of loading – concentrated, uniformly distributed and uniformly varying loading.

UNIT – II

FRICTION : Types of friction– laws of Friction – Limiting friction- Cone of limiting friction– static and Dynamic Frictions – Motion of bodies – Wedge, Screw jack and differential Screw jack.

UNIT – III

CENTROID AND CENTER OF GRAVITY: Centroids of simple figures – Centroids of Composite figures – Centre of Gravity of bodies – Area moment of Inertia - Parallel axis and perpendicular axis theorems - Moments of Inertia of Composite Figures.

MASS MOMENT OF INERTIA: Moment of Inertia of Simple solids – Moment of Inertia of composite masses.(Simple problems only)

UNIT – IV

KINEMATICS: Rectilinear and Curvilinear motion – Velocity and Acceleration – Motion of A Rigid Body – Types and their Analysis in Planar Motion.

KINETICS : Analysis as a particle and Analysis as a Rigid Body in Translation – Central Forces of motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies – Work Energy Method – Equation for Translation – Work Energy application to Particle Motion, Connection System – Fixed axis Rotation and Plane Motion.

UNIT – V

ANALYSIS OF PERFECT FRAMES: Types of frames – cantilever frames and simply supported frames – Analysis of frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

MECHANICAL VIBRATIONS: Definitions, Concepts-Simple Harmonic motion-Free vibrations-Simple Compound and Torsional pendulum- Numerical problems

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
3. Engineering Mechanics by Shames & Rao – Pearson Education.
4. Engineering Mechanics by Dr.R.k.Bansal, Lakshmi Publications.
5. Engineering Mechanics – B. Bhattacharyya, Oxford University Publications.

REFERENCES:

(1) Engineering Mechanics by Fedrinand L.Singer – Harper Collings Publishers.
(2) Engineering Mechanics by Seshigiri Rao, Universities Press, Hyderabad.
(3) Engineering Mechanics by Rajsekharan, Vikas Publications.
(4) Engineering Mechanics (Statics and Dynamics) by Hibller and Gupta; Pearson Education
(5) Engineering Mechanics by S.Timoshenko, D.H.Young and J.V.Rao, Tata McGraw-Hill Company
(6) Engineering Mechanics by Chandramouli, PHI publications.
(7) Engineering Mechanics –Arthur P. Boresi and Richard J. Schmidt. – Brooks/Cole – Cengage Learning

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DEPARTMENT OF MECHANICAL ENGINEERING

I-B.Tech. II SEM	T	P	C
	0	3	3

Computer Programming Lab
(Common to All Branches)

Week-1
1) Write an algorithm and draw a flowchart to make the following exchange between the variables a-> b -> c->d - > a
2) Write an algorithm and draw a flowchart to generate the first n terms of the sequence.

   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.
3) Write a algorithm and draw a flowchart to carry out the arithmetic operations addition, subtraction, multiplication, and division between two variables
4) Write a algorithm and draw a flowchart for printing prime numbers between 1 and n.

Week-2
1) Write a C program to construct a multiplication table for a given number.
2) Write a program to reverse the digit of a given integer.
1) Write a C program to calculate the factorial of a given number

Week-3 Write a program to calculate tax, given the following conditions:
a) If income is less than 1,50,000 then no tax.
b) If taxable income is in the range 1,50,001 – 300,000 then charge 10% tax

c) If taxable income is in the range 3,00,001 – 500,000 then charge 20% tax
d) If taxable income is above 5,00,001 then charge 30% tax

Week-4 1) Write a program to print the calendar for a month given the first Week- day of the month.

Input the first day of the month (Sun=0,Mon=1,Tue=2,Wed=3,.....) :: 3
Total number of days in the month : 31

Expected output

Sun	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*
-	-	-	*1*	*2*	*3*	*4*
5	*6*	*7*	*8*	*9*	*10*	*11*
12	*13*	*14*	*15*	*16*	*17*	*18*
19	*20*	*21*	*22*	*23*	*24*	*25*
25	*26*	*27*	*28*	*29*	*30*	*31*

Week-5 1) Write a program to print the Pascal triangle for a given number
2) Write a program to calculate the following expression for given x value

$$f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$$

Week-6 1) Write C code to define a function cash_dispense, which takes an amount as its input, and returns the number of 1000, 500, 100, 50, 20, 10, 5, 2, 1 rupee denomination that make up the given amount.
2) Write C code to reverse the contents of the array. For example, [1,2,3,4,5] should become [5,4,3,2,1]
3) Write a program that will search and find out the position where the given key element exist in a user chosen array and print it as output.

Week-7 1) Write C code to compute the frequency table of survey responses given by 20 users. The survey responses range from 1 to 5 and are stored in an array. For example, 10 responses are stored in the array [1,1,5,2,3,3,5,5,2,2]. The frequency table will be as shown below:

a. 1 = 2
b. 2 = 3
c. 3 = 2
d. 4 = 0
e. 5 = 3

2) Write a program to define a function to sort an array of integers in ascending order by using exchange sort.

Week-8 1) Write a C program to check whether a given string is a palindrome or not, without using any built-in functions
2) Write a function that accepts a string and delete the first character.
3) Write a function that accepts a string and delete all the leading spaces.

Week-9 Write a program to accept a string from user and display number of vowels, consonants, digits and special characters present in each of the words of the given string.

Week-10 1) Write a C program to define a union and structure both having exactly the same numbers using the sizeof operators print the sizeof structure variables as well as

union variable

2) Declare a structure *time* that has three fields *hr, min, secs.* Create two variables, *start_time* and *end_time.* Input there values from the user. Then while *start_time* is not equal to *end_time* display GOOD DAY on screen.

Week-11

1) Write a program to read in an array of names and to sort them in alphabetical order. Use sort function that receives pointers to the functions strcmp, and swap, sort in turn should call these functions via the pointers.
2) Write a program to read and display values of an integer array. Allocate space dynamically for the array using the *malloc().*
3) Write a program to calculate area of a triangle using function that has the input parameters as pointers as sides of the triangle.

Week-12

1) Two text files are given with the names text1 and text2. These files have several lines of text. Write a program to merge (first line of text1 followed by first line of text2 and so on until both the files reach the end of the file) the lines of text1 and text2 and write the merged text to a new file text3.
2) Write a program to split a given text file into n parts. Name each part as the name of the original file followed by .part<**n**> where n is the sequence number of the part file.

Reference Books:

1. Computer Science, A Structured Programming Approach Using C by Behrouz A. Forouzan & Richard F. Gilberg, Third Edition, Cengage Learning
2. C Programming A Problem-Solving Approach, Behrouz A. Forouzan & E.V. Prasad, F. Gilberg, Third Edition, Cengage Learning
3. Programming with C Rema Theraja, Oxford
4. "C Test Your Skills", Kamthane, Pearson Education
5. Programming in C: A Practical Approach, Ajay Mittal, Pearson
6. Problem solving with C, M.T.Somasekhara, PHI
7. C Programming with problem solving, J.A. Jones & K. Harrow,Dreamtech Press
8. Programming withc, Byron S Gottfried, Jitender Kumar Chhabra, TMH, 2011

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DEPARTMENT OF MECHANICAL ENGINEERING

I- Year B.Tech. M.E. II-Sem	**T**	**P**	**C**
	3	**0**	**3**

Engineering Physics Lab

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JNTUA COLLEGE OF ENGINEERING (Autonomous)-ANANTAPURAMU

Course Structure

DEPARTMENT OF MECHANICAL ENGINEERING

II Year B.Tech. ME- I Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	Thermodynamics	3	1	0	3
2	THEORY	Mathematical Methods	3	1	0	3
3	THEORY	Electrical and Electronics Engineering	3	1	0	3
4	THEORY	Mechanics of Solids	3	1	3	3
5	THEORY	Machine Drawing	1	1	3	3
6	THEORY	Material Science and Metallurgy	4	0	0	3
7	PRACTICAL	Electrical and Electronics Engineering Lab	0	0	3	2
8	PRACTICAL	Mechanics of Solids Lab & Material Science Lab	0	0	3	2
9		Human Values & Professional Ethics	2	0	0	0
		Total	**20**	**4**	**13**	**22**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::ANANTAPURUM

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

T	P	C
3	0	3

THERMODYNAMICS

UNIT- I

BASIC CONCEPTS: Macroscopic and Microscopic Approaches, Thermodynamic System, State, Property, Process and Cycle, Quasi Static Process, Thermodynamic Equilibrium, Quasi-static Process, Zeroth Law of Thermodynamics,

WORK & HEAT TRANSFER: Work transfer, types of work transfers, Point and Path Functions, Heat transfer, Comparison of Work and Heat transfers.

UNIT- II

FIRST LAW OF THERMODYNAMICS: First Law applied to a process and a cycle, Energy - a property, Forms and transformation of Energy, Internal Energy and Enthalpy, PMM I.

FLOW SYSTEMS: Control Volume, Steady Flow Process, Mass balance and Energy Balance, Applications of Steady Flow Processes.

UNIT- III

SECOND LAW OF THERMODYNAMICS: Heat Engine, Statements of Second law and their equivalence, Refrigeration and Heat Pump, Reversibility and Irreversibility, Carnot cycle and Carnot's Theorem, Thermodynamic Temperature Scale, Efficiency of Heat Engine, PMM II

ENTROPY AND AVAILABILITY: Clausius' Theorem, Entropy as a property, T-s Plot, Clausius Inequality, Principle of Entropy Increase and its applications. Available Energy, Quality of Energy, definitions of Dead state, Availability, Gibbs & Helmholtz functions.

UNIT- IV

PURE SUBSTANCES: P-v, P-T, T-s diagrams of Pure Substances, Mollier Diagram, Dryness Fraction, Use of Steam Tables for Thermodynamic Properties

THERMODYNAMIC RELATIONS: Maxwell's equations, TDS equations, Joule-Kelvin Effect, Clausius-clapeyron equation.

UNIT-V

PROPERTIES OF GASES AND GAS MIXTURES: Ideal Gas, Equation of State, Avogadro's Law, Internal Energy and Enthalpy of Ideal Gas, Entropy Change of Ideal Gas, Mixture of Gases-Dalton's Law of Partial Pressure , Specific Heats, Internal Energy and Enthalpy of Gas Mixtures

GAS POWER CYCLES: Carnot Cycle, Sterling Cycle, Ericson Cycle, Otto Cycle, Diesel Cycle, Dual Cycle, their applications, comparison of Otto, Diesel and Dual cycles, Second Law Analysis of Gas Power Cycles

Note: Steam tables Mollier Diagrams Shall be supplied.

TEXT BOOKS :

1. Engineering Thermodynamics, P.K Nag, TMH Publishers, New Delhi.
2. Engineering Thermodynamics by P.L.Dhar, Elsevier – 2008.

REFERENCES :

1. Fundamentals of Thermodynamics – Sonntag, Borgnakke and van wylen, John Wiley & sons (ASIA) Pte Ltd.
2. Thermodynamics by Chattopadhyay, oxford
3. Thermodynamics – An Engineering Approach – YunusCengel& Boles, TMH
4. Thermodynamics – J.P.Holman, McGrawHill
5. An introduction to Thermodynamics, YVC Rao, New Age
6. Engineering Thermodynamics – Jones & Dugan

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU

II Year B.Tech. M.E. I-Sem	**T**	**P**	**C**
	3	**0**	**3**

MATHEMATICAL METHODS
(CIVIL, MECH &CHEM)

Objectives:

- This course aims at providing the student with the concepts of Matrices, Numerical Techniques and Curve fitting.

UNIT – I

Rank – Echelon form, normal form – Consistency of System of Linear equations. Linear transformations. Hermitian, Skew-Hermitian and Unitary matrices and their properties. Eigen Values, Eigen vectors for both real and complex matrices. Cayley – Hamilton Theorem and its applications – Diagonolization of matrix. Calculation of powers of matrix. Quadratic forms – Reduction of quadratic form to canonical form and their nature.

UNIT – II

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

UNIT – III

Interpolation: Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula

UNIT – IV

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

UNIT – V

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods – Predictor-Corrector Method – Milne's Method. Numerical solutions of Laplace equation using finite difference approximation.

TEXT BOOKS:

3. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
4. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher.

REFERENCES:

3. Engineering Mathematics, Volume - II, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.
4. Engineering Mathematics, Volume - II, by G.S.S.Raju, CENGAGE publisher.
5. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.
4. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
5. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

Outcomes:

The student will be able to analyze engineering problems using the concepts of Matrices and Numerical methods.

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTAPURAMU

II YEAR I SEM B. Tech MECHANICAL **T P C**
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ELECTRICAL ENGINEERING AND ELECTRONICS ENGINEERING

PART – A

ELECTRICAL ENGINEERING

Objective:
Electrical Engineering contains basic Circuits, DC generators & motors, Transformers, Induction motors and their performance aspects will be studied.

UNIT – I Introduction to DC & AC Circuits
Ohm's Law, Basic Circuit Components, Kirchhoff's Laws, Types of Sources, Resistive Networks, Series Parallel Circuits, Star Delta and Delta Star Transformation. Principle of AC Voltages, Waveforms and Basic Definitions, Root Mean Square and Average Values of Alternating Currents and Voltage, Form Factor and Peak Factor, Phasor Representation of Alternating Quantities, The J Operator and Phasor Algebra, Analysis of Ac Circuits With Single Basic Network Element, Single Phase Series.

UNIT-II DC Machines
D.C Generators: Principle of Operation of Dc Machines, Types of D.C Generators, E.M.F Equation in D.C Generator, O.C.C. of a D.C. Shunt Generator
D.C Motors: Principle of Operation of Dc Motors, Types of D.C Motors, Torque Equation, Losses and Efficiency Calculation in D.C Motor- Swinburne's Test

UNIT-III AC Machines
Transformers: Principles of Operation, Constructional Details, Losses and Efficiency, Regulation of Transformer, Testing: OC & SC Tests.
Three Phase Induction Motors: Principle of Operation, Slip and Rotor Frequency, Torque (Simple Problems).
Alternators: Principle of Operation-Constructional Details-EMF Equation-Voltage Regulation by Synchronous Impedance Method.
OUTCOME:
After going through this course the student gets a thorough knowledge on basics of Electrical Circuits, DC Machines, Transformers, Induction motors & Alternators with which he/she can able to apply the above conceptual things to real-world problems and applications.

PART – B

ELECTRONICS ENGINEERING

Course Objectives:

- To provide an understanding and analyzing basic Electronic Circuits.
- To familiarize the students with fundamental concepts of electronic devices such as diodes their types, transistors, FETs and so on.
- To incorporate the simple problem solving skills in circuits comprising the diodes, transistors and other semiconductors devices as circuit elements.
- To familiarize the students with fundamental concepts of Digital Electronics such as number systems, basic gates, Boolean algebra and so on.

