LAKIREDDY BALIREDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

(Approved by AICTE, Accredited by NBA, Affiliated to JNTUK, Kakinada and ISO 9001: 2008 Certified)

ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

2010 - 2011

M.TECH – THERMAL ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

L.B.Reddy Nagar, MYLAVARAM – 521 230 Krishna District, Andhra Pradesh State
# M.TECH(ME – THERMAL ENGINEERING) - COURSE STRUCTURE

(Applicable for the batches admitted from 2010-11)

## I-SEMESTER

<table>
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<td>Thermal And Nuclear Power Plants</td>
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### III SEMESTER

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### IV SEMESTER

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**TOTAL CREDITS : 88**

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I SEMESTER
MME101: ADVANCED MATHEMATICS

Lecture : 4 Periods/week
Credits : 4

Internal Marks : 40
External Marks : 60
External Examination : 3 Hrs

UNIT - I


UNIT - II

Solution of Matrix Eigen value Problem: Introduction, Engineering Applications, Conversion of General Eigen value Problem to Standard Form, Methods of Solving Eigen value Problems, Solution of the Characteristic Polynomial Equations,


UNIT - III


UNIT - IV


UNIT - V


REFERENCES


Numerical Analysis - Francis Scheid 2nd ed., Schaum’s Series.

UNIT - I

**Basic Concepts:** Thermodynamics - Temperature and Zeroth law of thermodynamics - first law of thermodynamics - limitations of first law - concept of internal energy - second law of thermodynamics - concept of entropy - Third law of Thermodynamics.

**Thermodynamic Relations:** Introduction – Reciprocity and cyclic relations – The Maxwell’s relations – The Gibbs and Helmholtz relations - The Clapeyron Equation – General relations for $du$, $dh$, $ds$ - co-efficient of volumetric expansion - isothermal compressibility.

UNIT - II

**Exergy:** Introduction - availability of heat - availability of a closed system - availability function of the closed system - availability of steady flow system - availability function of open system.

**Irreversibility:** Introduction - irreversibility for closed and open system - steady flow process - effectiveness

UNIT - III

**Non Reactive Gas Mixtures:** Introduction - basic definitions for gas mixtures - PVT relationship for mixtures of ideal gases - properties of mixtures of ideal gases - entropy change due to mixing - mixtures of perfect gases at different initial pressure and temperatures.

**Reactive Gas Mixtures:** Introduction- fuels and combustion, theoretical and actual combustion processes, enthalpy of formation and enthalpy of reaction, first and second law analysis of reacting systems.

UNIT - IV

**Thermodynamics of Compressible Flow:** Introduction- stagnation properties, speed of sound and mach number, 1 – D isentropic flow and property relations for isentropic flow for perfect gases.

**Kinetic Theory of an Ideal Gas:** Introduction- equation of state of an ideal gas, collision frequency and mean free path, velocity and speed distribution function.

UNIT - V

**Thermodynamic cycles:** Vapor power cycles:- second law analysis of vapor power cycles, cogeneration, binary vapor cycles, combined gas vapor power cycles.

**Gas power cycles:** Ideal jet propulsion cycles- second law analysis of gas power cycles.
REFERENCES

1. Fundamentals of Thermodynamics: Sonntag, Borgnakke, Van Wyllan, TMH
2. Thermodynamics (An Engineering Approach): Yunus Cengel & Boles, TMH
4. Engineering Thermodynamics: P.K. Nag, TMH
5. Thermodynamics: Holman, TMH
UNIT - I

Introduction: Brief Introduction to different Modes of heat transfer- Conduction- General heat conduction equation – Boundary conditions – Steady simplified heat transfer in Cartesian coordinates – Finned surfaces- 1-D Heat transfer with internal heat generation.

UNIT – II


UNIT – III

Forced Convection: Concept of boundary layer- Hydrodynamic and Thermal boundary layer concepts-Equations of Motion and Energy-Methods to determine heat transfer coefficient- Dimensional Analysis –Importance of Non – Dimensional numbers – Analogies between Heat and Momentum Transfer-External flows and integral methods for flow over a flat plate-Application of empirical relations to various geometrics.

