

**Curriculum and Syllabus  
For B.Tech (Mechanical Engineering) (R15UG)  
(V & VI Semesters)**



**Kandula Srinivasa Reddy Memorial College of Engineering  
(Autonomous)**

**KADAPA – 516 003 (A.P.)**

(Affiliated to AICTE, Accredited By NBA & NAAC, Affiliated JNTUA, Anantapur)  
(An ISO 14001 : 2004 Certified Institute)

**V semester**

S.No	Subject code	Subject	Subject Category	L	T	P	IM	EM	Credits
1.	1503501	Heat Transfer	PJ	3	1	0	30	70	3
2	1503502	Design of Machine Elements-I	PJ	3	1	0	30	70	3
3	1503503	Machine tools	PJ	3	1	0	30	70	3
4.	1503504	Dynamics of Machinery- I	PJ	3	1	0	30	70	3
5	1503505	Thermal Engineering II	PJ	3	1	0	30	70	3
6 Elective	1503506	Hydraulic Machinery	PJ	3	1	0	30	70	3
	1503507	Industrial Management							
	1503508	Entrepreneurship							
7	1503509	Thermal Engineering Lab	PJ	0	0	3	50	50	2
8	1524510	Advanced English Communication Skills Lab	HU	0	0	3	50	50	2
		<b>Total</b>		<b>18</b>	<b>06</b>	<b>06</b>	<b>280</b>	<b>520</b>	<b>22</b>

**VI semester**

S.No	Subject code	Subject	Subject Category	L	T	P	IM	EM	Credits
1.	1525601	Managerial Economics and Financial Analysis	HU	3	1	0	30	70	3
2	1503602	Design of Machine Elements-II	PJ	3	1	0	30	70	3
3.	1503603	Operations Research	PJ	3	1	0	30	70	3
4	1503604	Dynamics of Machinery-II	PJ	3	1	0	30	70	3
5	1503605	Refrigeration and Air-Conditioning	PJ	3	1	0	30	70	3
6 Elective II	1503606	Automobile Engineering	PJ	3	1	0	30	70	3
	1503607	IC Engines							
	1503608	Power plant Engineering							
7	1503609	Metrology & Machine Tools Lab	PJ	0	0	3	50	50	2
8	1503610	Heat Transfer and Dynamics Lab	PJ	0	0	3	50	50	2
		<b>Total</b>		<b>18</b>	<b>06</b>	<b>06</b>	<b>280</b>	<b>520</b>	<b>22</b>

**V Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(1503501) HEAT TRANSFER****COURSE OBJECTIVE:**

This course provides the knowledge to understand the various modes of heat transfer like conduction, convection and radiation and also heat exchangers, fins efficiency.

**UNIT I**

**Introduction:** Modes, mechanisms and laws of heat transfer – Relationship between thermodynamics and heat transfer.

**Conduction Heat transfer:** Fourier law of equation – General heat conduction equation in Cartesian, Cylindrical and spherical coordinates.

One Dimensional steady state heat conduction in Homogeneous slab, hollow cylinders and spheres – Overall heat transfer coefficient – electrical analogy –with variable thermal conductivity– Composite systems and Logarithmic mean area and geometrical mean area - Critical radius / thickness of insulation - with internal heat sources or heat generation.

**UNIT-II**

**One Dimensional Transient heat conduction:** Systems with negligible internal resistance - Significance of Biot and Fourier Numbers – Chart solution of transient conduction systems –semi – infinite body and problems.

**Heat transfer through extended surfaces (or) fins:**

Extended surface (fins) heat transfer – Long Fin, Fin with insulated tip and short fin with problems

**UNIT – III**

**Radiation heat transfer:** Introduction, physical mechanism, radiation properties, Concept of black body ,grey body - laws of black body radiation – irradiation - laws of Planck's, wien, kirchoff, Lambert and Stefan Bolt man law - concept of shape factor- Emissivity – Heat exchange between grey bodies – radiation shields – problems.

## UNIT –IV

**Convection heat transfer:** Introduction of convective heat transfer, Concepts of Continuity, Momentum and Energy equation – Classification of convection.

### Forced convection-

**External flows:** Concepts of hydrodynamic and thermal boundary layer and use of empirical correlation 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 correlations for convective heat transfer in Horizontal pipe flow, annular flow.

**Free Convection:** Development of Hydrodynamic and thermal boundary layer along a vertical plate – convective heat transfer on vertical plates and cylinders.

## UNIT – V

**Heat Exchangers:** Introduction, classification of heat exchangers – overall heat transfer coefficient and fouling factor, concepts of LMTD, Effectiveness and NTU method- problems.

**Boiling and Condensation:** Principles of Boiling-Pool boiling, Regimes and determination of heat transfer coefficient in nucleate boiling, Critical heat flux and film boiling. Condensation - film wise and drop wise condensation- Nusselt's theory of condensation on a vertical plate.

## TEXT BOOKS

1. Basics of Heat and Mass Transfer-D.S.Kumar, Katsons books
2. Holman.J.P, "Heat Transfer", Tata McGraw-Hill, 2008.
3. Fundamentals of Engg.Heat and Mass Transfer – R.C. Sachdeva, 3/E New age International,2009
4. Kothandaraman.C.P, Subramanyan.S, "Heat and Mass Transfer ", New age International, 7th edition, 2010

## REFERENCES

1. Ozisik.M.N, "Heat Transfer", McGraw-Hill Book Co., 2003.
2. Nag.P.K, "Heat Transfer", Tata McGraw-Hill, New Delhi, 2006.
3. Heat and Mass transfer, R.K. Rajput, S.Chand & Company Ltd.,

## DATA BOOK

1. Heat and Mass rransfer –Subramanyam and Domkondwar
2. Khurmi.R.S, "Steam Tables", S.Chand Publishers, 2012.

## V Sem

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(1503502) DESIGN OF MACHINE ELEMENTS – I****COURSE OBJECTIVE:**

1. To study the basic design principles and apply the principles to the design of various elements encountered in Mechanical machines and structures.
2. To determine the strength of the components.
3. To determine the failure conditions and apply them to real life Problems.
4. To design simple joints

**UNIT – I**

**INTRODUCTION:** General considerations of design, design process. Engineering Materials - properties

**STRESSES IN MACHINE MEMBERS:** Simple stresses – Combined stresses –Torsional and bending Stresses – impact stresses – stress -strain relation-Principal stresses.

