SEMESTER VI

CODE	COURSE OF STUDY	L	T	P	C
ME302	Thermal Engineering-II	3	1	0	4
ME304	Design of Mechanical Drives	3	0	0	3
ME306	Computer Aided Design and Drafting	3	0	0	3
ME308	Refrigeration and Air Conditioning	3	0	0	3
	Elective – I	3	0	0	3

Practical

CODE	COURSE OF STUDY	L	T	P	C
ME310	Computer Aided Design and Drafting Practice	0	0	3	2
ME312	Thermal Engineering Lab	0	0	3	2
	Total	**15**	**1**	**6**	**20**

LIST OF ELECTIVES

SEMESTER VI

Elective – I

CODE	COURSE OF STUDY	L	T	P	C
ME352	Finite Element Methods	3	0	0	3
ME354	Advanced I.C. Engines	3	0	0	3
ME356	IT Applications in Manufacturing	3	0	0	3
ME358	Advances in Heat and Mass Transfer	3	0	0	3

SEMESTER VI

ME302 Thermal Engineering-II

UNIT-I

Steam generators: Classifcation – modern high pressure generators Accessories :Feed water Pump, feed water heaters / economiser, air-preheaters, Superheaters, separators, Separator drums, scale cleaners, soot blowers –Method of firing – Fluidized bed boilers.

UNIT-II

Steam nozzles – flow through nozzles – nozzle efficiency – Effect of super heating – supersaturated (or) metastable expansion of steam in a nozzle – steam turbines – classification – velocity diagrams – Compounding impulse turbine – Reaction turbine - Blade profiles of impulse and reaction turbines – Calculation of blade height, width – leakage prevention.

UNIT-III

Air handling system: forced draught fans, primary and secondary air system for solid fuels – flue gas path; method of producing draught: natural, induced draughts – induced draught fans – flue gas treatment for pollution: cyclone separator, electro-static precipitator – chimney – calculation of chimney height - Bottom ash handling system. Fuel handling system: solid fuels – pulverized fuels, liquid and gaseous fuels – supply system.

UNIT-IV

Gas turbine plant cycle – classification – simple cycle – regenerative cycle – reheat cycle – regenerative – reheat cycle – inter-cooling. Steam and gas turbine Power plants – cycle analysis. Nuclear fuels – Coolants – moderators – radiation shield – Nuclear reactor: different types – Nuclear Power Plant Layout – Waste disposal.

UNIT-V

Fluctuating loads – terms and definitions, load curves, effect of variable load, methods to meet variable load – peak load plants: demand, requirements and load analysis. Power plant economics: Estimation of cost of electrical energy, selection of type of generation and

equipment, economic analysis of performance and operating characteristics, methods of tariff for electrical energy.

Text Books:

1. Culp Jr., A.W., Principles of Energy Conversion, McGraw-Hill, 1985.
2. Arora, S.C. and Domkundwar, S., A Course in Power Plant Engineering, Dhanpat Rai & Sons, 2001.

Reference Books:

1. El Wakil, M.M., Power Plant Technology, Tata McGraw-Hill, 1985.
2. Nag. P.K., Power Plant Engineering, 2nd ed., Tata McGraw-Hill, 2002.

ME304 Design of Mechanical Drives

UNIT-I

Introduction to transmission elements - Positive and friction based drives.

UNIT-II

Importance of friction based drives - Design of flat and V-belts - Design of rope and chain drives.

UNIT-III

Design of spur and helical gears based on contact and beam strength.

UNIT-IV

Design of bevel and worm gears.

UNIT-V

Design of multi-speed gearbox - Preparation of ray diagram and kinematic arrangement diagram for multi-speed gearbox.

Text Books:

1. Sundararajamoorthy, T.V. and Shanmugam, N., Machine Design, Anuradha Agencies, 2003.

2. PSG Design Data Book, PSG Book Depot, 2010.

3. Bhandari V, "Design of Machine Elements", 3rd Edition, Tata McGraw-Hill Book Co, 2010.

4. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett "Mechanical Engineering Design", 8th Edition, Tata McGraw-Hill, 2008.