Course Outcomes:

Upon completion of the course, students will be able to:

- Analyze any basic electronic circuits
- Acquire complete knowledge regarding working principles of basic semiconductor devices such as diodes, transistors, FETs and so on.
- Solve simple problems consisting semiconductor devices such as diodes, transistors, FETs as circuit elements.
- Understands the fundamental concepts associated with Digital Electronics such as number systems, basic gates, Boolean algebra and so on.

UNIT I

Semiconductor Devices: Intrinsic semiconductors-Electron-Hole Pair Generation, Conduction in Intrinsic Semiconductors, Extrinsic Semiconductors-N-Type and P-Type Semiconductors, Comparison of N-Type and P-Type Semiconductors. The p-n Junction - Drift and Diffusion Currents, The p-n Junction Diode-Forward Bias, Reverse Bias, Volt-Ampere Characteristics-Diode Specifications, Applications of Diode, Diode as a Switch. Diode as a Rectifier-Half-wave Rectifier, Full-Wave Rectifier, Full-Wave Bridge Rectifier, Rectifiers with Filters, Zener Diode-Volt-Ampere Characteristics, Zener Diode as Voltage Regulator. Silicon Controlled Rectifier-Two Transistor Analogy of an SCR, Characteristics, Applications of SCR, DIAC, TRIAC.

UNIT II

BJT and FETs: Bipolar Junction Transistor (BJT) – Types of Transistors, Operation of NPN and PNP Transistors, Input-Output Characteristics of BJT-CB, CE and CC Configurations, Relation between I_C, I_B and I_E. Transistor Biasing- Fixed Bias, Voltage Divider Bias, Transistor Applications- Transistor as an Amplifier, Transistor as a Switch,. Junction Field Effect Transistor (JFET)- Theory and Operation of JFET, Output Characteristics, Transfer Characteristics, Configurations of JFET-CD, CS and CG Configurations, JFET Applications- JFET as an Amplifier, JFET as a Switch, Comparison of BJT and JFET,MOSFET-The Enhancement and Depletion MOSFET, Static Characteristics of MOSFET, Applications of MOSFET.

UNIT III

Digital Electronics: Number Systems-Decimal System, Binary System, Octal System, Hexadecimal System, Code Conversions, Binary Arithmetic- Binary Addition, Binary Subtraction, Logic Gates and Truth Tables-NOT, OR, AND, EX-OR, EX-NOR, Universal Gates- NAND, NOR

Gates. Boolean algebra and De Morgan's Theorems, Combinational Circuits-Adders and Subtractors.

TEXT BOOKS:

1. Basic Electrical Engineering - By M.S.Naidu and S. Kamakshiah – TMH.
2. Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University Press.
3. Electrical and Electronic Technology-By Hughes – Pearson Education.
4. Basic Electrical and Electronics Engineering, M.S.Sukhija, T.K.Nagsarkar, Oxford University Press, 1st Edition, 2012.
5. Basic Electrical and Electronics Engineering, S.K Bhattacharya, Pearson Education, 2012.

REFERENCES:

1. Theory and Problems of Basic Electrical Engineering by D.P.Kothari & I.J. Nagrath PHI.
2. Principles of Electrical Engineering by V.K Mehta, S.Chand Publications.
3. Fundamentals of Electrical Electronics Engineering by T.Thyagarajan, SCITECH Publications 5th Edition-2007.
4. Mahesh B.Patil, "Basic Electronic Devices and Circuits", PHI Publications, 2013.
5. Debashis De, "Basic Electronics", Pearson 2010.
6. Dr.K.Sharma, "Basic Electrical Engineering and Electronics", CBS Publications 4th Edition, 2013.

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II Year B.Tech. M.E. I-Sem	**T**	**P**	**C**
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MECHANICS OF SOLIDS

OBJECTIVE: *The subject provide the knowledge of simple stress strains flexural stresses in members, shear stresses and deflection in beams so that the concepts can be applied to the Engineering problems.*

UNIT – I

SIMPLE STRESSES AND STRAINS : – Deformable bodies **-** 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 – simple applications.

UNIT – II

SHEAR FORCE AND BENDING MOMENT: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed load uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III

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

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

UNIT – IV

TORSION OF CIRCULAR SHAFTS – Theory of pure torsion – Derivation of Torsion equations : – Assumptions made in the theory Theory of pure torsion – Torsional moment of resistance – Polar section modulus.

DEFLECTION OF BEAMS: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods.

Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L. uniformly varying load-Mohr's theorems – Moment area method – application to simple cases including overhanging beams-deflections of propped cantilevers for simple loading cases.

UNIT – V

THIN CYLINDERS & THICK 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.
Introduction Lame's theory for thick cylinders – Derivation of lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.

TEXT BOOKS :

(1) Strength of Materials by B.S.Basavarajaiah, Universities Press, Hyderabad
(2) Strength of Materials by Dr.R.K.Bansal, Lakshmi Publications.

REFERENCES:

1. Mechanics of Materials – Dr.B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications.
2. Strength of Materials by R.K Rajput, S.Chand & Company Ltd.
3. Strength of Materials by Jindal , Pearson publications
4. Strength of Materials by S.S.Bhavikatti, Vikas Publishing House Pvt. Ltd.
5. Strength of materials by Sadhu Singh, Khanna Pubilications, NewDelhi.
6. Strength of materials by Surendar Singh, CBS Pubilications.
7. Strength of Materials by Schaum's out line series – Mc.Graw hill International Editions.
8. Strength of Materials by L.S.Srinath et al., Macmillan India Ltd., Dew Delhi.

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTAPURAMU

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

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MACHINE DRAWING

Course Objectives:

To make the students understand the concepts of I.S. conventions, methods of dimensioning, the title boxes, to draw the machine elements and simple parts.

To make the students understand and draw assemblies of machine parts and to draw their sectional views

UNIT- I

Machine Drawing Conventions: Need for drawing conventions- introduction to IS conventions

a) Conventional representation of material, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs. Parts not usually sectioned.
b) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
c) Title boxes, their size, location and details-common abbreviations & their liberal usage

Learning Outcomes & Suggested Student Activities

This unit is useful to prepare the students for representing their ideas at International standards and will be able to convey in without much effort globally with ease. Students will acquire skills to draft on a drawing sheet without much effect.Studentsare advised to visit machine shop.

UNIT-II

Drawing of Machine Elements and simple parts: Selection of Views, additional views for the following machine elements and parts with drawing proportions:

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

Learning Outcomes & Suggested Student Activities

Students can represent various details of an object quickly without much time and ambiguity. These drawings can be easily prepared and understood by both the people in a manufacturing industry and the consumers too. Students are advised to visit machine shop.

UNIT- III

Assembly Drawings: Drawings of assembled views for the part drawings of the following.

a) Engine parts- stuffing boxes, cross heads, Eccentrics, Petrol Engine-connecting rod, piston assembly.

b) Other machine parts- Screw jack, Machine Vice, single tool post.

c) Valves: Steam stop valve, feed check valve. Non return value.

Learning Outcomes &Suggested Student Activities
Students can understand the working principles of an assembly or subassembly so that he/she will be able to produce the final product by procuring the units from various sources/suppliers and still produce any useful product serving effectively. It is not necessary that all the components to be made locally only. Students are advised to visit body building and assembly unit.
Note: *First angle projection to be adopted. The student should be able to provide working drawings of actual parts.*

Text Books:

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

References:

1. Machine Drawing- P.S. Gill.
2. Machine Drawing- Luzzader
3. Machine Drawing – Rajput
4. Textbook of Machine Drawing-K.C.John,2009, PHI learning

Suggestions:

1. *Student should buy a book mentioned under Text books and study all the exercises given at the end of each chapter to equip him/her with the required ammunition.*
2. *Student should visit an automobile shop while the unit is being disassembled / assembled.*
3. *Student should go through the exercises given under assembly drawings refereeing to various books in the library to improve his assimilation capacity.*

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MATERIAL SCIENCE AND METALLURGY

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 of Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cu-Sn and Fe-Fe_3C.

UNIT –III

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

Non-ferrous Metals and Alloys :

Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT –IV

Heat treatment of Alloys:

Effect of alloying elements on Iron – Iron carbon system, Annealing, normalizing, Hardening, TTT diagrams, tempering , Hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT – V

Ceramic materials:

Crystalline ceramics, glasses, cermets, abrasive materials, nonmaterial's-definition, properties and application 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 Carbon – Carbon composites.

TEXT BOOKS :

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

REFERENCES :

1. Material Science and Metallurgy/kodgire.
2. Science of Engineering Materials / Agarwal

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

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MECHANICS OF SOLIDS LAB & MATERIAL SCIENCE LAB

PART-A: MECHANICS OF SOLIDS LAB

OBJECTIVE: *The object of the course to make the student to understand the behaviour of materials under different types of loading for different types structures.*

LIST OF EXERCISES :

2. Tension test.
3. Bending test on (Steel/Wood) Cantilever beam.
4. Bending test on simple support beam.
5. Torsion test.
6. Hardness test.
7. Shear test

LIST OF MAJOR EQUIPEMNT:

1. UTM for conducting tension test on rods
2. Steel beam for flexure test.
3. Wooden beam for flexure test.
4. Torsion testing machine
5. Brinnell's/Rock well's hardness testing machine.
6. Shear testing machine

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PART-B: MATERIAL SCIENCE LAB

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

JNTUA COLLEGE OF ENGINEERING (Autonomous)-ANANTAPURAMU
Course Structure
DEPARTMENT OF MECHANICAL ENGINEERING
II Year B.Tech. ME- II Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	Design of Machine Members-I	3	1	0	3
2	THEORY	Fluid Mechanics & Hydraulic Machinery	3	1	0	3
3	THEORY	Kinematics of Machinery	3	1	0	3
4	THEORY	Thermal Engineering-I	3	1	0	3
5	THEORY	Probability and Statistics	3	1	0	3
6	THEORY	Manufacturing Technology	3	1	0	3
7	PRACTICAL	Fluid Mechanics & Hydraulic Machinery Lab	0	0	3	2

8	PRACTICAL	Manufacturing Technology Lab	0	0	3	2
9		Computer Aided Drafting Lab	0	0	3	0
		Total	**18**	**6**	**9**	**22**

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

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DESIGN OF MACHINE MEMBERS-I

Course Objective

The primary objective of this course is to demonstrate how engineering design uses for many principles learned in previous engineering science courses and to show how these principles are practically applied. This subject will help to the students to learn to analyze and design basic machine elements in mechanical systems. By this subject students will become familiar on design principles, materials selection, stresses developed in machine elements under different loads. The students will also get knowledge on design of the permanent and temporary joints, shafts and keys.

NOTE: Design data books are not permitted in the examinations.

UNIT – I

INTRODUCTION: General considerations of design, design process. Selection of Engineering Materials - properties –Manufacturing considerations in the design. BIS codes of materials, preferred numbers and interchangeability.

STRESSES IN MACHINE MEMBERS: Simple stresses – Combined stresses – Torsional and bending Stresses – impact stresses – stress -strain relation – Various theories of failure – factor of safety.

Learning Outcomes & Suggested Student Activity:

After completion of this unit students are capable to apply design procedures using theories of failure for different elements. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of machine design. http://machinedesign.com/
http://www.youtube.com/watch?v=qVj4VvMmQjc&list=PL3D4EECEFAA99D9BE&index=6

UNIT – II

DESIGN FOR FLUCTUATING LOADS: Stress concentration –notch sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Goodman's line – Soderberg's line design of components for finite and infinite life.

Learning Outcomes & Suggested Student Activities:

After completion of this chapter students are able to design simple components under cyclic loading using Goodman's and Soderberg's criterions. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of cyclic loading design.
http://machinedesign.com/
http://www.youtube.com/watch?v=SLqkITQfN1I&list=PL3D4EECEFAA99D9BE&index=8

UNIT – III

DESIGN OF RIVETED JOINTS: Types of riveted joints, design of riveted joints. Boiler shell riveting design and eccentric loading design of riveted joints.

DESIGN OF BOLTED JOINTS: Forms of Screw threads. Stresses in Screw fasteners. Design of bolts with pre-stresses, Design of bolted joints under eccentric loading, Bolts of uniform strength.

Learning Outcomes & Suggested Student Activities:

After completion of this unit students are able to design riveted joints with different configuration, boiler shell joint design and eccentric loading design of riveted joints. Further students are able to design bolted joints with direct loading and eccentric loading. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of design of joints. http://machinedesign.com/

http://www.youtube.com/watch?v=Z38Aq9ykUCM&list=PL3D4EECEFAA99D9BE&index=16

UNIT – IV

DESIGN OF COTTERS AND KNUCKLE JOINTS: Design of Cotter joints: spigot and socket, sleeve and cotter, jib and cotter joints- Knuckle joints

DESIGN OF SHAFTS: Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – Standard shaft sizes.

Learning Outcomes & Suggested Student Activities:

After completion of this unit students are able to design cotter joint, knuckle joint and shafts. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of design of shafts, http://machinedesign.com/

http://www.youtube.com/watch?v=4nlQwVqruRo&list=PL3D4EECEFAA99D9BE&index=20

UNIT-V

DESIGN OF KEYS AND COUPLINGS: Design of Rigid couplings: Muff, Split muff and Flange couplings- Design of flexible couplings.

Learning Outcomes & Suggested Student Activities:

After completion of this unit students are able to design various rigid and flexible shaft couplings. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of design of couplings. http://machinedesign.com/

http://www.youtube.com/watch?v=4nlQwVqruRo&list=PL3D4EECEFAA99D9BE&index=21

Text Books:

1. Design of Machine Elements, V.B.Bhandari , TMH Publishers,NewDelhi
2. MachineDesign,Schaum'sseries,TMHPublishers, NewDelhi
3. MachineDesign,R.K.Jain,KhannaPublishers,NewDelhi.

Reference Books:

1. MachineDesign,SadhuSingh,KhannaPublishers, NewDelhi
2. MachineDesign,R.S. Kurmi and J.K. Gupta ,S.ChandPublishers, NewDelhi
3. MechanicalEngineeringDesign,JosephE.Shigely,TMH Publishers,NewDelhi.
4. DesignofMachineElements,M.F.Spotts, PHIPublishers, NewDelhi.

5. MachineDesign,PandyaandShah,CharotarPublishers,Anand.
6. Machine Design, R.L. Norton, Tata McGrawHillPublishers
7. Machine Design by Groover – CBS Publications.

NOTE: Design data books are not permitted in the examinations.