**UNIT – II**

**THEORIES OF FAILURE** – Factor of safety – Design for strength and rigidity. Concept of stiffness in tension, bending, torsion and Combined cases

**STRENGTH OF MACHINE ELEMENTS:** Stress concentration –notch sensitivity –Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength –Gerber curve-Goodman’s line – Soderberg’s line.

**UNIT – III**

**WELDED JOINTS:** Introduction-types of welded joints- strength of transverse fillet and parallel fillet welded joints-Axially loaded unsymmetrical welded joints- Eccentrically loaded welded joints.

**BOLTED JOINTS** – Forms of Screw threads, Stresses in Screw fasteners, Design of bolts with pre-stresses – Design of joints under eccentric loading

**UNIT – IV**

**SHAFTS:** Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – Shaft sizes – BIS code.

**UNIT – V**

**COTTER JOINTS:** Design of Cotter joints: spigot and socket, sleeve and cotter- Knuckle joints.

**KEYS AND COUPLINGS:** Design of Rigid couplings: Muff, Split muff and Flange couplings- Bushed pin type flexible coupling.

**Text Books:**

1. Design of Machine Elements, V.B. Bhandari , TMH Publishers, New Delhi, 2nd edition, 2013
2. Machine Design, R.S. Kurmi and J.K. Gupta , S.Chand Publishers, New Delhi
3. Machine Design, R.K.Jain, Khanna Publishers, New Delhi.

**Reference Books:**

1. Machine Design, Pandya and Shah, Charotar Publishers, Anand, 17th edition, 20
2. Mechanical Engineering Design, JosephE.Shigely, TMH Publishers, New Delhi, 9th edition, 2011
3. Design of Machine Elements, M.F.Spotts, PHI Publishers, New Delhi.
4. Machine Design, R.L. Norton, Tata McGraw Hill Publishers, 2nd edition, 2002
5. Design Data Books by KBalaveera Reddy andMahadevan.K

**NOTE:** Design data books are permitted in the examinations.

## V SEM

L	T	P	C
3	1	0	3

**(1503503) MACHINE TOOLS****COURSE OBJECTIVE:**

1. To familiarize the working of Lathe machines
2. To study the working principle of Shaper, Planer and Slotting machines
3. To study the working principle and different operations performed on Drilling machines and to know the working principle of Boring machines
4. To study the working principle of Milling machines and to get knowledge on the division of the given work piece periphery into number of equal parts.
5. To study the working principle of different types of grinding machines, broaching machines and to give brief idea on lapping and honing processes.

**UNIT – I**

Basic elements of machining – Orthogonal, Oblique Cutting, Classification of cutting tools. Geometry of Single point cutting tool and Angles, Types of Chips, Chip Breakers. Cutting Tool materials, Tool failures.

**ENGINE LATHE:** Principle of working, Specification of Lathe, Types of Lathes, Operations performed, Workholding devices, Machining Parameters – Cutting Speed, Feed, Depth of Cut and Machining time, Taper turning methods, Thread cutting, Introduction to Capstan & Turret Lathes.

**UNIT – II**

**Shaper**– Working principle, Specifications, Classification, Principle parts of a Shaper, Machining time Calculations.

**Planer** - Working principle, Specifications, Classification, Principle parts of a Planer

**Slotter** - Working principle, Specifications, Classification, Principle parts of a Slotter

**UNIT – III**

**DRILLING MACHINES:** - Specifications, Operations performed, tool holding devices, Twist drill, types of drilling machines – Sensitive drilling machine, Upright drilling machine, radial drilling machine, Gang drilling machine, Multiple Spindle drilling machine.

**BORING MACHINES: Types** – Horizontal Boring machine, Jig Boring machine.

**UNIT – IV**

**Milling machine** – Principles of working – specifications – classifications of milling machines – Principle features of horizontal, vertical and universal milling machines – machining operations, – Up milling and Down milling - Working mechanism of Universal Dividing head, methods of indexing – Direct, Plain, Compound, Differential and Angular.

**UNIT – V**

**GRINDING MACHINES:** Classification of grinding machines – Cylindrical and Surface grinding machines – Tool and Cutter Grinders. Grinding wheel – Specification, Selection of grinding wheel, Wheel truing and Wheel dressing.

**BROACHING :** Types of broaching machines – Horizontal, Vertical, Continuous broaching machines, Elements of broach, broaching operations. Introduction to Lapping and Honing.

**TEXT BOOKS :**

1. Production Technology, R.K. Jain and S.C. Gupta.
2. Workshop Technology – Vol II, B.S. Raghuvanshi.
3. Workshop Technology – Vol II, Hazra Choudhary

**REFERENCES :**

1. Machine Tools, C.Elanhezian and M. Vijayan, Anuradha Agencies Publishers.
2. Manufacturing Technology, Kalpakzian, Pearson
3. Production Technology, H.M.T. (Hindustan Machine Tools).
4. Introduction to Manufacturing Technology, Date, Jaico Publ. House



## V Sem

L	T	P	C
3	1	0	3

**(1503504) DYNAMICS OF MACHINERY -I****COURSE OBJECTIVE:**

- To study types of gear trains
- To study Types of transmission units like belt, rope, chain etc...
- To study brakes and dynamometers
- To study concept of turning moment diagrams, flywheels and punching press
- To study about of Governors

**UNIT – I**

**GEAR TRAINS:** Introduction –Types of gears – Simple, compound, reverted and Epicyclic gear trains-sun and planet system. 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 – II**

**BELT, ROPE AND CHAIN DRIVES** : Introduction, Belt and rope drives, selection of belt drive- types of belt drives, materials used for belts and ropes, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains- length, angular speed ratio, classification of chains.