5. Prabhu. T.J., "Design of Transmission Elements", Mani Offset, Chennai, 2000.

Reference Books:

1. Shigley, J.E., Mechanical Engineering Design, 5th ed., McGraw-Hill, 1989.

2. Sundararajamoorthy T. V, Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2003.

3. Gitin Maitra, L. Prasad "Hand book of Mechanical Design", 2nd Edition, Tata McGraw-Hill, 2001.

4. C.S.Sharma, Kamlesh Purohit, "Design of Machine Elements", Prentice Hall of India, Pvt. Ltd.,2003.

5. Bernard Hamrock, Steven Schmid, Bo Jacobson, "Fundamentals of Machine Elements", 2nd Edition, Tata McGraw-Hill Book Co., 2006.

6. Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine Design", 4th Edition, Wiley,2005

7. Alfred Hall, Halowenko, A and Laughlin, H., "Machine Design", Tata McGraw-Hill Book Co.(Schaum's Outline), 2010

8. Orthwein W, "Machine Component Design", Jaico Publishing Co, 2003.

9. Ansel Ugural, "Mechanical Design – An Integral Approach", 1st Edition, Tata McGraw-Hill Book Co, 2003.

10. Merhyle F. Spotts, Terry E. Shoup and Lee E. Hornberger, "Design of Machine Elements" 8th Edition, Printice Hall, 2003.

11. U.C.Jindal : Machine Design, "Design of Transmission System", Dorling Kindersley, 2010

ME306 Computer Aided Design and Drafting

UNIT-I

CAD hardware - Product cycle - CAD tools, CAD systems; system evaluation, CAD specific I/O devices.CAD software - Graphic standards .

UNIT-II

Modes of graphics operation, Software Modules.

UNIT-III

Geometric modeling – Types and mathematical representation and manipulation of curves and surfaces.

UNIT-IV

Solid modeling- fundamentals, feature based modeling manipulations of solid models.

UNIT-V

Transformation of Geometric models and visual realism - Animation.

Text Books:

1.Zeid, I., CAD/CAM Theory and Practice, Tata McGraw-Hill, 2008.

2. Chris Mcmahon and Jimmie Browne - CAD/CAM – Principle Practice and Manufacturing

Management, 2nd Edition, Addision Wesley England, 2000.

3. Sadhu Singh - Computer Aided Design and Manufacturing, II Edition, Khanna Publishers, New Delhi, 2008.

Reference Books:

1. Rogers, D.E and Adams, J.A., Mathematical Elements for Computer Graphics, 2nd ed., McGraw-Hill, 1990.

2. P.Radhakrishnan et al - CAD/CAM/CIM, New Age International P Ltd., New Delhi, 2006.

3. M.P.Groover and E.W.Zimmers - CAD/CAM; Computer Aided Design and Manufacturing, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2006.

4. Ibrahim Zeid - CAD/CAM Theory and Practice, Tata McGraw Hill Publishing Co. Ltd., NewDelhi, 2005

ME308 Refrigeration and Air Conditioning

UNIT-I

Introduction about Refrigeration – Definitions of various terms. Methods of refrigeration. Air refrigeration system. Bell – Coleman cycle. Introduction about Air craft Air-Conditioning.

UNIT-II

Analysis of Vapour compression cycle, Modifications to basic cycle.Multi pressuresystems. Multi-evaporator system and Cascade systems. Properties of refrigerants.Selectionof refrigerants.

UNIT-III

Discussion of components of V.C system, Servicing.Vacuumizing and charging of refrigerant. Introduction to cryogenics.

UNIT-IV

Psychrometry – Definitions for properties. Introduction to cooling load calculations. Comfort conditions. Effective temperature concept.

UNIT- V

Air-conditioning systems – discussion about the central plant with direct evaporator and chiller applications, Ice plant, refrigerators. Food preservation, IQF technique and freeze drying etc. Cold storage and thermal insulation.

Text Books:

1. Manohar Prasad, Refrigeration and Air Conditioning, New Age International, 2004.
2. Dossat R.D., Principle of Refrigeration, 4th ed., Prentice-Hall, 1997.
3. Arora, C.P., Refrigeration and Air Conditioning, 2nd ed., Tata McGraw-Hill, 2000.

Reference Books:

1**.** Roy J. Dossat, "Principles of Refrigeration", 4th edition, Pearson Education Asia, 2009.