Web Resources

http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv077-page1.htm
http: // www .f a s t e n a l .c o m / c o n t e n t / f e d s / p d f / A r t i c l e % 2 0 - %20Bolted%20Joint%20Design.pdf
http://people.rit.edu/megite Lec%203%20Fatigue%20Failure% 20031004_ for_students.ppt
http://engineershandbook.com/Tables/materials.htm
www.nptel.iitm.ac.in/video

Suggestions:

1. students may visit near by automobile workshops and machine tool shops to know about different machine elements like shafts, keys, couplings and riveted and bolted joints.
2. In addition to the text books students may also go through the reference books authored by V.B. Bhandari, by Pandya and Shah for more number of numerical problems.

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FLUID MECHANICS AND HYDRAULIC MACHINERY

UNIT - I

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

FLUID KINEMATICS : stream line, path line and streak lines and steam tube, classification of flows-steady & unsteady, uniform, non uniform, laminar, turbulent, rotational, and irrotational flows-equation of continuity for one dimensional flow.

Fluid dynamics: surface and body forces – Euler's and Bernoulli's equations for flowing stream line, momentum equation and its application on force on pipe bend.

UNIT – II

CONDUIT FLOW: Reynold's experiment – Darcy Weisbach equation – Minor losses in pipes – pipes in series and pipes in parallel – total energy line-hydraulic gradient line. Measurement of flow: pilot tube, venturimeter, and orifice meter, Flow nozzle, Turbine current meter.

UNIT – III

TURBO MACHINERY : hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jEt striking centrally and at tip, velocity diagrams, work done efficiency, flow over radial vanes.

HYDROELECTRIC POWER STATIONS: Elements of hydro electric power station-types-concept of pumped storage plants-storage requirements.

UNIT – IV

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

PERFORMANCE OF HYDRAULIC TURBINES : Unit and specific quantities, characteristic c governing of turbines, selection of type of turbine, cavitation, surge tank, hammer.

UNIT – V

CENTRIFUGAL PUMPS : Classification, working, work done – manomertic head – loss efficiencies – specific speed – pumps in series and parallel – performance characteristic curves, NPSH.

TEXT BOOKS :

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.
3. Fluid Mechanics by Dr.R.K.Bansal, Lakshmi Publications Pvt.Ltd.

REFERENCE BOOKS :

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria &.
2. Fluid Mechanics and Machinery by D.Rama Durgaiah, New Age Internat.

3. hydraulic Machines by Banga & Sharma, Khanna Publishers.
4. Instrumentation for Engineering Measurements by James W.Dally, Wiley Riley, John Wiley & Sons Inc. 2004

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KINEMATICS OF MACHINERY

UNIT – I

MECHANISMS AND MACHINES: Elements or Links – Classification – Rigid Link, flexible and fluid link. Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained. Mechanisms and machines – classification of mechanisms and machines – kinematic chain – inversion of mechanisms – inversions of quadric cycle chain – single and double slider crank chain.Mobility of mechanisms.

UNIT-II

Straight Line Motion Mechanisms- Exact and approximate, copied and generated types – Peaucellier, Hart and Scott Russel, Grasshopper, Watt, Tchebicheff and Robert Mechanisms. Pantograph.

Steering Mechanisms: Conditions for correct steering – Davis Steering gear, Ackermanns steering gear. Hooke's Joint (Universal coupling) -Single and double Hooke's joint — applications – Simple problems.

UNIT – III

KINEMATICS

Velocity and Acceleration Diagrams- Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method – Slider crank mechanism, four bar mechanism. Acceleration diagrams for simple mechanisms, Coriolis acceleration, determination of Coriolis component of acceleration. Kleins construction. Analysis of slider crank mechanism for displacement, velocity and acceleration of slider using analytical method

Instantaneous Centre Method: Instantaneous centre of rotation, centrode and axode – relative motion between two bodies – Three centres in-line theorem – Locating instantaneous centres for simple mechanisms and determination of angular velocity of points and links.

UNIT – IV

GEARS: Higher pairs, toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion, Forms of tooth- cycloidal and involute profiles. Velocity of sliding – phenomena of interference – Methods to avoid interference.Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact. Introduction to Helical, Bevel and Worm gearing.

GEAR TRAINS: Introduction –Types of gears – Simple, Compound, Reverted and Epicyclic gear trains, Train value – Methods of finding train value or velocity ratio – Tabular column method for Epicyclic gear trains. Torque in epicyclic gear trains.Differential gear of an automobile.

UNIT – V

CAMS: Definitions of cam and follower – uses – Types of followers and cams – Terminology. Types of follower motion - Uniform velocity, Simple harmonic motion, Cycloidal and uniform acceleration–and retardation Maximum velocity and maximum acceleration during outward and return strokes. Drawing of cam profiles.

ANALYSIS OF MOTION OF FOLLOWERS: Tangent cam with roller follower – circular arc (Convex) cam with flat faced and roller follower.

TEXT BOOKS :

1. Theory of Machines, S.S. Rattan, Tata McGraw Hill Publishers.
2. The Theory of Machines, J.E. Shiegley, McGraw Hill .

REFERENCES :

1. Theory of Machines, R.K.Bansal and J S Brar, Laxmi Publications.
2. Theory of Machines, Thomas Bevan, CBS.
3. Mechanism and Machine Theory, J.S. Rao and R.V. Dukkipati, New Age
4. Theory of machines, P.L. Ballaney, Khanna Publishers.
5. Kinematics and dynamics of machinery, R.L Norton ,Tata McGraw Hill Publishers

Suggestions:

Students may visit nearby machine tool shops and automobile workshops to know about different mechanisms, gears, gear trains, flexible drives and cams. Students are suggested to search the web and identify different URLs which provide animations of mechanisms for better visualization and understanding purpose.

WEB REFERENCES :

http://nptel.iitk.ac.in
http://ptumech.loremate.com/tom1/node/1
http://www.youtube.com/watch?v=6coD3oOuhr8

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THERMAL ENGINEERING - I

UNIT-I

I.C. ENGINES : Definition of Engine and Heat Engine, I.C Engine Classification – Parts of I.C. Engines, Working of I.C. Engines, Two Stroke & Four Stroke I.C. Engines SI & CI Engines, Valve and Port Timing Diagrams.

UNIT-II

Fuel System: S.I. Engine: Fuel Supply Systems, carburetor types Air Filters, Mechanical and Electrical Fuel Pump – Filters– Gasoline Injection Systems..

Cooling & Lubrication Systems: Cooling Requirements, Air Cooling, Liquid Cooling, Thermo Siphon, Water And Forced Circulation System, Lubrication Systems-Flash, Pressurized and Mist Lubrication.

Ignition System: Function Of An Ignition System, Battery coil Ignition System, Magneto Coil Ignition System, Electronic Ignition System using Contact Breaker, Electronic Ignition using Contact Triggers – Spark Advance And Retard Mechanism.

UNIT-III

Fuels and Combustion:

S I engine : Normal Combustion and Abnormal Combustion – Importance of Flame Speed and Effect of Engine Variables – Type of Abnormal Combustion, Pre-Ignition and Knocking (Explanation) – Fuel Requirements and Fuel Rating, Anti Knock Additives, Combustion Chambers.

C.I. Engines: Stages Of Combustion – Delay Period And Its Importance – Effect Of Engine Variables – Diesel Knock– Combustion Chambers (DI And IDI), Fuel Requirements And Fuel Rating.

UNIT – IV

Testing and Performance : Parameters of Performance - Measurement of Cylinder Pressure, Fuel Consumption, Air Intake, Exhaust Gas Composition, Brake Power – Determination of Frictional Losses And Indicated Power – Performance Test – Heat Balance Sheet and Chart.

UNIT-V

Air Compressors: Reciprocating Compressors, Effect of Clearance volume in Compressors, Volumetric Efficiency, Single Stage and Multi Stage Compressors, Effect of Inter cooling and Pressure Drop in Multi - Stage Compressors, Problems Related to Reciprocating Compressors, Working principles of Roots blower, Vane type Blower, Centrifugal Compressor - Axial Flow Compressors.

- **Students are advised to refer the text book of "Internal Combustion Engine Fundamentals" by John B. Heywood.**

TEXT BOOKS:

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

REFERENCES:

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

WEB RESOURCES

http://autoclub.rso.siuc.edu/frange.html
http://www.howstuffworks.com/engine1.htm
http://inventors.about.com/library/inventors/blinternalcombustion.htm
http://www.animatedengines.com/

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PROBABILITY AND STATISTICS
(CIVIL, MECH & CHEM)

Objectives:

- To help the students in getting a thorough understanding of the fundamentals of probability and usage of statistical techniques like testing of hypothesis, ANOVA, Statistical Quality Control and Queuing theory

UNIT – I

Conditional probability – Baye's theorem. Random variables – Discrete and continuous Distributions – Distribution functions. Binomial and poison distributions Normal distribution – Related properties.

UNIT – II

Test of Hypothesis: Population and Sample - Confidence interval of mean from Normal distribution - Statistical hypothesis - Null and Alternative hypothesis - Level of significance - Test of significance - Test based on normal distribution - Z test for means and proportions; Small samples - t- test for one sample and two sample problem and paired t-test, F-test and Chi-square test (testing of goodness of fit and independence).

UNIT – III

Analysis of variance one way classification and two way classification (Latic square Design and RBD)

UNIT – IV

Statistical Quality Control: Concept of quality of a manufactured product -Defects and Defectives - Causes of variations - Random and assignable - The principle of Shewhart Control Chart-Charts for attribute and variable quality characteristics- Constructions and operation of X- bar Chart, R-Chart, P-Chart and C-Chart.

UNIT – V

Queuing Theory: Pure Birth and Death process, M/M/1 & M/M/S & their related simple problems.

TEXT BOOKS:

1. Probability & Statistics for engineers by Dr. J. Ravichandran WILEY-INDIA publishers.
2. Probability & Statistics by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publications.

REFERENCES:

1. Probability & Statistics by E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.
2. Statistical methods by S.P. Gupta, S.Chand publications.
3. Probability & Statistics for Science and Engineering by G.Shanker Rao, Universities Press.
4. Probability and Statistics for Engineering and Sciences by Jay L.Devore, CENGAGE.
5. Probability and Statistics by R.A. Jhonson and Gupta C.B.

Outcomes:

- The student will be able to analyze the problems of engineering & industry using the techniques of testing of hypothesis, ANOVA, Statistical Quality Control and Queuing theory and draw appropriate inferences.

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II Year B.Tech. M.E. II-Sem	**T**	**P**	**C**
	3	**0**	**3**

MANUFATURING TECHNOLOGY

UNIT – I

CASTING: Steps involved in making a casting– Types of patterns - Patterns and Pattern making – – Materials used for patterns, pattern allowances and their Construction, Principles of Gating, Gating ratio and design of Gating systems, Solidification of casting – Concept – Solidification of pure metal and alloys, short & long freezing range alloys. Risers – Types, function and design, casting design considerations, special casting processes 1) Centrifugal 2) Die, 3) Investment.

Methods of Melting: Crucible melting and cupola operation, steel making processes.

UNIT – II

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

Cutting of Metals: Oxy – Acetylene Gas cutting, Plasma Cutting , Inert Gas welding, TIG & MIG, welding, Friction welding, Induction welding, Explosive welding, Laser welding, Soldering & Brazing. Heat affected zones in welding; welding defects – causes and remedies – destructive non-destructive testing of welds.

UNIT – III

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

UNIT- IV

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

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

UNIT - V

Plastic –types, properties and their applications; processing of plastic – different methods – blow and injection molding, process capabilities and equipment details. Ceramic – Processing of different types of ceramics- compaction of metal powders, sintering, finishing operations, process capabilities.

TEXT BOOKS:

1. Manufacturing Technology / P.N. Rao/TMH
2. Manufacturing Technology/ kalpak Jian, Pearson education

REFERENCES:

1. Production Technology / R.K. Jain
2. Process and materials of manufacturing –Lindberg/PE
3. Principles of Metal Castings / Rosenthal.
4. Welding Process / Paramar
5. Manufacturing Technology / R.K. Rajput, Laxhimi Pub
6. Workshop Technology Vol-, by Raghuvamsi

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3 0 3

FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

OBJECTIVE: *The object of the course to make the students understand the fluid flow concepts and get familiarity with flow measuring devices.*

SYLLABUS :

1. Calibration of Venturimeter
2. Calibration of Orifice meter
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Calibration of contracted Rectangular Notch and /or Triangular Notch.
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Varification of Bernoulli's equation.
8. Impact of jet on vanes.
9. Study of Hydraulic jump.
10. Performance test on Pelton wheel turbine.
11. Performance test on Francis turbine.
12. Efficiency test on centrifugal pump.

LIST OF EQUIPMENT :

1. Venturimeter Sutup.
2. Orifice meter setup.
3. Small orifice setup.
4. External mouthpiece setup.
5. Rectangular and Triangular notch setups.
6. Friction factor test setup.
7. Bernoulli's theorem setup.
8. Impact of jets.
9. Hydraulic jump test setup.
10. Pelton wheel and Francis turbines.
11. Centrifugal pumps.

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MANUFACTURING TECHNOLOGY LAB

Minimum of 12 Exercises need to be performed

I. METAL CASTING LAB:

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

II. WELDING LAB :

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

III. MECHANICAL PRESS WORKING:

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

IV. PROCESSING OF PLASTICS

1. Injection Moulding
2. Blow Moulding

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Course Structure
DEPARTMENT OF MECHANICAL ENGINEERING

III Year B.Tech. ME- I Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	Dynamics of Machinery	3	1	0	3
2	THEORY	Managerial Economics and Financial Analysis	3	1	0	3
3	THEORY	Machine Tools	3	1	0	3
4	THEORY	Design of Machine Members – II	3	1	0	3
5	THEORY	Thermal Engineering - II	3	1	0	3
6	THEORY	Automobile Engineering	3	1	0	3
7	PRACTICAL	Thermal Engineering Lab	0	0	3	2
8	PRACTICAL	Machine Tools Lab	0	0	3	2
9		Automotive Act & Practice	0	0	3	0
		Total	18	6	9	22

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MECHANICAL ENGINEERING DEPARTMENT

III Year B.Tech.M.E. I Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

DYNAMICS OF MACHINERY

UNIT I

FRICTION: Inclined plane, friction of screws and nuts, pivot and collar, uniform pressure, uniform wear.

Friction circle and friction axis, lubricated surfaces, boundary friction, film lubrication.

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

BRAKES AND DYNAMOMETERS: Simple block brakes, Band brake, internal expanding brake, braking of vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

UNIT II

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aeroplanes and ships.

TURNING MOMENT DIAGRAMS AND FLY WHEELS: Turning moment diagrams for steam engine,

IC Engine and multi cylinder engine. Crank effort - coefficient of Fluctuation of energy, coefficient of Fluctuation of speed – Fly wheels and their design, Fly wheels for Punching machines.