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

**UNIT-III**

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

**UNIT IV**

**TURNING MOMENT DIAGRAM AND FLY WHEELS:** Turning moment diagrams for steam engine, I.C. Engine and multi cylinder engine. Crank effort - coefficient of Fluctuation of energy, coefficient of Fluctuation of speed – Fly wheels and their design.

**UNIT V**

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

**TEXT BOOKS :**

1. Theory of Machines, S.S Ratan, MGH
2. Theory of machines, Khurmi, S.Chand.

**REFERENCES :**

1. Mechanism and Machine Theory, JS Rao and RV Dukkanpati, New Age Publ.
2. Dynamics of Machinery, Ballaney, Dhanpat Rai
3. Theory of Machines, R.K.Bansal, J.S.Brar, Lakshmi Publications
4. Theory of Machines, Jagadish Lal & J.M.Shah, Metropolitan

## V Sem

L	T	P	C
3	1	0	3

## (1503505) THERMAL ENGINEERING – II

**COURSE OBJECTIVE:**

- To study vapor power cycles with reheat and regeneration
- To study the working of Steam Generators and performance predictions
- To study the performance of steam nozzles
- Familiarize with various types of condensers
- To study various types of steam Turbines and performance predictions

**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 – Boiler horse power, equivalent evaporation, efficiency and heat balance – **Draught:** classification – Height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced 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. Super saturated flow, its effects, degree of super saturation and degree of under cooling - Wilson line –Shock at the exit.

**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. -Velocity compounding and pressure compounding, Combined velocity diagram for a velocity compounded impulse turbine. Governing of 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. Governing of reaction turbine

**UNIT V**

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

**TEXT BOOKS:**

1. Thermal Engineering- Mahesh.M.Rathore, TMH
2. Basic and Applied Thermodynamics, P.K. Nag, TMH

**REFERENCES:**

1. Thermodynamics and Heat Engines, R.Yadav, Central Book Depot
2. Thermal Engineering, R.K. Rajput, 7/e, Lakshmi Publications, 2009
3. Thermal Engineering-M.L.Mathur & Mehta, Jain bros.

**V Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(1503506) HYDRAULIC MACHINERY****(ELECTIVE-I)****Course Objective:**

The aim of this course is to make the students familiar with the different components of a hydroelectric power plant and understand the basic concepts of power production using energy of water along with estimation of potential of power generation. And also to make the students to study the working of hydraulic machines, their features of design and working proportions.

**UNIT I**

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

**UNIT II**

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

**UNIT III**

**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.

**UNIT IV**

**PERFORMANCE OF HYDRAULIC TURBINES:** Geometric similarity - unit quantities – performance under specific conditions – specific speed - characteristic curves - Governing of turbines - Selection of type of turbine – model testing of turbines – cavitation - surge tank - water hammer.

**UNIT V**

**PUMPS-Centrifugal pumps:** Classification, working, work done – manometric head – losses and efficiencies specific speed – pumps in series and parallel - performance – characteristic curves, NPSH. Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

**Text Books:**

1. Hydraulics, fluid mechanics and hydraulic machinery by Modi and Seth, Standard Publishers, 19<sup>th</sup> Edition, 2013.
2. Fluid Mechanics and Hydraulic Machines by R.K Rajput. 5<sup>th</sup> Edition, 2013.

**Reference Books:**

1. Fluid Mechanics and Hydraulic Machinery by R.K. Bansal, Laxmi Publications (P) Ltd. 9<sup>th</sup> Edition, 2012.
  2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International. 1<sup>st</sup> Edition,
  3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.
- Jagdish Lal, Hydraulic Machines, Metropolitan Book Company Pvt. Ltd.

## V Sem

L	T	P	C
3	1	0	3

**(1503507) INDUSTRIAL MANAGEMENT****(ELECTIVE-I)****COURSE OBJECTIVE:**

To provide the basic features of Industrial Engineering like work study, material handling, production planning and control, project management, quality management etc. In this subject students learn about the principles, functions and various concepts of industrial engineering and management. After completion of this course the students will learn about

1. Plant location problems, various types of plant layout and material handling equipment
2. The techniques and procedures of work study techniques like method study and work measurement
3. Project management concepts like PERT and CPM and crashing of simple networks
4. Inspection and SQC techniques, control charts for variables and attributes

**UNIT I:-**

**Plant location:** definition, factors affecting the plant location, various analytical methods for selection of plant location; **Plant Layout:** definition, objectives, types of production, types of plant layout; **Material Handling:** Definition, principles, various material handling equipments.

**UNIT II:-**

**Work study:** Definition, basic steps in work study, objectives and advantages; **Method study:** definition, steps involved, process chart symbols, various types of charts and diagrams; principles of motion economy, micro-motion study.

**UNIT III:-**

**Work measurement:** Definition, time study procedure, equipment, methods of performance rating, types of allowances, standard time calculation; **Work Sampling:** steps involved, standard time calculations, advantages and limitations, applications.

**UNIT IV:-**

**PERT & CPM:** Introduction, Terms used in PERT and CPM, probabilistic model: various types of activity time estimation, programme evaluation review techniques, critical path, probability of completing the project, deterministic model: critical path method, critical path and float calculations, crashing of simple of networks.

**UNIT V:-**

**Inspection and Quality Control** - types of inspections, inspection & quality control; Statistical Quality Control: variables and attributes, assignable and chance causes, control charts for variables: X-bar and R charts; control charts for attributes: p charts and c charts.