2. Stoecker, W.F. and Jones J. W., "Refrigeration and Air Conditioning", McGraw Hill, New Delhi, 1986.

3. ASHRAE Hand book, Fundamentals, 2010

4. Jones W.P., "Air conditioning engineering", 5th edition, Elsevier Butterworth-Heinemann, 2001

ME310 Computer Aided Design and Drafting Practice

Using Auto CAD Script file, draw the orthographic views for the given simple 3D blocks Preparation of Drawings for Parts and Assembly of the following by using AutoCAD.

Components drawing with dimensioning

    1) Joints : Riveted Joints - Butt & Lap joints, Knuckle joint,

    2) Couplings : flexible type flange coupling, Universal coupling.

    3) Bearing : Pedestal bearing.

    4) Screw jack

    5) Connecting rod

    6) Tail stock

Text Books:

    1. N.D. Bhatt - Machine Drawing, Charotar Publishing House.

    2. K.R. Gopalakrishnan - Machine Drawing, Subshas Publications, XII edition, 1988.

    3. R.B.Gupta - Machine Drawing, SatyaPrakasham, 1988

Reference Books:

    1. Sidheswar - Machine Drawiing, Tata McGraw Hill edition, 1998

    2. Auto CAD user Manual

ME312 Thermal Engineering Lab

Any ten experiments:

1. Study and performance tests on refrigeration.

2. Study and performance tests on air conditioning test rig.

3. Determination of Thermal Resistance and Conductivity of a Composite wall

4. Heat Transfer from Cylindrical Surface by Natural Convection

5. Heat Transfer from Cylindrical Surface by Forced Convection

6. Heat Transfer from Pin Fin by Forced Convection

7. Performance of Parallel Flow/Counter Flow Heat Exchanger

8. Determination of Kinematic Viscosity using Redwood viscometer

9. Determination of Flash and Fire Points using Cleaveland Apparatus.

10. Determination of Calorific value of Solid Fuel using Bomb Calorimeter

11. Determination of Calorific value of Gaseous Fuel using Junker's Gas Calorimeter

12. Performance test on Reciprocating Air Compressor

13. Performance test on Centrifugal Air Blower

14. Study on the composition of Exhaust gas of an IC engine using Orsat Apparatus under various loads.

15. Study and performance testing of IC engines & Emission measurements.

SEMESTER-VI

Elective-I

ME352 Finite Element Method

UNIT-I

Introduction - Illustration using spring systems and simple problems - Weighted residual methods Galerkin's method - Variational approach - Rayleigh-Ritz method.

UNIT-II

One-dimensional finite element analysis; bar element, beam element, frame element – Heat transfer problems.

UNIT-III

Two-dimensional finite element analysis; types of elements, shape functions, natural coordinate systems.

UNIT-IV

Applications to structural mechanics - Numerical integration - Solution of finite element equations.

UNIT-V

Fluid flow problems - Dynamic problems.

Text Books:

1.Seshu, P., Textbook of Finite Element Analysis, Prentice-Hall, India, 2003.

2. Frank L.Stasa,Applied Finite Element Analysis for Engineers, CBS International, Edition, 1985.

3. J.N.Reddy, An Introduction to Finite Element Method, McGraw Hill International Edition, 1993.

Reference Books:

1.Segerlind, L.J., Applied Finite Element Analysis, John Wiley, 1987.

2. S.S.Rao, Finite Element Method in Engineering, Pergamon Press, 1989.

3. Cook Robert Devis et al, Concepts and Application of finite Element Analysis, Wiley John & Sons, 1999.

4. G.Buchaman, Schaum's Outline of finite Element Analysis, McGraw Hill,

ME354 Advanced IC Engines

UNIT-I

Engine design parameters, properties of working fluids.

UNIT-II

Analysis of engine cycles, fuel intake systems.

UNIT-III

Combustion in SI and CI engines.

UNIT-IV

Pollutant formation and control in IC engines.

UNIT-V

Engine performance and modeling.