UNIT III

GOVERNORS: Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung governors with auxiliary springs. Sensitiveness, isochronism and hunting. Effort and power of a governor.

UNIT IV

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

BALANCING OF RECIPROCATING MASSES: Primary and Secondary balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples – V-engine, multi cylinder inline and radial engines for primary and secondary balancing.

UNIT V

VIBRATION: Free and forced vibration of single degree of freedom system, Role of damping, whirling of shafts and critical speeds. Simple problems on free, forced and damped vibrations. Vibration Isolation & Transmissibility. Transverse vibrations of beams with concentrated and distributed loads. Dunkerly's method, Raleigh's method. Torsional vibrations - two and three rotor systems.

Text Books:

1. Theory of Machines, S.S. Rattan, MGH Publishers,3rd Edition,2013.

2. Kinematics and Dynamics of Machinery R.L. Norton, Tata McGraw Hill.

Reference Books:

1. Theory of Machines, Thomas Bevan, Pearson, 3rd Edition,2012.
2. The theory of Machines, J.E. Shiegley, McGraw Hill .
3. Theory of Machines and Mechanisms of Shigley et.al. Oxford International Student Edition.

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MECHANICAL ENGINEERING DEPARTMENT

III Year B.Tech.M.E. I Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS

Course Objectives: The objective of this course is to equip the student with the basic inputs of Managerial Economics and Economic Environment of business and to impart analytical skills in helping them take sound financial decisions for achieving higher organizational productivity.

Unit I: INTRODUCTION TO MANAGERIAL ECONOMICS

Managerial Economics – Definition- Nature- Scope - Contemporary importance of Managerial Economics - Demand Analysis: Concept of Demand-Demand Function - Law of Demand - Elasticity of Demand- Significance - Types of Elasticity - Measurement of elasticity of demand - Demand Forecasting- factors governing demand forecasting- methods of demand forecasting - Relationship of Managerial Economics with Financial Accounting and Management.

UNIT II: THEORY OF PRODUCTION AND COST ANALYSIS

Production Function- Least cost combination- Short-run and Long- run production function- Isoquants and Isocosts, MRTS - Cobb-Douglas production function - Laws of returns - Internal and External economies of scale - **Cost Analysis**: Cost concepts and cost behavior- Break-Even Analysis (BEA) -Determination of Break Even Point (Simple Problems)-Managerial significance and limitations of Break- Even Point.

UNIT III: INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT

Market structures: Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition- Monopoly-Monopolistic Competition-Oligopoly-Price-Output Determination - Pricing Methods and Strategies-Forms of Business Organizations- Sole Proprietorship- Partnership – Joint Stock Companies - Public Sector Enterprises – New Economic Environment- Economic Liberalization – Privatization - Globalization.

UNIT IV: CAPITAL AND CAPITAL BUDGETING

Concept of Capital - Over and Undercapitalization – Remedial Measures - Sources of Shot term and Long term Capital - Estimating Working Capital Requirements – Capital Budgeting – Features of Capital Budgeting Proposals – Methods and Evaluation of Capital Budgeting Projects – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

UNIT V: INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS

Financial Accounting – Concept - Emerging need and Importance - Double-Entry Book Keeping- Journal - Ledger – Trial Balance - Financial Statements - Trading Account – Profit & Loss Account – Balance Sheet (with simple adjustments). Financial Analysis – Ratios – Liquidity, Leverage, Profitability, and Activity Ratios (simple problems).

The students are required to submit any one of the following- two assignments/ a mini project/submission of any two case studies in the subject.

Learning Outcome: After completion of this course, the student will able to understand various aspects of Managerial Economics and analysis of financial statements and inputs therein will help them to make sound and effective decisions under different economic environment and market situations.

TEXT BOOKS:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Ahuja H.L Managerial economics. S.Chand, 3/e, 2013
3.

REFERENCES

1. Aryasri: Managerial Economics and Financial Analysis, 4/e, TMH, 2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International,. 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

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MECHANICAL ENGINEERING DEPARTMENT

III Year B.Tech.M.E. I Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

MACHINE TOOLS

UNIT I

Elementary treatment of metal cutting theory – Elements 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, heat generation, tool life, coolants, machinability –economics of machining. cutting Tool materials and cutting fluids –types and characteristics .

UNIT II

Engine lathe – Principle of working- specification of lathe – types of lathes – work holders and tool holders –Taper turning, thread turning and attachments for Lathes.Turret and capstan lathes – collet chucks – other work holders – tool holding devices – box and tool layout. Principal features of automatic lathes – classification – Single spindle and multi-spindle automatic lathes– tool layout and cam design.

UNIT III

Drilling and Boring Machines – Principles of working, specifications, types, operations performed – tool holding devices – twist drill – Boring tools – machining time calculation.
Shaping, Slotting and Planning machines –Principles of working – Principal parts – specification, classification, Operations performed. Machining time calculations.

UNIT IV

Milling machine – Principles of working – specifications – classifications of milling machines – Principal features – machining operations, Types and geometry of milling cutters– methods of indexing – Accessories to milling machines.
Grinding machine –Theory of grinding – classification– cylindrical and surface grinding machine – Tool and cutter grinding machine – special types of grinding machines – Grinding wheel: Different types of abrasives – bonds, specification and selection of a grinding wheel. Static and dynamic balancing of a wheel Truing and Dressing of wheels. Lapping, Honing and Broaching machines – comparison of grinding, lapping and honing. machining time calculations.

UNIT V

Principles of design of Jigs and fixtures and uses, 3-2-1 Classification of Jigs & Fixtures – Principles of location and clamping – Types of clamping & work holding devices, Typical examples of jigs and Fixtures Unit built machine tools – multispindle heads. power units-principal of working types of UBMTS, characterization, applications

Text Books:

1. Workshop Technology – Vol II, B.S.RaghuVamshi, Dhanpat Rai & Co, 10th edition, 2013
2. Production Technology by R.K. Jain and S.C. Gupta, Khanna Publishers, 17th edition, 2012

Reference Books:

1. Manufacturing Technology-Kalpakzian- Pearson
2. Metal cutting Principles by Milton C.Shaw, oxford Second Edn, 2nd edition, 2012
3. Production Technology by H.M.T. (Hindustan Machine Tools),TMH, 1st edition, 2001
4. Production Technology by K.L.Narayana, IK International Pub.
5. Unconventional Machining process by V.K.Jain, Allied Pub.
6. manufacturing technology Vol II by P.N. Rao, Tata McGraw Hill, 4th edition, 2013
7. Machining and machine tools by AB. Chattopadyay, WileyEdn,2013
8. Machine Technology Machine tools and operations by Halmi A Yousuf&Harson, CRC Press Taylor and Francies .

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

L	T	P	C
3	1	0	3

DESIGN OF MACHINE ELEMENTS– II

UNIT I

DESIGN OF CURVED BEAMS: Stresses in curved beams, Expression for radius of neutral axis for rectangular, circular, trapezoidal and T-Section. Design of crane hooks, C –clamps.

DESIGN OF POWER TRANSMISSIONS SYSTEMS: Design of Flat belt drives, V-belt drives & rope drives. Selection of wire ropes, design procedure for chain drives.

UNIT II

DESIGN OF MECHANICAL SPRINGS: Stress and deflections of helical Springs-Springs for fatigue loading – Natural frequency of helical springs-Energy storage capacity- Helical Torsion springs- Design of leaf springs.

DESIGN OF POWER SCREWS: Design of screw- Square, ACME and Buttress screws- Efficiency of the screw. Design of compound screw, differential screw, ball screw- possible failures

UNIT III

DESIGN OF BEARINGS: Types of Journal bearings – Lubrication – Bearing Modulus–bearing materials – journal bearing design – Ball and roller bearings – Static loading of ball & roller bearings, bearing life –Failure of bearings.

UNIT IV

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

UNIT V

DESIGN OF IC ENGINE PARTS: Pistons– Construction, Design of piston. Cylinder, Cylinder block, Connecting Rod. Cranks and Crank shafts- Center and over hung cranks.

Text Books:

1. MechanicalEngineeringDesign,JosephE.Shigely,TMH Publishers,NewDelhi, 9th edition, 2010.
2. Machine Design, R.L. Norton, Tata McGraw Hill Publishers, 2nd edition, 2012.
*3. Machine design by SundarRajan ***

Reference Books:

1. MachineDesign,Schaum"sseries,TMHPublishers, NewDelhi, 1st edition, 2011
2. Design ofMachine Elements, V.B.Bhandari , TMH Publishers,NewDelhi, 2nd edition, 2013.
3. MachineDesign,SadhuSingh,KhannaPublishers, NewDelhi
4. DesignofMachineElements,M.F.Spotts,PHIPublishers, NewDelhi.

5. MachineDesign,PandyaandShah,CharotarPublishers,Anand, 17th edition, 2012.

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MECHANICAL ENGINEERING DEPARTMENT

III Year B.Tech.M.E. I Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

THERMAL ENGINEERING – II

UNIT I

BASIC CONCEPTS: Rankine Cycle - Schematic Layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat Addition, Methods to Improve Cycle Performance – Regeneration – Reheating-Combined- Cycles.

UNIT II

BOILERS: Classification Based on Working Principles & Pressures of Operation - L.P & H.P. Boilers – Mountings and Accessories.

DRAUGHT: Classification – Height Of Chimney for Given Draught and Discharge, Condition for Maximum Discharge, Efficiency of Chimney – Artificial Draught, Induced and Forced Draught.

UNIT III

STEAM NOZZLES: Function of Nozzle – Applications - Types, Flow through Nozzles, Thermodynamic Analysis – Assumptions -Velocity of Nozzle at Exit-Ideal And Actual Expansion in Nozzle, Velocity Coefficient, Condition for Maximum Discharge, Critical Pressure Ratio.

Criteria for Design of Nozzle Shape: Super Saturated Flow and its Effects, Degree of Super Saturation and Degree of Under Cooling - Wilson Line –Shock at The Exit.

CONDENSERS: Classification, Air Leakage Vacuum Efficiency, condenser efficiency, problems.

UNIT IV

IMPULSE TURBINE: Mechanical Details – Velocity Diagram – Effect of Friction – Power Developed, Axial Thrust Blade or Diagram Efficiency – Condition for Maximum Efficiency. De-Laval Turbine – Its Features. Methods To Reduce Rotor Speed - Velocity Compounding And Pressure Compounding, Velocity And Pressure Variation Along The Flow – Combined Velocity Diagram For A Velocity Compounded Impulse Turbine.

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 V

GAS TURBINES:Simple Gas Turbine Plant – Ideal Cycle, Essential Components – Parameters of Performance – Actual Cycle – Regeneration, Inter Cooling and Reheating – Closed And Semi-Closed Cycles – Merits and Demerits, Brief Concepts of Compressors, Combustion Chambers and Turbines used in Gas Turbine Plants

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, Turbo Prop, Pulse Jet Engines – Schematic Diagram, Thermodynamic Cycle. Introduction to Rocket Propulsion.

Text Books:

1. Thermal Engineering, R.K. Rajput, 9/e, Lakshmi Publications, 2013
2. Basic and Applied Thermodynamics, P.K. Nag, TMH , 2nd Edition,2012.

Reference Books:

1. Gas Turbines, V. Ganesan, TMH
2. Thermodynamics and Heat Engines, R.Yadav, Central Publishing House, Allahabad, 2002.
3. Gas Turbines and Propulsive Systems, P.Khajuria&S.P.Dubey, Dhanpatrai
4. Thermal Engineering, R.S Khurmi & JS Gupta, S.Chand, 2012.
5. Thermal Engineering-M.L.Mathur & F.S.Mehta, Jain bros, 2006.
6. Thermal Engineering Data Book, B.S. Reddy and K.H. Reddy, I.K. International, 2007.
7. Steam Tables SI Units- Dr.B.Umamaheswar Gowd and A. Nagraju, Siri Publ.

NOTE: *Steam tables and Mollier charts to be supplied for exam.*

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MECHANICAL ENGINEERING DEPARTMENT

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

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3	1	0	3

AUTOMOBILE ENGINEERING

UNIT I

Introduction: Components of a Four Wheeler Automobile – Chassis and Body – Power Unit –Power Transmission – Rear Wheel Drive, Front Wheel Drive, Four Wheel Drive – Types of Automobile Engines, Engine Construction, Turbo Charging and Super Charging – Oil Filters, Oil Pumps – Crank Case Ventilation.

UNIT II

Emissions from Automobiles – Pollution Standards National and International – Pollution Control– Techniques – Multipoint Fuel Injection for SI Engines- Common Rail Diesel Injection, Emissions from Alternative Energy Sources– Hydrogen, Biomass, Alcohols, LPG, CNG - Their Merits And Demerits.
Electrical System: Charging Circuit, Generator, Current – Voltage Regulator – Starting System, Bendix Drive, Mechanism of Solenoid Switch, Lighting Systems, Horn, Wiper, Fuel Gauge – Oil Pressure Gauge, Engine Température Indicator.

UNIT III

Transmission System: Clutches- Principle- Types: Cone Clutch, Single Plate Clutch, Multi Plate Clutch, Magnetic and Centrifugal Clutches, Fluid Fly Wheel – Gear Box- Types: Sliding Mesh, Constant Mesh, Synchromesh, Epi-Cyclic, Over Drive, Torque Converter.
Propeller Shaft – Hotch – Kiss Drive, Torque Tube Drive, Universal Joint, Differential, Rear Axles.

UNIT IV

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.

UNIT V

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, Pneumatic and Vacuum Brake Systems.

Text Books:

1. Automotive Mechanics – Vol. 1 & Vol. 2, Kirpal Singh, Standard Publishers Distributors, 13th edition, 2013.
2. Automobile Engineering , William Crouse, TMH, 10th edition, 2006.

Reference Books:

1. Automobile Engineering ,R.K.Rajput,Laxmi Pub, 1st edition, 2013.
2. Automobile Engineering ,K.K.Ramalingam/Scitech Pub, 2nd edition.
3. Automotive engines , Newton, Steeds & Garret.

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MECHANICAL ENGINEERING DEPARTMENT

III Year B.Tech.M.E. I Semester	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

THERMAL ENGINEERING LAB

1. Valve / Port Timing Diagrams of an I.C. Engines
2. Performance Test on a 4 -Stroke Diesel Engines
3. Performance Test on 2-Stroke Petrol engine
4. Evaluation of Engine friction by conducting Morse test on 4-Stroke Multi cylinder Engine
5. Retardation and motoring test on 4- stroke engine
6. Heat Balance of an I.C. Engine.
7. Air/Fuel Ratio and Volumetric Efficiency of an I.C. Engines.
8. Performance Test on Variable Compression Ratio Engines, economical speed test.
9. Performance Test on Reciprocating Air – Compressor Unit
10. Study of Boilers
11. Dismantling / Assembly of Engines to identify the parts and their position in an engine.