**TEXT BOOKS:**

1. Analysis and control of production systems and operations and production management, Rajagopal Kurnool, CBS publishers
2. Production and Operations Management, Panneer Selvam, PHI, 2004.
3. Industrial Engineering and Management, O.P. Khanna, Dhanpat Rai.

**REFERENCES:**

1. Motion and Time Studies, Ralph M Barnes, John Wiley and Sons, 2004.
2. Reliability Engineering & Quality Engineering, Dr.C. Nadhamuni Reddy and Dr. K. Vijaya Kumar Reddy, Galgotia Publ. Pvt..Ltd.
3. PERT/CPM, L.S. Srinath, East-West Press, 2000

**V Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(1503508) ENTREPRENEURSHIP****(ELECTIVE-I)****COURSE OBJECTIVE:**

In this Subject we will study the entrepreneur role, characteristics, opportunities and importance of woman to become an entrepreneur. It also gives the clear view of how a venture needs to be established with the available resources. Financing & managing the capital & venture expansion strategies, Global aspects of the Entrepreneurship. It also gives the information on location of plants & various public issues, material handling & production management

**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

**UNIT II :**

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

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.

Global aspects of Entrepreneurship



**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

**TEXT BOOKS:**

1. Entrepreneurship, Robert Hisrich, & Michael Peters, 5/e TMH.
2. Entrepreneurship, Dollinger, Pearson, 4/e, 2004.

**REFERENCES:**

1. Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, 2004.
2. Harvard Business Review on Entrepreneurship. HBR Paper Back, 1999.
3. Entrepreneurial Management, Robert J. Calvin, TMH, 2004.
4. The Entrepreneurial Connection, Gurmeet Naroola, TMH, 2001.
5. Indian Economy, Dutt & Sundaram S. Chand, 2005.
6. Essential of Entrepreneurship and small business management, Thomas W. Zimmerer & Norman M. Scarborough, 4/e PHI, 2005.
7. Industrial Relations & Labour Laws, Srivastava, Vikas, 2005.
8. Industrial Law, ND Kapoor, Sultan Chand & Sons, 2005

**V Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**(1503509) THERMAL ENGINEERING LAB**

1. Valve / Port Timing Diagrams of an I.C. Engines cut models.
2. Optimal cooling water flow rate for an I.C. Engine.
3. Performance Test on 2-Stroke Petrol engine
4. V T D of R.N. engine cut model.
5. Retardation test.
6. Heat Balance of an I.C. Engine.
7. Air/Fuel Ratio and Volumetric Efficiency of an I.C. Engines.
8. Performance Test on 7 H.P. Kirlosker engine
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.
12. Heat balance test on 10 H.P Kirlosker Engine.

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

**V Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**(1524510) ADVANCED ENGLISH COMMUNICATION SKILLS LAB****1. Introduction**

The Advanced English Language Skills Lab introduced at the 3<sup>rd</sup> year B.Tech level is considered essential for the student for focusing on his/her career. At this stage it is imperative for the student to start preparing for the ever growing competition in the job market. In this scenario, in order to be on par with the best, he/she needs to improve his/her Communication and soft skills

This course focuses on the practical aspects of English incorporating all the four (LRSW) skills relevant to the requirements of the prospective employers in view of globalization. The proposed course will enable the students to perform the following:

- Intensive reading to improve comprehension and communication
- Attentive listening for better understanding
- Write project/research/technical reports
- Write Resume' to attract attention
- Discuss ideas / opinions for better solutions
- Face interviews confidently
- Gather information, organize ideas, and present them effectively before an audience
- To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required ability to face computer-based competitive exams such GRE, TOEFL,CAT, GMAT etc.

**2. Objectives:**

Keeping in mind the previous exposure of the student to English, this lab focuses on improving the student's proficiency in English at all levels. The lab intends to train students to use language effectively, to participate in group discussions, to help them face interviews, and sharpen public speaking skills and enhance the confidence of the student by exposing him/her to various situations and contexts which he/she would face in his/her career

**3 Syllabus**

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

**Reading Comprehension** -- Reading for facts, guessing meanings from context, speed reading, scanning, skimming for building vocabulary(synonyms and antonyms, one word substitutes, prefixes and suffixes, idioms and phrases.)

**Listening Comprehension**-- Listening for understanding, so as to respond relevantly and appropriately to people of different backgrounds and dialects in various personal and professional situations.

**Technical Report Writing**—Types of formats and styles, subject matter, organization, clarity, coherence and style, data-collection, tools, analysis

**Resume' Writing**—Structure, format and style, planning, defining the career objective, projecting one's strengths, and skills, creative self marketing, cover letter

**Group Discussion**-- Communicating views and opinions, discussing, intervening. providing solutions on any given topic across a cross-section of individuals,(keeping an eye on modulation of voice, clarity, body language, relevance, fluency and coherence) in personal and professional lives.

**Interview Skills**—Concept and process, pre-interview planning, mannerisms, body language, organizing, answering strategies, interview through tele and video-conferencing

**Technical Presentations (Oral)**— Collection of data, planning, preparation, type, style and format ,use of props, attracting audience, voice modulation, clarity, body language, asking queries.

#### **4. 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 P.A System, a TV, A digital stereo-audio and video system, 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: Walden and K-van solutions.**

**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. **Speaking about Science, A Manual for Creating Clear Presentations by Scott Morgan and Barrett Whitener, Cambridge University press, 2006**
3. **Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron's/DELTA/Cambridge University Press.**
4. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008
5. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.