Text Books:

1. Heywood, J.B., Internal Combustion Engine Fundamentals, McGraw-Hill, 1988.

2. Taylor, C.P., The Internal Combustion Engines in Theory and Practice, Vol. II, MIT

3. Ramalingam. K.K., "Internal Combustion Engine Fundamentals", Scitech Publications, 2002.

4. Ganesan, "Internal Combustion Engines", II Edition, TMH, 2002.

Reference Books:

1. Ganesan, V., Internal Combustion Engines, 2nd ed., Tata McGraw-Hill, 2003.

2. Mathur. R.B. and R.P. Sharma, "Internal Combustion Engines", Dhanpat Rai & Sons2007.

3. Duffy Smith, "Auto Fuel Systems", The Good Heart Willcox Company, Inc., 1987.

4. Eric Chowenitz, "Automobile Electronics", SAE Publications, 1995

ME356 IT Applications in Manufacturing

UNIT – I

Introduction to IT – Definition of IT – Application of IT in day to day design and manufacturing, Data base – Classification.

UNIT – II

Introduction to transaction processing – basics of a network – LAN, WAN, MAN – network topology – connecting devices – concepts of client – server computing.

UNIT – III

Multimedia – details on hardware, Software and its application, introduction to Internet-Internet Service providers – naming and addressing – Email and browsing - Intranet and extranet: introduction and applications.

UNIT – IV

Application of IT in – supply chain management, Inventory, Manufacturing resource Planning, Decision Support system and logistics.

UNIT – V

Enterprise Computing, Introduction to ERP, Activities under ERP, Benefits of ERP.

Text Books :

1. S.Jaiswal, Information Technology – Today, Galgotia Publications, 2000.

Reference Books

1. Dennis P.Curtin et al., Information Technology – The breaking wave, Tata McGraw Hill, 2001.

ME358 Advances in Heat and Mass Transfer

UNIT-I

Factors affecting thermal conductivity of solids, liquids & gases. General three dimensional heat conduction equation in Cartesian, cylindrical & spherical coordinates. Initial condition and various boundary conditions. Heat sources systems, Critical thickness of insulation. Different types of fins & their analysis. Two dimensional steady state conduction. Transient heat conduction.

UNIT-II

Free & forced convection, Similarity & simulation of convection heat transfer, Boundary layer theory, Turbulent flow heat transfer. Analogy between momentum & heat transfer. Heat transfer with liquid metals. Recent developments in the theory of turbulent heat transfer. Natural convection under different situations. Empirical relations in convection heat transfer.

UNIT-III

Boiling- Introduction to boiling heat transfer, regimes of boiling heat transfer, pool boiling, flow boiling. Condensation- Heat transfer in condensation, Drop wise & film wise condensation. Empirical equations. Laws of thermal radiation. Shape factors. Radiation heat transfer between black, diffuse & gray surface.

UNIT-IV

LMTD Methods, importance of fouling factor, Overall heat transfer co-efficient, NTU effectiveness method, Analysis of compact heat exchanger—plate-fin heat exchangers, regenerative type heat exchanger. Optimization & simulation of heat exchangers. Basic aspects of heat transfer in porous media.

UNIT-V

Modes of mass transfer, comparison between heat & mass transfer, Frick's law of diffusion, general mass diffusion equation, diffusion through stagnant gas, convective mass transfer, dimensionless parameters & dimensional analysis of convective mass transfer, Evaporation of water in air.

Text Books:

1.J.P. Holman, "Heat Transfer", McGraw Hill Book Co. 9th edition, 2008.

2.Incropera & Hewitt, "Fundamentals of Heat & Mass Transfer", John Willey, 2005.

3.Collier, J.B. and Thome, J.R., Convective boiling and condensation, Oxford Science Publications, 1994.

Reference Books:

1.L S Tong and Y S Tang. Boiling Heat Transfer and Two-Phase Flow. Taylor and Francis,1997.

2.P.BWhalley. Boiling, Condensation and Gas-Liquid Flow. Oxford University Press, 1987.

3.Louis C Burmeister, Convective Heat Transfer, John Wiley and Sons, 1993.

4.AdrianBejan, Convective Heat Transfer, John Wiley and Sons, 1995.

5. R.C. Sachdeva, Fundamentals of Heat and Mass Transfer, New Age International Ltd., 2000.

6. Eckert and Drag, Analysis of Heat and Mass Transfer, McGraw Hill, New York, 1975.