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MECHANICAL ENGINEERING DEPARTMENT

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

L	T	P	C
0	0	3	2

MACHINE TOOLS LAB

1. Demonstration of construction & operations of general purpose machines: Lathe, Drilling machine, Milling machine, Shaper, Planning machine, Slotting machine, Cylindrical Grinder, Surface grinder and Tool & cutter grinder.
2. Job on Step turning and taper turning on lathe machine
3. Job on Thread cutting and knurling on -lathe machine.
4. Job on Drilling and Tapping
5. Job on Shaping and Planning
6. Job on Slotting
7. Job on Milling (groove cutting/ gear cutting)
8. Job on Cylindrical and Surface Grinding
9. Job on Grinding of Tool angles.

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Course Structure
DEPARTMENT OF MECHANICAL ENGINEERING

III Year B.Tech. ME- II Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	Industrial Engineering & Management	3	1	0	3
2	THEORY	Engineering Metrology	3	1	0	3
3	THEORY	Refrigeration & Air Conditioning	3	1	0	3
4	THEORY	Operations Research	3	1	0	3

5	THEORY	Heat Transfer	3	1	0	3
6	THEORY	CAD/CAM	3	1	0	3
7	PRACTICAL	Heat Transfer Lab	0	0	3	2
8	PRACTICAL	CAD/CAM Lab	0	0	3	2
9		Advanced Communication Skills Lab	0	0	3	0
		Total	18	6	9	22

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MECHANICAL ENGINEERING DEPARTMENT

III Year B.Tech.M.E. II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

INDUSTRIAL ENGINEERING & MANAGEMENT

UNIT I

Concepts of Management-Administration and Organization – Functions of Management – Schools of Management Thought: Taylor's Scientific Management, Fayol's Principles of Management, Douglas Mc-Gregor's Theory X and Y, Mayo's Hawthorne Experiments, Hertzberg's Two factor Theory of Motivation, Maslow's Hierarchy of Human needs – Systems Approach to Management.

Organizational Structures- Functional- Divisional- Matrix etc., Basic Concepts Related to Organization – Departmentation and Decentralization and their Merits, Demerits and Suitability

UNIT II

Plant Location: Definition, Factors affecting the Plant Location, Comparison of Rural and Urban sites, Selection of Plant Location – Types of Production; Plant Layout: Definition, Objectives, Types of Plant Layout - Materials Handling: Functions- Objectives – Types, Selection Criteria of Material Handling Equipment.

UNIT III

Work Study – Definition, Objectives, Method Study – Steps Involved – Various Types of Process Charts – Micro motion and Memo motion Studies.

Work Measurement - Definition, Time Study, Steps involved - Equipment, Different Methods of Performance Rating - Allowances, Standard Time Calculation. Work Sampling - Definition, Steps Involved, Standard Time Calculations - Applications.

UNIT IV

Material Management – Functions; Inventory – functions, types, associated costs, inventory classification techniques- ABC, VED Analysis; Inventory Models- Deterministic models- EOQ Models – With and Without Shortages Models; Inventory Models with Price Breaks -Probabilistic Models –Discrete Variable, Continuous Variable. Inventory Control Systems : P&Q Systems. Stores Management and Purchase Management, Duties of Purchase Manager.

UNIT V

Human Resource Management - Functions of HRM, Job Evaluation, Merit Rating, Wage Incentives, Different Types of Incentive Schemes, Introduction to Factory act and Industrial Dispute Acts.

Inspection & Quality Control: Statistical Quality Control- Techniques-Variables and Attributes- Control Charts: X and R Charts; P Charts and C Charts. Acceptance Sampling Plan - Single Sampling and Double Sampling Plans- OC Curves. Introduction to TQM- Quality circles-BIS & ISO Standards-Importance .

Text Books:

1. Manufacturing Organization and Management, T.Amrine/ Pearson, 2nd Edition, 2004
2. Industrial Engineering and Management ,O.P.Khanna, DhanpatiRai, 18th edition, 2013.

3. Industrial Engineering and Management, Dr. C.Nadamuni Reddy, New Age International Publishers, 1st edition, 2011.

Reference Books:

1. Industrial Engineering and production management, MartindTelsang S.Chand..
2. Work Study by ILO(International Labour Organization)
3. Management by James AF Stoner, Freeman 6th Ed, Pearson Education, New Delhi,2005
4. Production and Operations management, PanneerSelvam, PHI,2004.
5. Statistical Quality Control by EL Grantt, McGrawhil
6. Motion and time studies by Ralph M Barnes, John Wiley and Sons,2004

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::ANANTAPURAMU

MECHANICAL ENGINEERING DEPARTMENT

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

L	T	P	C
3	1	0	3

ENGINEERING METROLOGY

UNIT I

LIMITS, FITS and TOLERNCES : Introduction, Definitions, fits and their types – unilateral and bilateral tolerance system, hole and shaft basis systems – interchangeability and selective assembly. Indian standard system – International Standard organization system for plain work.

LIMIT GAUGES and GAUGE DESIGN: Plug, Ring, Snap, Gap, Taper gauges. Taylor's principle. Design of Go and No Go gauges.

COMPARATORS: Principle of Measurement with Mechanical, Optical, Electrical, Electronic, Pneumatic comparators and their uses..

UNIT II

LINEAR MEASUREMENT: Length standard, line and end & wavelength standards, slip gauges – calibration of the slip gauges, Dial indicator, micrometers, vernier height gauges.

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

FLATNESS MEASUREMENT: Measurement of flatness of surfaces – straight edges– surface plates – optical flat and auto collimators, interferometer and their uses.

UNIT III

SURFACE ROUGHNESS MEASUREMENT: Differences between surface roughness and surfacewaviness- Numerical assessment of surface finish – CLA, R.M.S Values – R_a , R_z values, Methods of measurement of surface finish-profilograph, Talysurf, BIS symbols for indication of surface finish.

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

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 and drilling machine tools. Preparation of acceptance charts.

UNIT IV

MEASUREMENT OF DISPLACEMENT: Theory and construction of various transducers to measure displacement - Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

MEASUREMENT OF SPEED: Mechanical Tachometers - Electrical tachometers - Stroboscope, Noncontact type of tachometer .

STRESS & STRAIN MEASUREMENTS: Various types - electrical strain gauge - gauge factor – method of usage of resistance strain gauge for bending, compressive and tensile strains - usage for measuring torque, Strain gauge Rosettes.

MEASUREMENT OF ACCELERATION AND VIBRATION: Different simple instruments – Principles of Seismic instruments - Vibrometer and accelerometer.

UNIT V

MEASURMENT OF TEMPERATURE: Standards and calibration, thermal expansion methods, thermo electric sensors(thermocouples), Electrical Resistance sensors, Junction semiconductor sensors, Digital thermometers, Radiation methods.

MEASUREMENT OF PRESSURE AND SOUND: Standards and calibration, basic methods of pressure measurement, dead weight gauges and manometers, Elastic transducers, vibrating cylinder, resonant transducers, High and low pressure measurement, sound measurement.

MEASUREMENT OF FORCE, TORQUE,POWER: Standards and calibration, Basic methods of Force Measurement, Torque measurement on rotating shafts, shaft power Measurement(dynamometers), Vibrating wire force transducers.

Text Books:

(1) Mechanical Measurements ,Beckwith, Marangoni, Linehard, PHI, PE
(2) Measurement systems: Application and design, Doeblin Earnest. O. Adaptation by Manik and Dhanesh, TMH,2012.
(3) Engineering Metrology, R.K. Jain, Khanna Publishers, 20th edition, 2013.

Reference Books:

(1) Engineering Metrology, Mahajan, DhanpatRai, 2nd edition, 2013.
(2) BIS standards on Limits & Fits
(3) Fundamentals of Dimensional Metrology,Connie Dotson ,4e, Thomson
(4) Metrology & Measurement by Anand K Bewoor, vinay A kulkarni, Mc GrawHill, 2013.
(5) Instrumentation, measurement &analysis ,B.C.Nakra&KKChoudhary, TMH, 6th edition, 2011.

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	3	**1**	**0**	**3**

REFRIGERATION AND AIR CONDITIONING

UNIT I

Introduction to Refrigeration: Necessity and Applications, Carnot Refrigerator, First and Second Law Applied to Refrigerating Machines, Unit of Refrigeration, COP, EER, Different Refrigeration Methods Air Refrigeration: Bell-Coleman Cycle, Ideal and Actual Cycles, Open and Dense Air Systems - Numerical Problems – Refrigeration Needs of Air Crafts.

UNIT II

Vapour Compression Refrigeration (VCR) System – Basic Cycle - Working Principle and Essential Components of The Plant – COP – Representation of Cycle On T-S and P-h Charts – Expander Vs. Throttling, Effect of Sub Cooling and Super Heating – Cycle Analysis – Actual Cycle- Influence of Various Parameters on System Performance – Construction and Use of P-h Charts – Numerical Problems.

Refrigerants – Desirable Properties – Classification of Refrigerants Used – Nomenclature- Secondary Refrigerants- Lubricants – Ozone Depletion – Global Warming- Newer Refrigerants.

UNIT III

Vapor Absorption Refrigeration (VAR) System – Description and Working of NH_3 – Water System and Li Br –Water (Two Shell & Four Shell) System -Calculation of Max COP, Principle of Operation of Three Fluid Absorption System.

Steam Jet Refrigeration System: Working Principle and Basic Components-Estimation of Motive Steam Required, Principle and Operation of: (I) Thermo-Electric Refrigerator (Ii) Vortex Tube OrHilsch Tube.

UNIT IV

Introduction to Air Conditioning: Psychrometric Properties & Processes – Characterization of Sensible and Latent Heat Loads — Need For Ventilation, Consideration of Infiltrated Air – Heat Load Concepts.

Air Conditioning Systems: Air Cooler (Evaporative Cooling) ,Window, Split, Summer , Winter, Year Round, Central Air Conditioning Systems.

UNIT V

Air Conditioning Equipment - Humidifiers – Dehumidifiers – Air Filters, Fans and Blowers.

Human Comfort: Requirements of Temperature, Humidity And Concept of Effective Temperature, Comfort Chart.Heat Pump – Heat Sources – Different Heat Pump Circuits.

Text Books:

1. Refrigeration and Air Conditioning ,CP Arora,TMH, 15th edition, 2013.
2. A Course in Refrigeration and Air conditioning,S.CArora&Domkundwar, Dhanpatrai

Reference Books:

1. Refrigeration and Air Conditioning / Manohar Prasad / New Age, 2nd edition, 2013
2. Principles of Refrigeration - Dossat / Pearson Education, 4th edition, 2007.
3. Refrigeration and Air Conditioning-P.L.Ballaney, 2nd edition, 2012.
4. Basic Refrigeration and Air-Conditioning – P.N.Ananthanarayanan / TMH, 4th edition, 2013.

NOTE: *Tables/Codes: Thermal Engineering Data Book containingRéfrigérant and Psychrometric property Tables and charts are permitted in Exam*

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3	1	0	3

OPERATIONS RESEARCH

UNIT I

Introduction to OR – Classification of Models –Types of Operations Research models; Linear Programming- Problem Formulation, Graphical Method, Simplex Method, Big-M Method Two–Phase Simplex Method, Special Cases of LP- Degeneracy, Infeasibility and Multiple Optimal Solutions- Duality-primal - dual Relations.

UNIT II

Transportation Problem – Formulation; Different Methods of Obtaining Initial Basic Feasible Solution- Optimality Methods-Stepping Stone Method and Modified Distribution (MODI) Method- Degeneracy. Assignment Problem - Optimal Solution -Travelling Salesman problem.

UNIT III

Game Theory: Introduction – Two- person zero sum games – Minimax (Maximin) Criterion - Principle of dominance, Saddle Point, Pure Strategy –Games with Mixed Strategies – different methods: Arithmetic and algebraic methods- graphical method for 2 x n and n x 2 games.

Queuing Theory: Introduction –Terminology, Birth & Death Process, Balking, Reneging, Jockeying;
Single Channel Models with Poisson Arrivals, Exponential Service Times with finite queue length and In-finite queue length; Multichannel Model with Poisson Arrivals, Exponential Service Times with finite queue length.

UNIT IV

Replacement models: Introduction – Types of Replacement Problems, Replacement items that deteriorate with time – Time value of money - Replacement of items which completely fail suddenly -Individual Replacement policy and Group Replacement policy.

Dynamic Programming : Introduction – Bellman's Principle of Optimality – Applications of Dynamic Programming- Capital Budgeting Problem – Shortest Path Problem – Solution of Linear Programming Problem by DP

UNIT V

PERT & CPM: Introduction to Project Management, Activities, Events, Predecessor Relationships, AOA & AON Diagrams, Types of Floats; CPM- Critical Path, Crashing, Optimal Project Duration. Introduction to Resource Levelling & Smoothening.

PERT- Probabilistic Model- Various types of Activity Time Estimates, Standard Deviation and Variance of the Activities and Projects, and Probability of Completing the Project within scheduled time, particular time.
Introduction to Simulation – Simple Problems.

Text Books:

1. Quantitative techniques for management by N. D. Vohra, Tata McGraw-Hill Education, 3rd edition 01-Jul-2006
2. Operations Research by S.D.Sharma
3. Introduction to Operations Research, H.A.Taha, PHI, 9th edition, 2013.
4. Operations Research by R Panneerselvam, PHI, 2nd edition, 2012.

Reference Books:

1. Operation Research, J.K.Sharma,MacMilan, 5th edition, 2013.
2. Linear Programming, SusyPhillippose, PHI
3. Operations Research, A.M.Natarajan,P.Balasubramani,A. Tamilarasi,Pearson Education, 8th edition, 2011.
4. Operations Research: Methods & Problems , Maurice Saseini, ArhurYaspan& Lawrence Friedman
5. Operations Research, Dr. C.Nadhamuni Reddy & Sri Gopal Krishna, Kurnool Publishers
6. Introduction to Operations Research Frederick K. Hiller, Bodhibrata Nag, PreetamBasu, Geralld J. Lieberman, TMH, 9th edition, 2011.

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HEAT TRANSFER

UNIT I

Introduction: Modes and Mechanisms of Heat Transfer – Basic Laws of Heat Transfer – General 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 – Boundary and Initial Conditions.