6. **The ACE of Soft Skills** by Gopal Ramesh and Mahadevan Ramesh, Pearson Education, 2010
7. **Cambridge English for Job-Hunting** by Colm Downes, Cambridge University Press, 2008
8. **Resume's and Interviews** by M.Ashraf Rizvi, Tata Mc Graw-Hill, 2008
9. **From Campus To Corporate** by KK Ramachandran and KK Karthick, Macmillan Publishers India Ltd, 2010
10. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
11. **Managing Soft Skills** by K R Lakshminarayan and T.Muruguvel, Sci-Tech Publications, 2010
12. **Business Communication** by John X Wang, CRC Press, Special Indian Edition,2008

The following activities have been suggested to conduct them in language lab and communication lab so as to cover the syllabus of 5<sup>th</sup> semester and 6<sup>th</sup> semester.

#### **English Multimedia Lab [EM LAB]**

1. Listening skills – listening to a passage/text and answering the questions.
2. Reading comprehension- reading the text/passage and testing the comprehending abilities.
3. GD – listening to/ watching a sample GD
4. Interview skills – listening to mock interview/sample interview
5. Technical report writing - Presenting or presentation      Instructions for preparation of Reports
6. Pictionary learning vocabulary by describing an object
7. Cover Letter Resume/ C.V Preparation
8. Revision

#### **Interactive Communication Skills Lab [ICS LAB]**

1. Ice – breaking Activity
2. Role- Play
3. Seminar
4. Mock GD
5. Story – Telling
6. Mock Interview

**VI Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(1525601) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS****(Common to CE, ME & ECE)****OBJECTIVES:**

- To equip the budding engineering student with an understanding of concepts and tools of economic analysis.
- Provide knowledge of managerial economics through differential economics concepts, accounting concepts are necessary to analyze and solve complex problems relating financial related matters in bog industries.
- An understanding of professional and ethical responsibility and ability to communicate effectively.
- The broad education necessary to understand the impact of engineering solutions in a global and societal context.
- Recognition of the need for, and an ability to engage in life-long learning and to meet contemporary issues.

**UNIT – I: INTRODUCTION TO MANAGERIAL ECONOMICS**

Definition, nature and scope of Managerial Economics – relation with other disciplines. Demand analysis – Determinants, Law of Demand and its exceptions – Elasticity of Demand – Types and Measurement of Elasticity of Demand – Methods of Demand Forecasting.

**UNIT – II: THEORY OF PRODUCTION AND COST ANALYSIS**

**Production Functions:** Law of variable proportion, Isoquants and Isocost, least cost combination of inputs, Returns to Scale and Cobb- Douglas production function. Internal and external economies of scale.

**Cost Analysis:** Cost concepts – Break-Even Analysis (BEA) – Break Even Point – significance and limitations of BEA.

**UNIT – III: INTRODUCTION TO MARKETS AND PRICING**

**Markets structures:** Perfect and Imperfect competition – Features of Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly. Price- Output determination under perfect competition, monopoly and monopolistic competition – Price rigidity in Oligopoly.

Methods of pricing – cost plus pricing, marginal cost pricing, skimming pricing, penetration pricing, differential pricing and administrative pricing.

#### **UNIT – IV: BUSINESS ORGANIZATIONS AND CAPITAL BUDGETING**

**Business Organizations:** Types of business organizations- Sole Proprietorship, Partnership, Joint Stock Company, Public Ltd and Private Ltd companies, Public Private Partnership (PPP).

**Capital Budgeting:** Types of capital, methods and sources of raising Capital. Capital Budgeting Techniques: Payback Period Method, Accounting Rate of return (ARR) and Net Present Value Method (NPV) (simple problems).

#### **UNIT – V: FINANCIAL ACCOUNTING AND ANALYSIS**

Double Entry Book keeping, Journal, Ledger, Trail Balance – Final Accounts (Preparation of Trading Account, Profit and Loss Account and Balance Sheet without adjustments). Analysis and interpretation of financial statements through ratios (Liquidity, Profitability and Activity Ratios) (Simple problems).

#### **TEXT BOOKS:**

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.
2. Prasad and K.V.Rao: Financial Accounting, Jaibharth Publishers, Vijayawada.

#### **REFERENCES:**

1. P.L Mehtha: Managerial Economics, Sulthan Chand publishers
2. K K Dewett - Managerial Economics, S. Chand Publishers
3. S.P Jain & K.L Narang: Financial Accounting, Kalyani publishers.
4. M.Sugunatha Reddy: Managerial Economics and Financial Analysis, Research India Publication, New Delhi, 2013.

#### **COURSE OUTCOMES:**

- Expected to achieve the overall course objective to understand and enhancing the knowledge regarding managerial concepts and obtaining optimal solutions. And to get an idea of analysis of firm's financial position with the techniques of financial analysis and ratio analysis.

**VI Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**(1503602) DESIGN OF MACHINE ELEMENTS– II****COURSE OBJECTIVES:**

To study the design of various mechanical transmission systems  
 To study the design of different types of engine parts  
 To study the design of different types of transmission parts  
 To study the design of gears  
 To study the design of springs

**UNIT – I**

**MECHANICAL SPRINGS:** Introduction-classification-design of helical compression Springs-fatigue loading –Coaxial springs- Natural frequency of helical springs-Energy storage capacity-Fatigue loading- Leaf springs.

**UNIT – II**

**BEARINGS:** Introduction-Types of Journal bearings – Lubrication – Bearing Modulus–bearing materials – Sliding contact bearing design.

**UNIT –III**

**ROLLING CONTACT BEARINGS:** Introduction -Ball and roller bearings – Static and dynamic loading of ball &roller bearings, bearing life –Failure of bearings.

**UNIT – IV**

**SPUR & HELICAL GEARS:** Introduction to gears-Nomenclature of Spur and helical gears-force analysis- law of gearing-Design analysis of spur gears –Lewis equation-Estimation of centre distance, module and face width, Check for dynamic and wear load considerations.  
 Design analysis of helical gears –Lewis equation-Estimation of centre distance, module and face width, Check for dynamic and wear load considerations.