One Dimensional Steady State Heat Conduction: In Homogeneous Slabs, Hollow Cylinders and Spheres – Overall Heat Transfer Coefficient – Electrical Analogy – Critical Radius/Thickness of Insulation – With Variable Thermal Conductivity – With Internal Heat Sources or Heat Generation

UNIT II

Heat Transfer in Extended Surface (Fins) – efficiency, effectiveness and temperature distribution on Long Fin, Fin with Insulated Tip and Short Fin, Application to Errors in Temperature Measurement.

One Dimensional Transient Heat Conduction: In Systems with Negligible Internal Resistance – Significance of Biot and Fourier Numbers – Chart Solutions of Transient Conduction Systems – Problems on Semi-infinite Body.

UNIT III

Convective Heat Transfer: Dimensional Analysis – Buckingham Π Theorem and Its Application for Developing Semi – Empirical Non-Dimensional Correlations for Convective Heat Transfer – Significance of Non-Dimensional Numbers – Concepts of Continuity, Momentum And Energy Equations.

Forced Convection: External Flows: Concepts of Hydrodynamic and Thermal Boundary Layer and Use of Empirical Correlations for Convective Heat Transfer for Flow Over – Flat Plates, Cylinders and Spheres.

Internal Flows: Division of Internal Flow through Concepts of Hydrodynamic and Thermal Entry Lengths – Use of Empirical Relations for Convective Heat Transfer in Horizontal Pipe Flow, Annular Flow.

Free Convection: Development of Hydrodynamic and Thermal Boundary Layer along a Vertical Plate – Use of Empirical Relations for Convective Heat Transfer on Plates and Cylinders in Horizontal and Vertical Orientation.

UNIT IV

Heat Transfer with Phase Change:

Boiling: Pool Boiling – Regimes, Determination of Heat Transfer Coefficient in Nucleate Boiling, Critical Heat Flux and Film Boiling.

Condensation: Filmwise and Dropwise Condensation – Nusselt's Theory of Condensation on a Vertical Plate – Film Condensation on Vertical snd Horizontal Cylinders Using Empirical Correlations.

Heat Exchangers: Classification of Heat Exchangers – Overall Heat Transfer Coefficient and Fouling Factor – Concepts of LMTD and NTU Methods – Problems using LMTD And NTU Methods.

UNIT V

Radiative 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 Gray Bodies – Radiation Shields – Electrical Analogy for Radiation Networks.

Text Books:

1. Fundamentals of Engg. Heat and Mass Transfer, R.C. Sachdeva, 4/e, New Age International, 2010.

Reference Books:

1. Heat Transfer, P.K.Nag, 3/e, TMH, 2011
2. Heat Transfer, Ghoshdastidar, Oxford Univ. Press, 1st edition, 2004
3. Heat Transfer, Holman.J.P, 10/e, TMH, 2012
4. Heat and Mass Transfer, R.K.Rajput, S.Chand& Company Ltd, 2001
5. Fundamentals of Heat and Mass Transfer, Kondandaraman, C.P., 3/e, New Age Publ.
6. Fundamentals of Heat and Mass Transfer, Incropera, 5/e, Wiley India.
7. Thermal Engineering Data Book, B.S.Reddy and K.H.Reddy Rev/e, I.K. International, 2007

NOTE: *Heat transfer Data books are permitted for Exam.*

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MECHANICAL ENGINEERING DEPARTMENT

III Year B.Tech. M.E. -II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

CAD / CAM

UNIT I

Overview of CAD/CAM: Product cycle, CAD, CAM and CIM. CAD Tools, CAM Tools, Utilization in an Industrial Environment, Evaluation criteria. CAD standards, CAD data structure, Data base management systems.

Computer Graphics: Co-ordinate systems, Graphics package functions, 2D and 3D transformations, homogeneous transformations, clipping, hidden line / surface removal colour, shading.

UNIT II

Geometric Modeling: Representation techniques, Parametric and non parametric representation, various construction methods, wire frame modeling, synthetic curves and their representations, surface modeling, synthetics surfaces and their representations.

Solid modeling, solid representation, fundamentals, introduction to boundary representation, constructive solid geometry representation.

UNIT III

Numerical Control: NC, NC Modes, NC Elements, NC Machine tools and their structure, Machining centre, types and features. Controls in NC, CNC systems, DNC systems. Adaptive control machining systems, types of adaptive control.

CNC Part Programming: Fundamentals, NC word, NC Nodes, canned cycles, cutter radius compensation, length compensation, computed assisted part programming using APT: Geometry statements, motion statements, post process statements, auxiliary statements, macro statement program for simple components.

UNIT IV

Group Technology & FMS: Part Family, Classification and Coding, advantages & limitations, Group technology machine cells, benefits. FMS: Introduction, components of FMS, material handling systems, Computer control systems, advantages.

Computer Aided Quality Control: Terminology in Quality control, Inspection and testing, Contact inspection methods - optical and non optical, integration of CAQC with CAD and CIM.

UNIT V

Computer Aided Processes Planning: Retrieval type and Generative type, benefits Machinability data systems, Computer generated time standards.

Computer integrated production planning: Capacity planning, shop floor control, MRP-I, MRP-II, CIMS benefits. Trends in Manufacturing systems: Concepts of Reconfigurable manufacturing, Sustainable manufacturing and Lean manufacturing.

Text Books:

1. CAD/CAM, A Zimmers&P.Groover, PE, PHI
2. CAD/CAM-Principles and applications, P.N. Rao, TMH, 3rd edition, 2010

Reference Books:

1. Automation, Production systems & Computer integrated Manufacturing,Groover, P.E
2. CAD/CAM/CIM, Radhakrishnan and Subramaniah, New Age, 3rd edition, 2008
3. Principles of Computer Aided Design and Manufacturing, FaridAmirouche, Pearson
4. CAD/CAM Theory and Practice, R. Sivasubramaniam, TMH
5. Computer Aided Design and Manufacturing, K.Lalit Narayan , PHI, 2008.
6. Computer Aided Manufacturing, T.C. Chang, Pearson, 3rd edition, 2008
7. A text book of CAD/CAM, CSP Rao, Hitech Publ.

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MECHANICAL ENGINEERING DEPARTMENT

III Year B.Tech.M.E. I Semester	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

HEAT TRANSFER LAB

NOTE*: Thermal Engineering data books are permitted in the examinations*

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

Note: *Any 10 of the above 15 experiments are to be conducted*

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MECHANICAL ENGINEERING DEPARTMENT

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

L	T	P	C
0	0	3	2

CAD / CAM LAB

I. Introduction to CAD/CAM software packages.

II. 1. Development of part drawings in the form of orthographic & isometric.
2. 3D Modelling of various parts.
3. Assembly Modelling of various parts.

III. a). Development of process sheets for various components based on tooling Machines.
b). Development of manufacturing and tool management systems.
c). Study of various post processors used in NC Machines.
d). Development of NC code for free form and sculptured surfaces using CAM packages.
e). Machining of simple components on NC lathe and Mill by transferring NC Code / from a CAM package.
f). Computer Aided Quality Control and inspection.

The following packages can be used in lab.
Auto Cad, CATIA, Pro-E, I-DEAS, Iron- CAD, Edge CAM, Master CAM, Robot Packages etc.

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MECHANICAL ENGINEERING DEPARTMENT

III Year B.Tech. M.E. II-Sem	**L**	**T**	**P**	**C**
	0	**0**		**0**

ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

1. Introduction:

In the past engineering education has focused only on imparting "hard" or technical skills. With the entry of multinational companies in India there is a revolutionary change in the employment opportunities and recruitment process as well. Globalization demands universities to produce engineers who are equipped with effective interpersonal skills to meet global demands.

In this scenario the **Advanced English Language Communication skills lab** introduced at the 3rd B. Tech. level plays a key role to learn the foreign language in a happy atmosphere and in a successful way. Breaking through the traditional method of teaching, this course motivates student's learning attitude by providing an interactive learning environment.

This course is developed on the methodology of LSRW skills along with soft skills. This course focuses on the practical aspects of listening, speaking, reading and writing that enable the students to expose to various activities like group discussions, Oral Presentations, Mock interview sessions etc., Personality development, etiquettes and to provide corporate knowledge to help the students in facing interviews in a formal organizational set up.

2. Objectives:

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

- To expose the students to a variety of self instructional, learner-friendly modes of language learning.
- To enable the students to learn better pronunciation and accent through listening and reading exercises.
- To train students to use language appropriately for interviews, group discussion and public speaking.
- To initiate them to greater use of the computer in resume preparation, format-making etc.
- To help the students to cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer based competitive exams such as GRE, TOFEL, and GMAT etc.
- To enable the students to acquire good communication skills as well as soft skills to meet global demands.

3 **Syllabus:**

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

Unit I:

Reading &Listening Comprehension: Skimming –scanning- Extensive and Intensive reading. Reading for making inferences. Active VS passive listening. Listening and Note taking, - Listening for making inferences.

. **Unit II:**

Writing Skills: Formal and informal writing- Resume Writing-E-Correspondence.

. **Unit III:**

Technical Presentations (Oral) : Planning-Preparation-Presentation . Art of Persuasion- Audience analysis- Handling questions.

.

Unit IV:

Interview Skills: Types of Interviews - pre-interview planning- answering strategies. Analysis of One to one –interviews – group interviews - Mock interviews.

Unit V:

Soft Skills: Inter Personal Skills- Goal setting – Etiquettes and good manners – Team Working – Work Ethics--Time management – Problem Solving.

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Minimum Requirements

The English Language Lab shall have two parts:

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 PA System, a TV, a digital stereo-audio and video system, a Camcorder, etc

System Requirement (Hardware Component):

Computer network with LAN with a minimum of 60 multimedia systems with the following specifications:

P-IV Processor
Speed-2.8 GHZ
RAM_512 MB minimum
Hard Disk-80 GB
Headphones

Prescribed Software:

9. K-Van Advanced Communication Skills
10. Walden Infotech Advanced Communication Skills.

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

1. **Technical Writing and Professional Communication, Huckin and Olsen** Tata Mc Graw-Hil 2009.

2. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.

3. **Cambridge English for Job-Hunting** by Colm Downes, Cambridge University Press, 2008

4. **Resume's and Interviews** by M.Ashraf Rizvi, Tata Mc Graw-Hill, 2008

5.. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.

6. **Managing Soft Skills** by K R Lakshminarayan and T.Muruguvel, Sci-Tech Publications, 2010

7. **The ACE of Soft Skills** by Gopal Ramesh and Mahadevan Ramesh, Pearson Education, 2010

8. **Soft Skills** by Dr. K. Alex, S.Chand

9. **Study Skills for Professional Students in Higher Education** by Dr. M. Adithan, S.Chand.

10. **Personality Development and Soft Skills by Barun** K. Mitra, Oxford Higher Education.

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Course Structure
DEPARTMENT OF MECHANICAL ENGINEERING

IV Year B.Tech. ME- I Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	Finite Element Methods	3	1	0	3

2	THEORY	Renewable Energy Sources	3	1	0	3
3	THEORY	Instrumentation & Control Systems	3	1	0	3
4	THEORY	Automation & Robotics	3	1	0	3
5	THEORY	Open Elective	3	1	0	3
6	THEORY	MOOC	3	1	0	3
7	PRACTICAL	Instrumentation & Metrology Lab	0	0	3	2
8	PRACTICAL	Computer Aided Engineering Lab	0	0	3	2
9		Project Part-A -Seminar	-	-	-	2
		Total	18	6	6	24

Open Elective
Entrepreneurship
Total Quality Management
Energy Ecology & Environment

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MECHANICAL ENGINEERING DEPARTMENT

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

L	T	P	C
3	1	0	3

FINITE ELEMENT METHODS

UNIT I

INTRODUCTION: Equilibrium equations in elasticity subjected to body force, traction forces and point loads, stress strain relations in 3D elasticity, plane stress and plane strain, Boundary conditions, Initial conditions. Governing equation for Steady state heat conduction with convective boundary conditions. Approximate methods for solving the differential equations: Rayleigh-Ritz method, Weighted residual methods, Galerkin's method.

Integral formulation: Principle of a minimum potential energy, principle of virtual work, Generalized Finite element approach in solving these problems.

Solution methods for solving simultaneous equations.

UNIT II

Problems with One-dimensional geometry:

Bars: Formulation of stiffness matrix, Load vectors, Incorporation of boundary conditions: Elimination approach and penalty approach.

Trusses: Plane truss and space truss elements, Example problems involving plane truss elements.

Examples involving multipoint constrains. Stress calculations. Beams & Frames: Bending of beams, Interpolation functions, formulation of stiffness matrix and load vectors. Plane frames, space frames. Transformations of stiffness and load vectors.

UNIT III

INTERPOLATION MODELS: Polynomial form of interpolation functions - linear, quadratic and cubic, simplex, complex, Multiplex elements, Selection of the order of the interpolation polynomial,

Convergence requirements, 2D Pascal Triangle, Linear interpolation polynomials in terms of global coordinates for triangular (2D simplex) elements, Linear interpolation polynomials in terms of local coordinates for triangular (2D simplex) elements, quadrilateral element.

HIGHER ORDER AND ISOPARAMETRIC ELEMENTS: Lagrangian interpolation, Higher order one dimensional elements- quadratic, Cubic element and their shape functions, properties of shape functions, Shape functions of 2D quadratic triangular element in natural coordinates, 2D quadrilateral element shape functions – linear, quadratic, Biquadric rectangular element Tetrahedral and hexahedral elements.

UNIT IV

FINITE ELEMENT APPLICATION IN SOLID MECHANICS:

Problem modeling and Finite element analysis in 2D plane elasticity with triangular and quadrilateral elements, Isoparametric, subparametric and superparametric elements. Interpolation, Jacobian, matrices relating strain and nodal displacements, stiffness matrix formulation, Consistent and lumped load vectors, Numerical integration Gaussian quadrate.

Axi-symmetric triangular elements: formulation of stiffness and load vectors.

Introduction to 3D stress analysis.

UNIT V

HEAT TRANSFER AND FLUID MECHANICS PROBLEMS:
Steady state heat conduction with convective and heat flux boundary conditions, Functional approach, Galerkin approach formulation of element characteristic matrices and vectors in 1D and 2D problems. Temperature distribution in composite walls one dimensional and two dimensional fins and extended surfaces.
Two dimensional potential flow problems: Potential function formulation and stream function formulation.

Text Books:

1. Introduction to Finite Element in Engineering, TirupatiChandrapatla and Bellagundu , Pearson Education, New Delhi.
2. Finite Element Methods, S. S. Rao , Pergamom Press, New York

Reference Books:

1. Introduction to FEM, J. N. Reddy, TMH Publishers, New Delhi.
2. Finite Element Analysis, C.S. Krishna Moorthy, TMH Publishers, New Delhi.
3. Fundamentals of Finite Element Analysis, David V. Hutton , TMH Publishers, New Delhi.
4. Introduction to the Finite Element Methods, Desai and Abel , CBS Publishers, New Delhi.
5. Finite and Boundary Methods in Engineering, O.P.Gupta, Oxford and IBH Publishers, New Delhi.
6. Finite Element Modeling for Stress Analysis, R. D. Cook, John. Wiley & Sons, 1995.

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::ANANTAPURAMU

MECHANICAL ENGINEERING DEPARTMENT

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

L	T	P	C
3	1	0	3

RENEWABLE ENERGY SOURCES

UNIT – I

PRINCIPLES OF SOLAR RADIATION: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power - Physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, Solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT – II

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications - solar heating/cooling techniques, solar distillation and drying, Photovoltaic energy conversion.

UNIT – III

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics.

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

UNIT – IV

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

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

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

UNIT –V

DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, Principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thompson effects, figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator,

MHD engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principle, faraday's laws, thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS:

Renewable Energy Resources / Tiwari and Ghosal / Narosa
Non- conventional Energy Sources / G.D. Rai

REFERENCE BOOKS:

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

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MECHANICAL ENGINEERING DEPARTMENT

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

L	T	P	C
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INSTRUMENTATION AND CONTROL SYSTEMS

UNIT-I

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

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: Classification - Ranges - Various Principles of measurement - Expansion, Electrical Resistance - Thermistor - Thermocouple - Pyrometers - Temperature Indicators.

MEASUREMENT OF PRESSURE: Units - classification - different principles used- Manometers, Piston, Bourdon pressure gauges, Bellows - Diaphragm gauges. Low pressure measurement - Thermal. conductivity gauges - ionization pressure gauges, Mcleod pressure gauge.

UNIT - III

MEASUREMENT OF SPEED: Mechanical Tachometers - Electrical tachometers - Stroboscope, Noncontact type of tachometer .

Measurement of Acceleration and Vibration: Different simple instruments - Principles of Seismic instruments - Vibrometer and accelerometer.

STRESS & STRAIN MEASUREMENTS: Various types - electrical strain gauge - gauge factor - method of usage of resistance strain gauge for bending, compressive and tensile strains - usage for measuring torque, Strain gauge Rosettes.

UNIT -IV

MEASUREMENT OF LEVEL: Direct method - Indirect methods - capacitative, ultrasonic, magnetic, cryogenic fuel level indicators - Bubbler level indicators.

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

MEASUREMENT OF HUMIDITY - Moisture content in the gases, sling Psychrometer, Absorption Psychrometer, Dew point meter.

UNIT - V

MEASUREMENT OF FORCE, TORQUE AND POWER- Elastic force meters, load cells, Torsion meters, Dynamometers.

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

TEXT BOOKS:

1. Measurement systems: Application and design, Doeblin Earnest. O. Adaptation by Manik and Dhaneshl TMH
2. Mechanical Measurements *I* Beckwith, Marangoni, Linehard, Phi/ PE

REFERENCES:

1. Instrumentation, measurement & analysis by B.C.Nakra & KKChoudhary, TMH
2. Measurement Systems: Applications & design by D.S Kumar.
3. Instrumentation and Control systems/ S.Bhaskar/ Anuradha Agencies.
4. Mechanical and Industrial Measurements */* R.K. *Jain/*Khanna Publishers.
5. Instrumentation & mech. Measurements by AK. Tayal ,Galgotia Publications
6. Mechanical Measurements /Sawhani

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MECHANICAL ENGINEERING DEPARTMENT

IV Year B.Tech.M.E. I Semester **L**

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3	1	0	3

AUTOMATION & ROBOTICS

UNIT I

Introduction to Automation: Need, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing in manufacturing, Automation strategies and levels of automation.

Hardware components for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices.

UNIT II

Automated flow lines: Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines.

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

UNIT III

Introduction to Industrial Robotics: Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers.

Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors.

UNIT IV

Manipulator Kinematics: Homogenous transformations as applicable to rotation and transition - D-H notation, Forward inverse kinematics.

Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton - Euler formations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion.

UNIT V

Robot Programming: Methods of programming - requirements and features of programming languages, software packages. Problems with programming languages.

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

Text Books:

1. Automation , Production systems and CIM,M.P. Groover/Pearson Edu.
2. Industrial Robotics - M.P. Groover, TMH.

Reference Books:

1. Robotics , Fu K S, McGraw Hill, 4th edition, 2010.
2. An Introduction to Robot Technology, P. Coiffet and M. Chaironze, Kogam Page Ltd. 1983 London.
3. Robotic Engineering , Richard D. Klafter, Prentice Hall
4. Robotics, Fundamental Concepts and analysis – AshitaveGhosal,Oxford Press, 1/e, 2006
5. Robotics and Control , Mittal R K &Nagrath I J , TMH.
6. Introduction to Robotics – John J. Craig,PearsonEdu

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MECHANICAL ENGINEERING DEPARTMENT

IV Year B.Tech. M.E. –I Semester

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3	1	0	3

ENTREPRENEURSHIP
(Open Elective)

UNIT 1:
Introduction to Entrepreneurship Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Intrapreneur. The Entrepreneurial decision process. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur.

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

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

UNIT III:
Financing and Managing the new venture, Sources of capital, venture capital , angel investment, Record keeping, recruitment, motivating and leading teams, financial controls. Marketing and sales controls. E-commerce and Entrepreneurship, Internet advertising.

UNIT IV:
New venture Expansion Strategies and Issues, Features and evaluation of joint ventures, acquisitions, merges, franchising. Public issues, rights issues, bonus issues and stock splits.

Choosing location and layout, Issues related to Selection of layout.

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

Text Books:

1. Robert Hisrich, & Michael Peters: Entrepreneurship, TMH, 5th Edition

2. Dollinger: Entrepreneurship,4/e, Pearson, 2004.

REFERENCES:

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

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MECHANICAL ENGINEERING DEPARTMENT

IV Year B.Tech. M.E. –I Semester

L	T	P	C
3	1	0	3

TOTAL QUALITY MANAGEMENT

(Open Elective)

UNIT – I

TQM – Overview, Concepts, Elements – History-Quality Management Philosophies-Juran, Deming, Crosby , Feigenbaum, Ishikawa– Stages of Evolution– Continuous Improvement – Objectives – Internal and External Customers. Quality Standards – Need for Standardization - Institutions – Bodies of Standardization, ISO 9000 series – ISO 14000 series – Other Contemporary Standards – ISO Certification Process-Third Party Audit

UNIT – II

Process Management- Quality Measurement Systems (QMS) – Developing and Implementing QMS –TQM Tools & Techniques- 7 QC Tools- 7 New QC Tools.

Problem Solving Techniques - Problem Solving Process – Corrective Action – Order of Precedence– System Failure Analysis Approach – Flow Chart – Fault Tree Analysis – Failure Mode Assessment and Assignment Matrix – Organizing Failure Mode Analysis – Pedigree Analysis.

UNIT – III

Quality Circles – Organization – Focus Team Approach – Statistical Process Control –Process Chart – Ishikawa Diagram – Preparing and using Control Charts.

UNIT – IV

Quality Function Development (QFD) – Elements of QFD – Benchmarking-Types- Advantages & Limitations of Benchmarking – Taguchi Analysis – Loss function - Taguchi Design of Experiments, Robust Design, Poka-yoke, Kaizen, Deming Cycle.

UNIT – V

Value Improvement Elements – Value Improvement Assault – Supplier Teaming; Business Process Reengineering & Elements of Supply Chain Management. Six Sigma Approach – Application of Six Sigma Approach to various Industrial Situations.

TEXT BOOKS:

1Total Quality Management,DakhBesterfield, Pearson Edu.
2. Total Quality Management, K.ShridharBhat, Himalaya.

REFERENCE BOOKS:

1. Quality management, Howard Giltow-TMH
2. Quality management, Evans.
3. Quality management, Bedi

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MECHANICAL ENGINEERING DEPARTMENT

IV Year B.Tech. M.E. –I Semester

L	T	P	C
3	1	0	3

ENERGY ECOLOGY & ENVIRONMENT
(Open Elective)

UNIT-I

Energy source for earth – sun – its radiation – its absorption and reflection. Various renewable and non-renewable resources.

UNIT-II

Boisphere – Energetics of the biosphere – Concepts of Ecology – Components of Ecosystems.

UNIT-III

Energy transactions in biosphere – photo synthesis and producers – Herbivones – Carnivones – decomposers – Energy transfers & food wells.

UNIT-IV

Dependence on abiotic systems – biogeochemical cycles. Elements of Environment – Interrelationships in environmental components.

UNIT-V

Concepts of pollution and affecting the natural balances in energy systems. Energy concepts for a sustainable world bio – systems.

REFERENCE BOOKS:

1. Renewable Energy, Environment and Development, Maheshwar Dayal, Konark Publishers Pvt. Ltd.,
2. Ecology and Environment, P.D. Sharma Rastogi Publications.
3. Energy for a sustainable world, J.Goldenberg, T.B. Johnson, Amulya K.Reddy & Robert Williams Willey Eastern Ltd.,
4. Concepts of Ecology, E.J.Kormondal , Prentice Hall India Ltd.,

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MECHANICAL ENGINEERING DEPARTMENT

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

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INSTRUMENTATION & METROLOGY LAB

Section A

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

Section B

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

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MECHANICAL ENGINEERING DEPARTMENT

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

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0	0	3	2

COMPUTER AIDED ENGINEERING LAB (CAE LAB)

I. Introduction to Analysis Software Package

II. Structural analysis: (Any Six exercises)

1. Analysis of a rectangular plate with a hole.
2. Analysis of a truss member under loading.
3. Analysis of a bracket plate with axial loading
4. Analysis of a bracket plate with eccentric loading
5. Static Analysis of Prismatic bar
6. Static Analysis of a Corner Bracket
7. Static Analysis of beam
8. Analysis of Thermally Loaded support Structure
9. Analysis of Hinged support member
10. Analysis of Tapered plate under transverse load

III. Thermal analysis:(Any two exercises)

1. Analysis of a square plate considering conduction.
2. Analysis of a square plate considering conduction and convection.
3. Analysis of a compound bodies considering conduction and convection.

IV. Computational Fluid Dynamics (Any four exercises)

1. Determine the flow of incompressible gas through an S-bend for laminar flow.
2. Determine the flow of incompressible gas through an S-bend for turbulent flow.
3. Determine that of incompressible water flowing over a cylinder.
4. Determine air flow over a simple geometry (aerofoil) in a wind tunnel (2-D).
5. Determine heat transfer from the heated fin within a rectangular enclose containing air.
6. Determine how to solve a natural convection problem (in an infinitely long concentric cylinders).
7. Determine liquid enters through two inlets with different temperatures (multiphase flow) and leaves one outlet.

Software can be used: ANSYS, ALG Nastran, Star-CCM+, Fluent, FIRE. CFX.

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Course Structure

DEPARTMENT OF MECHANICAL ENGINEERING

IV Year : II Semester

S.No		SUBJECT	L	T	P	CREDITS
1	THEORY	Production & Operations Management	3	1	0	3
2	THEORY	Power Plant Engineering	3	1	0	3
3	THEORY	E-I	3	1	0	3
4	THEORY	E-II	3	1	0	3
5		Comprehensive Viva -Voice	0	0	3	3
6		Project Part-B	0	0	15	10
		Total	12	4	18	25

Elective-I	Elective-II
Modern Manufacturing Methods	Tribology
Jet Propulsion and Rocket Engineering	Computational Fluid Dynamics
Mechanical vibrations	Energy Management

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MECHANICAL ENGINEERING DEPARTMENT

IV Year B.Tech.M.E. II Semester	**T**	**P**	**C**
	4	**0**	**4**

PRODUCTION & OPERATIONS MANAGEMENT

UNIT – I

Functions of production planning & control operations & productivity, productivity measurement, Design of goods.

Forecasting – Importance of forecasting – Types of forecasting,– Forecasting techniques – qualitative methods and quantitive methods – accuracy of forecasting methods.

UNIT – II

Strategies for aggregates planning, aggregate planning using O.R. Models, Chase planning, Expediting, controlling aspects.

Scheduling Policies – Techniques, flow shop and job shop Scheduling techniques.

UNIT – III

Inventory management – EPQ model with and without shortages, Inventory models with constraints. Optional replenishment system, Tin-Bin System – P–Systems and Q-Systems Policy.

UNIT – IV

MRP, –lot sizing techniques in MRP, introduction to ERP, Assembly line balancing.

UNIT – V

Lean Management, philosophy and creation of lean enterprise, JIT concepts-Kanban System-Elements of total quality management, Six Sigma Quality Control.

TEXT BOOKS :

1. Modern Production / Operations Management / Baffa & Rakesh Sarin.
2. Operation Management by B. Mahadevan/Pearson Edu.
3. Operation and O.M by Adam & Ebert- PHI Pub.,

REFERENCES :

1. Operations Management – S.N. Chary.
2. Inventory Control Theory and Practice / Martin K. Starr and David W. Miller.
3. Production Control A Quantitative Approach / John E. Biegel.
4. Production Control / Moore.
5. Operations Management / Joseph Monks.
6. Operation Management by Jay Heizar & Read new Pearson
7. Elements of Production Planning and Control / Samuel Eilon.

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MECHANICAL ENGINEERING DEPARTMENT

IV Year B.Tech.M.E. II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

POWER PLANT ENGINEERING

UNIT I

Introduction To The Sources Of Energy – Resources and Development of Power in India.
Layouts of Steam, Hydel, Diesel, MHD, Nuclear and Gas Turbine Power Plants - Combined Power Cycles - Comparison and Selection,
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 – Tariff - Related Exercises. Effluents from Power Plants and Impact on Environment – Pollutants and Pollution Standards – Methods of Pollution Control. Inspection And Safety Regulations.

UNIT II

Steam Power Plant : Modern High Pressure and Supercritical Boilers - Analysis of Power Plant Cycles - Modern Trends in Cycle Improvement - Waste Heat Recovery, Fluidized Bed Boilers., Fuel and Handling Equipments, Types of Coals, Coal Handling, Choice of Handling Equipment, Coal Storage, Ash Handling Systems.
Steam Power Plant : Combustion Process : Properties of Coal – Overfeed and Under Feed 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. Analysis of Pollution from Thermal Power Plants - Pollution Controls.CO_2 Recorders

UNIT III

Diesel Power Plant: Diesel Power Plant: Introduction – IC Engines, Types, Construction– Plant Layout with Auxiliaries – Fuel Storage
Gas Turbine Plant : Introduction – Classification - Construction – Layout With Auxiliaries – Principles of Working Closed and Open Cycle Gas Turbines. Advantages And Disadvantages Combined Cycle Power Plants.