**UNIT – V**

**ENGINE PARTS:** Introduction to IC Engines parts -Forces acting on piston –design of piston, cylinder and cylinder liners,  
 Connecting rod: Thrust in connecting rod – stress due to whipping action on Connecting rod ends.

**TEXT BOOK:**

1. Machine Design , V.B.Bhandari, TMH



2. Machine Design, R.S. Khurmi & J.S.Gupta, S.Chand Publ.

**REFERENCES:**

1. Mech. Engg. Design, JE Shingley
2. Design of Machine Elements-II, T. Krishna Rao, I.K. International
- 3 Machine Design, Pandya and Shah, Charotar Publishers, Anand, 17th edition, 20
4. Mechanical Engineering Design, JosephE.Shigely, TMH Publishers, New Delhi, 9th edition, 2011
5. Design Data Books by KBalaveera Reddy andMahadevan.K

**NOTE:** Design data books are permitted in the examination hall.

**VI Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(1503603) OPERATIONS RESEARCH****COURSE OBJECTIVES:**

1. To enlighten the students with the various optimization techniques to understand and apply in industrial operations
2. To understand the concepts of linear programming techniques
3. To obtain knowledge in inventory control and queuing theory
4. To learn simulation techniques
5. To understand various sequencing models and application of this models in process planning
6. To understand various replacement models in order to make optimum replacement decisions

**UNIT – I**

Introduction to operations Research: Development, Definition, Types of models, Operation Research models and Applications

ALLOCATION: Linear programming problem formulation, Graphical solution, Simplex method, Big-M method and Duality

**UNIT – II**

TRANSPORTATION PROBLEM: Formulation, Optimal solution, unbalanced transportation problem, Degeneracy.

Assignment problem: Formulation, Difference between assignment and Transportation models, To represent assignment model as transportation model (or) L.P.P. Optimal solution and applications of Assignment Problem.

**UNIT – III**

REPLACEMENT: Introduction, Replacement of items that deteriorate with time when money value is not considered and considered, Replacement of items that fail completely and Group replacement.

SEQUENCING: Introduction, Flow Shop sequencing, n jobs through two machines, n jobs through three machines, n jobs through m machines, Two jobs through m machines, Traveling Salesman problem

**UNIT IV**

WAITING LINES: Single Channel: Poisson arrivals, Exponential Service times with finite queue length and non finite queue length models

Multichannel: Poisson arrivals, Exponential service times with finite queue length and non finite queue length models.

**UNIT – V****INVENTORY:**

Introduction, Single item deterministic models, Purchase inventory models with one price break and multiple price breaks

Stochastic models: Demand may be discrete variable or continuous variable, Instantaneous production, Instantaneous demand and continuous demand and no setup cost.

**SIMULATION:** Definition, Types of simulation models, Phases of simulation, Applications of simulation, Inventory and Queuing problems, Advantages and disadvantages and Simulation Languages

**TEXT BOOKS:**

1. Operations Research, K.Rajagopal, PHI.
2. Introduction to Operations Research, Taha, PHI

**REFERENCES:**

1. Operations Research: Methods & Problems, Maurice Saseini, Arhur Yaspan & Lawrence Friedman
2. Operations Research, R.Panneerselvam, PHI Publ.
3. Operations Research, J.K. Sharma
4. Operations Research, Wayne L. Winston, Thomson Brooks, Cole

## VI Sem

L	T	P	C
3	1	0	3

**(1503604) DYNAMICS OF MACHINERY –II****COURSE OBJECTIVES:**

1. To understand the principles gyroscopic couple.
2. To learn various methods of balancing of rotating masses.
3. To know the various forces acting in reciprocating engine mechanism.
4. To under the difficulties in complete balancing of reciprocating parts.
5. To understand different types of vibrations and to know different methods of finding natural frequency for different mechanical components.

**UNIT-I**

**Precession:** Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships.

**UNIT – II**

**Balancing of Rotating Masses:** Balancing of rotating masses - single and multiple – single and different planes.

**Inertia Force Analysis of Reciprocating Engines:** Analytical method for velocity and acceleration of the piston, connecting rod, force analysis of reciprocating mechanism without considering the connecting rod weight, equivalent dynamical system, correction couple

**UNIT –III**

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

**UNIT – IV**

**Vibrations:** Free Vibration of mass attached to vertical spring – oscillation of pendulums, centers of oscillation and suspension. Transverse loads, vibrations of beams with concentrated and distributed loads. Dunkerly’s method, Rayleigh’s method, whirling of shafts-critical speeds.

**UNIT V**

**Torsional Vibrations:** Torsional vibrations- two and three rotor systems, equivalent systems.

**Damped Vibrations:** Free damped and forced damped vibrations- Vibration Isolation & Transmissibility.

**TEXT BOOKS :**

1. Theory of Machines, S.S Ratan, MGH
2. Theory of machines, Khurmi, S.Chand.

**REFERENCES :**

1. Mechanism and Machine Theory, JS Rao and RV Dukkipati, New Age Publ.
2. Dynamics of Machinery, Ballaney, Dhanpat Rai
3. Theory of Machines, Thomas Bevan, CBS Publishers
4. Theory of Machines, Jagadish Lal & J.M.Shah, Metropolitan.

## VI Sem

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**(1503605) REFRIGERATION AND AIR CONDITIONING****COURSE OBJECTIVES:**

On completion of this course, the students are expected to gain knowledge about refrigeration and air conditioning system, analysis and design calculations.

1. Understand vapour compression and vapour absorption system Operation.
2. Analyze the refrigeration cycles and methods for improving Performance.
3. Familiarize the components of refrigeration systems.
4. Know the application of refrigeration and air conditioning systems.
5. Able to know about human comfort and effective temperature.

**UNIT – I**

**Introduction to Refrigeration:** Necessity and applications – Unit of refrigeration and C.O.P. – Different refrigeration methods - Air Refrigeration: Ideal and Actual cycles, Open and Dense air systems – problems – Fundamentals of Refrigeration needs of Air craft.