UNIT IV

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 V

Power from Non-Conventional Sources: Utilization of Solar Collectors- Principle Of its Working, Wind Energy – Types of Turbines – HAWT & VAWT-Tidal Energy. MHD power Generation.

Nuclear Power Station: Nuclear Fuel – Nuclear Fission, Chain Reaction, 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.

Text Books:

1. Power plant Engineering, P.K. Nag, TMH, 3rd edition, 2013.
2. A course in power plant Engineering, Arora and S. Domkundwar.

Reference Books:

1. A Text Book of Power Plant Engineering , Rajput , Laxmi Publications, 4th edition, 2012.
2. Power plant Engineering, Ramalingam, Scietech Publishers
3. power plant engineering P.C. Sharma, S.K. Kataria Publications,2012.

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MECHANICAL ENGINEERING DEPARTMENT

IV Year B.Tech. M.E. –II Semester

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MODERN MANUFACTURING METHODS
(ELECTIVE –I)

UNIT I

Need for Modern Manufacturing Methods: Non-traditional machining methods and rapid prototyping methods - their relevance for precision and lean manufacturing.

Classification of non-traditional processes - their selection for processing of different materials and the range of applications.

Introduction to rapid prototyping - Classification of rapid prototyping methods - sterolithography, fused deposition methods - materials, principle of prototyping and various applications.

UNIT II

Ultrasonic machining – Elements of the process, mechanics of material removal, process parameters, applications and limitations.

Abrasive jet, Water jet and abrasive water jet machining: Basic mechanics of material removal, descriptive of equipment, process variables, applications and limitations.

UNIT III

Electro – Chemical Processes: Fundamentals of electro chemical machining, electrochemical grinding, metal removal rate in ECM, Tooling, process variables, applications, economic aspects of ECM.

Chemical Machining: Fundamentals of chemical machining- Principle of material removal- maskants – etchants- process variables, advantages and applications.

UNIT IV

Thermal Metal Removal Processes: Basic principle of spark erosion (EDM), Wire cut EDM, and Electric Discharge Grinding processes - Mechanics of machining, process parameters, selection of tool electrode and dielectric fluids, choice of parameters for improved surface finish and machining accuracy - Applications of different processes and their limitations.

Plasma Machining: Principle of material removal, description of process and equipment, process variables, scope of applications and the process limitations.

UNIT V

Electron Beam Machining: Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes - process mechanics, parameters, applications and limitations.

Laser Beam Machining: Process description, Mechanism of material removal, process parameters, capabilities and limitations, features of machining, applications and limitations.

Text Books:

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

2. Manufacturing processes for engineering materials by Serope Kalpakjian and Steven R Schmid, 5edn, Pearson Pub.

Reference Books:

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

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MECHANICAL ENGINEERING DEPARTMENT

IV Year B.Tech. M.E. II Semester	**L**	**T**	**P**	**C**
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JET PROPULSION AND ROCKET ENGINEERING
(ELECTIVE-I)

UNIT-I

Fundamentals of Gas Turbine theory-Thermo dynamic Cycles, open closed and semi-closed – parameters of performances –cycle modifications for improvement of performance.

Jet propulsion: Historical sketch-reaction principle –essential features of propulsion devices-Thermal Engines, Classification of –Energy flow thrust, Thrust power and propulsion efficiency-Need for Thermal Jet Engines and applications

UNIT-III

Turboprop and Turbojet-1: Thermo dynamic cycles, plant layout, essential components, principles of operation –performance evaluation

Turboprop and Turbojet-II: Thrust Augmentation and Thrust reversal-Contrasting with piston Engine Propeller plant.

UNIT-IV

Ramjet: Thermo dynamic Cycle, plant lay-out, essential components –principle of operation-performance evaluation –comparison among atmospheric thermal jet engines- serqujet and pulse jet, elementary treatment.

Rocket Engines: Need for, applicat**ions –**Basic principles of operation and parameter s of performance –classification ,solid and liquid propellant rocket engines ,advantages, domains of application –propellants –comparison of propulsion systems.

UNIT-V

Rocket Technology-I: Flight mechanics, Application Thrust profiles, Acceleration –staging of Rockets ,need for –Feed systems, injectors and expansion nozzles –Rocket heat transfer and ablative cooling.

Rocket Technology- II: Testing & instrumentation –Need for Cryogenics –Advanced propulsion Systems, elementary treatment of Electrical Nuclear and plasma Arc propulsion.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Rocket propulsion –Sutton
2. Gas Turbines /Cohen, Rogers & Sarvana Muttoo/Addision Wesley & Longman.

3. Gas Turbines-V.Ganesan /TMH.

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MECHANICAL ENGINEERING DEPARTMENT

IV Year B.Tech.M.E. II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

MECHANICAL VIBRATIONS
(Elective-I)

UNIT I

Introduction: Importance and scope ,definitions and terminology, simple harmonic motion, combination of simple harmonic motions, Fourier analysis.

Single Degree Freedom Systems: Un-damped free vibration: Classical method, Energy method, equivalent systems, torsional systems. Damped free vibration- Viscous damping, under damping, critical damping, over damping. Coulomb damping, equivalent damping coefficient. Simple problems.

UNIT II

Forced vibrations of Single Degree Freedom Systems : Steady state forced vibration, sources of excitation, impressed harmonic force, resonance impressed force due to unbalance, motion excitation, transmissibility and isolation, performance of different type of isolators, power absorbed by viscous damping, General theory of seismic instruments, accelerometer and vibrometer, methods of vibration control- excitation reduction at source, system modification.

UNIT III

Two Degree Freedom Systems: Formulation of Equation of motion, Natural frequencies and modes of vibration by classical method, coupled pendulum Beat Phenomena, forced vibration, dynamic vibration absorber.

UNIT IV

Multi Degree Freedom Systems: Lagrangion method for formulation of equation of motion Influence coefficient method, Lumped mass and distributed mass systems, Stodola method, Holzer's method, Matrix iteration method, orthogonality of mode shapes, model analysis of free and forced vibrations.

UNIT V

Vibration of Continuous Systems: Longitudinal vibration of bars, torsional vibrations of circular rods or shafts, lateral vibrations of beams and shafts.

Whirling of Shafts: Critical speed of shafts, Rayleigh's upper bound approximation, Dunkerley's lower bound approximation, critical speed of shafts with damping.

Text Books:

1. Elements of Vibrations Analysis L. Meirovich Tata McGraw Hill.
2. Vibration of Mechanical Systems ,C. Nataraj, Cenage Learning, 1st edition, 2012.

Reference Books:

1. Mechanical Vibrations, S. Graham Kelly, Tata McGraw Hill.

2. Vibration Theory and Applications, William Thomson, Pearson Education, New Delhi
3. Vibration problems in Engineering, Timeoshenko and Young, John Wiley and sons Publishers, Singapore.
4. Singrasu S. Rao, Mechanical Vibrations, Pearson Education, New Delhi.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::ANANTAPURAMU

MECHANICAL ENGINEERING DEPARTMENT

IV Year B.Tech.M.E. II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

TRIBOLOGY
(Elective-II)

UNIT I

SURFACES AND FRICTION: Topography of Engineering surfaces- Contact between surfaces - Sources of sliding Friction - Adhesion Ploughint- Energy dissipation mechanisms Friction Characteristics of metals - Friction of non metals. Friction of lamellar solids - friction of Ceramic materials and polymers - Rolling Friction - Source of Rolling Friction - Stick slip motion – Measurement of Friction.

UNIT II

WEAR: Types of wear - Simple theory of Sliding Wear Mechanism of sliding wear of metals – Abrasive wear - Materials for Adhesive and Abrasive wear situations - Corrosive wear - Surface Fatigue wear situations - Brittle Fracture wear - Wear of Ceramics and Polymers - Wear Measurements.

UNIT III

LUBRICANTS AND LUBRICATION TYPES: Types, properties, Requirements of Lubricants – Testing methods - Hydrodynamic Lubrication - Elasto hydrodynamic lubrication- Boundary Lubrication, Mist lubrication, Requirements of lubrication, Solid Lubrication, Hydrostatic Lubrication.

UNIT IV

FILM LUBRICATION THEORY: Fluid film in simple shear - Viscous flow between very close parallel plates - Shear stress variation Reynolds Equation for film Lubrication - High speed unloaded journal bearings - Loaded journal bearings - Reaction torque on the bearings - Virtual Co-efficient of friction - The Somerfield diagram.

UNIT V

SURFACE ENGINEERING AND MATERIALS FOR BEARINGS: Surface modifications - Transformation Hardening, surface fusion - Thermo chemical processes - Surface coatings - Plating and anodizing - Fusion Processes - Vapour Phase processes - Materials for rolling Element bearings - Materials for fluid film bearings - Materials for marginally lubricated and dry bearings.

Text Books:

1. *I.M. Hutchings, Tribology, " Friction and Wear of Engineering Material ", Edward Arnold, London, 1992.*

Reference Books:

1. T.A. Stolarski, " Tribology in Machine Design ", Industrial Press Inc., 1990.
2. Kenneth C Ludema, Friction, Wear, Lubrication: A textbook in Tribology, CRC Press,1996.
3. A.Cameron, " Basic Lubrication theory ", Longman, U.K.., 1981.
4. M.J.Neale (Editor), " Tribology Handbook ", Newnes. Butter worth, Heinemann, U.K., 1975.
5. B.C. Majumdar "Introduction to Tribology bearings", S. Chand

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::ANANTAPURAMU

MECHANICAL ENGINEERING DEPARTMENT

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

L	T	P	C
3	1	0	3

COMPUTATIONAL FLUID DYNAMICS
(ELECTIVE - II)

UNIT I

INTRODUCTION: Methods to solve a physical problem , numerical methods , brief comparison between FDM, FEM & FVM, applied numerical methods. Solution of a system of simultaneous linear algebraic equations, Iterative schemes of matrix inversion, direct methods for matrix inversion, direct methods for baned matrices. Finite difference applications in heat conduction and convention, heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer.

UNIT II

FINITE DIFFERENCES: Discretization, consistency, stability, and fundamentals of fluid flow modeling. Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

UNIT III

ERRORS AND STABILITY ANALYSIS: introduction, first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme. REVIEW OF EQUATIONS GOVERNING FLUID FLOW AND HEAT TRANSFER: Introduction, Conservation of mass Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier stokes equations.

UNIT IV

STEADY FLOW: Dimensions form of momentum and energy equations, navier stokes equation, and conservative body force fields, stream function, vorticity formulation, boundary, layer theory, buoyancy, driven convection and stability.

UNIT V

SIMPLE CFD TECHNIQUES: Viscous flows conservation form space marching, relovation techniques, viscous flows, conservation from space marching relovation techniques, artificial viscosity, the alternating direction implicit techniques, pressure correction technique, computer graphic techniques used in CFD. Quasi one dimensional flow through a nozzle, turbulence models, standard and high reynolds number models and their applications.

Text Books:

1. Computational Fluid Dynamics, J Chung (2010), 2nd edition, Cambridge University Press, India.
2. Computational Fluid Dynamics, John .D. Anderson (2010), 3rd edition, McGraw- Hill International Edition, India.

Reference Books:

1. Computational Fluid Dynamics for Engineers, Ronnie Anderson (2012), 2nd edition, Cambridge University Press, India.
2. Computational aerodynamics and fluid dynamics an introduction, Jean-Jacques Chattot (2010),3rd edition, Springer, Germany.
3. Essential computational fluid Dynamics – olegzikanov, wiley India.
4. Introduction to computational fluid dynamics – pradip, Niyogi S.K. Chakrabary, M.K. Laha – pearson.

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::ANANTAPURAMU

MECHANICAL ENGINEERING DEPARTMENT

IV Year B.Tech.M.E. II Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

ENERGY MANAGEMENT
(Elective – II)

UNIT - I

ENGINEERING ECONOMICS:

Managerial objectives - steps in planning- Capital budgeting- Classification of costs- Interest- Types- Nominal and effective interest rates Discrete and continuous compounding - discounting - Time value of money - Cash flow diagrams - Present worth factor, Capital recovery factor, Equal annual payments - Equivalence between cash flows.

UNIT - II

DEPRECIATION & COST ANALYSIS:

Aims-Physical depreciation-Functional depreciation- Methods of depreciation-Straight line method, Declining balance method, Sum of years digits method, Sinking fund method, Service output method- Capital recovery with return-Service life estimation- Morality curves. Break even analysis and break even chart- Minimum cost analysis- Benefit cost analysis- Life cycle cost analysis.

UNIT - III

PROJECT MANAGEMENT:

Methods of investment appraisal- Rate of return method, Payback period method, Net present value method (NPV)- Internal Rate of Return method(IRR)- Adoption of the methods in energy conservation campaign- Types of projects- Purpose of project management - Classification – Role and qualities of project manager - Types of budgets - Budget committee – budgeting.

ENERGY MANAGEMENT PROGRAMS:

Necessary steps of energy management programmer - Concepts of Energy management - General principles of energy management – Energy management in manufacturing and process industries- Qualities and functions of Energy manager - Language of Energy manager-Checklist for top management.

UNIT - IV

ENERGY AUDITING:

A definition- Objectives- Level of responsibility- Control of Energy- Uses of Energy checklists - Energy conservation- Energy index - Cost index - Pie charts-sankey diagrams Load profiles - Types of energy audits- Questionnaire - Energy audit of industries - General energy audit- Detailed energy audit - Energy saving potential.

UNIT - V

ENERGY POLICY, SUPPLY, TRADE& PRICES:

Energy resources in India – level of power generation – transmission & distribution of power. Indian energy policy,Energy trade & its economic impacts – domestic energy production – Energy transformation & distribution & energy self sufficiency. International & National crude oil prices – domestic fuel prices – natural gas, LPG, kerosene and firewood - pricing policy.

BOOKS:

1. Albert Thumann, Handbook of Energy Audits, The Fairmont Press Inc., Atlanta gergia, 1979.
2. Murphy W.R and Mckay G, Energy Management, Butterworths, London, 1982.
3. Albert Thumann, Plant Engineer and Management guide to Energy Conservation, Van Nost and Reinhold Co., Newyork.
4. Energy Audits, E.E.O.-Book-lets, U.K. 1988.
5. Craig B.Smith, "Energy Management Principles", Pergamon Press.
6. The role of Energy Manager, E.E.O., U.K.
7. The Energy conservation Design Resource Hand Book-The Royal architectural Institute of Canada.
8. Energy Management Hand Book-Ed. By Wayne C. Turner, John Wiley and sons, 1982.