**UNIT – II**

**Vapour compression refrigeration** – 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.

**Vapour Absorption Refrigeration System** – description and working of NH<sub>3</sub> – water system and Li Br –water (Two shell & Four shell) System -Calculation of max COP.

Principle of operation of three Fluid absorption systems.

**UNIT III**

**Steam Jet Refrigeration System:** Simple treatment of steam Jet Refrigeration System-Principle and operation of Thermo-electric refrigerator and Vortex tube, testing, charging and maintenance of refrigeration and air conditioning.

**Refrigerants** – Desirable properties – classification of refrigerants used –Nomenclature-secondary refrigerants- lubricants – Ozone Depletion – Global Warming new refrigerants.

**UNIT –IV**

**Introduction to Air Conditioning:** Psychrometric Properties & Processes- problems on psychrometric processes. – Need for Ventilation, Consideration of Infiltrated air – Heat Load concepts: Simple treatment on RSHF, GSHF, and ERSHF.

**UNIT V**

Requirements of human comfort and concept of Effective Temperature- Comfort chart–Comfort Air Conditioning- Summer, Winter & year round air conditioning-Split air conditioning – window air conditioning (Elementary treatment for Summer, Winter and Year Round Air-Conditioning).

**TEXT BOOKS:**

1. A Course in Refrigeration and Air conditioning, SC Arora & Domkundwar, Dhanpat Rai publications
2. Refrigeration and Air Conditioning, Manohar Prasad, 2/e, New Age.
3. Principles of Refrigeration, Dossat, 4/e, Pearson Edu.

**REFERENCES:**

1. Refrigeration and Air Conditioning, CP Arora, 3/e, TMH, 2008
2. Basic Refrigeration and Air-Conditioning – Ananthanarayanan, TMH Refrigeration and Air Conditioning, 3/e, TMH, 2010
3. Refrigeration and Air Conditioning, R.K.Rajput, S.K.KATARIA&SONS
4. Refrigeration and Air Conditioning, R.S khurmi and J K Gupta, S.Chand publications

**Tables/Codes:** Refrigeration & Psychrometric charts by Dr.S.S.Banwit & Dr. S.C. Laroia, Birla publications

## VI Sem

L	T	P	C
3	1	0	3

**(1503606) AUTOMOBILE ENGINEERING****(ELECTIVE –II)****COURSE OBJECTIVES:**

- 1. The anatomy of the automobile in general.**
- 2. The Location and importance of each part.**
- 3. The functioning of the engine and its accessories, gear box, clutch, brakes, steering, axles and wheels.**
- 4. Suspension, frame, springs, and other connections**
- 5. Emission, ignition, controls, electrical systems and ventilation**

**UNIT – I**

**Introduction:** Components of a four wheeler automobile – chassis and body – power unit – power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction, turbo charging and super charging – oil filters, oil pumps – crank case ventilation.

**UNIT – II**

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

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

**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.

**UNIT – III**

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

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

**Braking System:** Mechanical brake system, Hydraulic brake system, Pneumatic and vacuum brake systems.



**Unit – IV**

**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 temperature indicator.

**UNIT – V**

**Transmission System:** Clutches- Principle- 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.

**Steering System:** Steering geometry – camber, castor, king pin rake, combined angle toe-in, center point steering, steering gears – types, steering linkages.

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

Introduction to Power Steering.

**TEXT BOOKS:**

1. Automotive Mechanics –Vol.1&Vol.2, Kirpal Singh.
2. Automobile Engineering, William Crouse
3. Alternate Fuels, Thipse, Jaico Publ. House

**REFERENCE BOOKS:**

1. Automobile Engineering, R.K.Rajput, Lakshmi Publ.
2. Automobile Engineering, K.K. Ramalingam, scitech Publ.
3. Automotive Engines, Newton, Steeds & Garret.

**VI Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**(1503607) INTERNAL COMBUSTION ENGINES****(ELECTIVE –II)****COURSE OBJECTIVES:**

On completion of this course, the students are expected to understand the fundamental principle, operation, performance of IC Engines, auxiliary systems, combustion of SI & CI engines, various fuels used and engine emissions.

1. Acquire the knowledge of engine components and fuel air cycles.
2. Understand the working of engine auxiliary systems.
3. Understand the combustion aspects of SI Engines
4. Understand the combustion aspects of CI Engines.
5. Know the various alternate fuels, engine emissions, measuring and control techniques

**UNIT I - COMPONENTS OF IC ENGINES AND PERFORMANCE**

Classification of Internal combustion Engine, Function and operation of Two stroke and Four stroke engines, Comparison of SI and CI and two stroke and four stroke engines, Effects of supercharging and supercharging Types - centrifugal, roots, vane, Types of scavenging process, Design and Performance data, Efficiency, Specific fuel consumption, IMEP determination - Simple calculations -Performance characteristics, Heat balance calculations, Fuel air cycles and their significance, Comparison of air-standard and fuel air cycles.

**UNIT II - ENGINE AUXILIARY SYSTEMS**

Desirable air- fuel ratios for starting, warm up, acceleration, idling and normal operation, Necessity of Carburetors and their function and types, Function and classification of injection systems, Injection pump, governor and nozzle types, Description of construction and function of Electronic injection system and MPFI systems, Energy requirement of ignition system, need, Types - Battery and Magneto ignition types, Ignition timing and engine parameters, Engine oil properties, lubrication system types - mist, wet sump and dry sump lubrication systems, Types of cooling systems - Direct and Indirect - Coolant and antifreeze solutions.

**UNIT III - COMBUSTION IN SI ENGINES**

Homogeneous and heterogeneous mixture, Combustion in spark ignition engines, Stages of combustion in spark ignition engines, Flame front propagation, Factors influencing flame speed, Rate of pressure rise, Phenomenon of knock in SI engines, Effect of engine variables on knock, Combustion chambers for SI engines - Smooth engine operation, High power output and thermal efficiency, Stratified charge engine.

**UNIT IV - COMBUSTION IN CI ENGINES**

Combustion in CI engine, Stages of combustion in CI engines, Factors affecting the delay period - compression ratio, engine speed, output, atomization and duration of injection, quality of fuel, intake temperature, intake pressure, Phenomenon of knock in CI engines, Comparison of knock in SI and CI engines, Air motion - Swirl - Squish.

**UNIT V - ALTERNATE FUELS AND EMISSION**

Alternate Fuels -Alcohol, Methanol, Ethanol, Gaseous fuel - Hydrogen, CNG, LPG, Biodiesel - production, advantages & disadvantages. Air pollution due to IC engines, Hydrocarbon emission and their reasons, Formation of oxides of nitrogen, CO, Particulates, aldehydes, sulphur, lead and phosphorus emissions, catalytic converter, exhaust gas recirculation, Flame ionization detector, NDIR, smoke types - measuring device. Emission standards

**TEXT BOOKS**

1. Ganesan.V, "Internal Combustion Engines", Tata McGraw-Hill, New Delhi,2009.
2. Ramalingam.K.K, "Internal Combustion Engines- Theory and practice",SciTech publications India Pvt. Ltd., Chennai, 2010.

**REFERENCES**

1. Thipse.S.S, "Internal Combustion Engines", Jaico Publication House., 2010.
2. Thipse.S.S, "Alternate Fuels", Jaico Publication House., 2010.
3. Mathur.M.L and Sharma.R.P, "A course in Internal Combustion Engines", Dhanpat Rai & Sons, New Delhi, 2010.
4. Heywood.J.B, "Internal Combustion Engine Fundamentals", McGraw Hill International, New York, 2008.
5. Domkundwar.V.M, "A course in Internal Combustion Engines", Dhanpat Rai & Sons, 2010.

**VI Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(1503608) POWER PLANT ENGINEERING  
(ELECTIVE - II)**

**COURSE OBJECTIVES:**

This course serves as an introduction to fossil-fuel plants for both steam generation and electricity production and electricity production using I.C engine power plants, gas turbine power plants, hydroelectric power plants, nuclear power plants and power from non-conventional sources. Following an overview of an entire plant and an introduction to combustion processes, each subsystem of a fossil-fuel plant will be considered. The subsystems include fuel preparation and handling, boiler types and the fundamentals of steam generation, water systems (condensate-feed water, makeup, cooling, and waste). Consideration will be given to environmental aspects of steam and power generation as well as operations, maintenance, and controls issues.

Objectives that students will meet at the end of the course:

1. list the sub systems of a plant, indicating the function of each subsystem
2. Sketch typical subsystems of a power plant (example: sketch the coal and ash handling system)
3. Perform basic analyses associated with each subsystem
4. Sketch the flow of water-steam, fuel, and air through a plant
5. Select the type of plant appropriate for a given application

**UNIT – I**

Introduction to the Sources of Energy – Resources and Development of Power in India

STEAM POWER PLANT: Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems, cooling towers and condensers.

**UNIT – II**

INTERNAL COMBUSTION ENGINE PLANT: DIESEL POWER PLANT: Introduction –IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging.

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

**UNIT – III**

HYDRO ELECTRIC POWER PLANT: Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pondage –classification of dams and spill ways.

HYDRO PROJECTS AND PLANT: Classification – Typical layouts – plant auxiliaries –plant operation pumped storage plants.

NUCLEAR POWER STATION: Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation.

TYPES OF REACTORS: Pressurized water reactor, boiling water reactor, sodium graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

#### **UNIT IV**

POWER FROM NON-CONVENTIONAL SOURCES: Utilization of Solar- Collectors-Principle of Working, Wind Energy – types – HAWT, VAWT -Tidal Energy. DIRECT ENERGY CONVERSION: Solar energy, Fuel cells, MHD generation.

#### **UNIT – V**

POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, and load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution contro

#### **TEXT BOOK:**

1. Power Plant Engineering, P.K.Nag, 2/e, TMH.
2. Power Plant Engineering, P.C.Sharma , S.K.Kataria Publ
3. A Course in Power Plant Engineering, Arora and S. Domkundwar

.

#### **REFERENCES :**

1. Power plant Engineering, Ramalingam, Scietech Publ.
2. A Text Book of Power Plant Engineering , Rajput. R.K., 4/e, Laxmi Publ,2007.
3. Power Plant Engineering, C. Elanchezian and others, I.K. International, 2010.

**VI Sem**

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<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**(1503609) METROLOGY AND MACHINE TOOLS LAB****Minimum number of five experiments from each section****Section A:**

1. Measurement of lengths, heights, diameters by vernier calipers, micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear teeth, vernier calipers and checking the chordal addendum and chordal height of spur gear.
4. 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.

**Section B:**

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 Job on Cylindrical Surface Grinding
8. Job on Grinding of Tool angles.

**VI Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**(1503610) HEAT TRANSFER AND DYNAMICS LAB****Section A: HEAT TRANSFER STREAM**

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. Heat transfer coefficient in forced convection.
7. Heat transfer coefficient in natural convection
8. Experiment on Parallel and counter flow heat exchanger.
9. Experiment on Stefan Boltzman Apparatus.
10. Study on Vapor compression Refrigeration system
11. Study on Air condition unit

**Section B: DYNAMICS STREAM**

1. Experiment on vibration Lab unit.
2. Experiment on gyroscopic unit.
3. Experiment on Balancing unit.
4. Experiment on whirling shaft Apparatus
5. Experiment on Cam Apparatus
6. Experiment on Governor Apparatus

- NOTE:** 1. Choose any six experiments from Heat Transfer stream and any four from Dynamics stream
2. Heat Transfer data books are permitted in the examinations.