Free convection: Dimensionless parameters of Free convection-An Approximate Analysis of Laminar Free Convection on a Vertical Plate-Free convection on a Horizontal Plate, Cylinder and Sphere- Combined free and forced convection.

UNIT – IV

Boiling and condensation: Boiling curve – Correlations – Nusselt’s theory of film condensation on a vertical plate – Assumptions & correlations of film condensation for different geometrics.

Radiation: Concept of View factor- Methods of Determining View factors-Radiant heat exchange in Grey, Non- Grey bodies with Transmitting, Reflecting and Absorbing media- Specular surface, gas radiation –Radiation from flames.

UNIT – V

REFERENCES

1. Heat Transfer – Necati Ozisik ,TMH
2. Heat Transfer a basic approach – Yunus Cengel (MH)
3. Heat Transfer – Holman ,TMH
5. Heat & Mass Transfer P. K Nag(TMH)
MME104: IC ENGINE COMBUSTION & POLLUTION

Lecture : 4 Periods/week  
Internal Marks : 40  
External Marks : 60

Credits : 4  
External Examination : 3 Hrs

UNIT - I

Engine Types and Their Operation:

UNIT - II

Combustion in Spark – Ignition Engines:

UNIT – III

Combustion in Compression – Ignition Engines:

UNIT – IV

Engine Performance and Testing:
Introduction - Parameters of performance – Engine performance characteristics – variables affecting performance characteristics - Pressure- Volume measurement and combustion Analysis- Performance test – heat balance test problems 

UNIT – V

Pollutant Formation and Control:
REFERENCES

MME1051: GAS DYNAMICS

Lecture : 4 Periods/week  Internal Marks : 40

Credits : 4  External Marks : 60

External Examination : 3 Hrs

UNIT - I


UNIT - II

Steady One-dimensional Flow: Introduction, Fundamental Equations, Discharge from a reservoir, Critical values, Stream tube area-velocity relation, Types of nozzles, Applications of nozzles, Area Mach number relation, Isentropic flow through nozzles, Diffusers, Dynamics head measurement in compressible flow, Compressibility correction to dynamics pressure, Pressure coefficient

UNIT - III

Normal Shock Waves: Introduction, Types of waves, Normal shock-equations of motion, The normal shock relations for perfect gas, Change of stagnation or total pressure across the shock, Hugoniot equation

UNIT – IV


UNIT - V

REFERENCES

MME1052: ENERGY CONSERVATION AND MANAGEMENT

Lecture : 4 Periods/week
Internal Marks : 40
External Marks : 60
Credits : 4
External Examination : 3 Hrs

UNIT - I

General energy problem, Energy uses patterns and scope of conversion.


Energy Auditing: Elements and concepts, Type of energy audits instruments used in energy auditing.

UNIT – II

Economic Analysis: Cash flows, Time value of money, Formulae relating present and future cash flows- single amount, uniform series.

Financial appraisal methods: Pay back periods, net present value, benefit cost ratio, internal rate of return and Life cycle cost / benefits.

UNIT – III

Thermodynamics of energy conservation: Energy conservation in Boilers and furnace, Energy conservation in stream and condensate system.

Cogeneration: Concepts, Type of cogeneration system, performance evaluation of a cogeneration system.

UNIT – V


UNIT – V


REFERENCES

3. Industrial Energy Conversation - D.A. Reay, Pergamon Press

HEAD
Dept. of Mechanical Engineering
LAKIREDDY BALI REDDY COLLEGE OF ENGG.
MYLAVARAM - 521 230, KRISHNA DT, A.P.
UNIT - I


UNIT – II

Introduction to Pollution: Green house effect, Ozone hole, Pollution of air, water, and soil; Effect of pollution on living systems, Minimum national standards.

Air Pollution: Sources and classification of pollutants, Effect of air pollution, Pollution from industries, Chemical reactions in a contaminated atmosphere, urban air pollution, Acid rain, Photo chemical smog, Meteorological aspects of air pollution.

UNIT - III


Air Pollution Control Methods and Equipment: Control methods, Source correction method, Cleaning of gaseous effluents, Particulate emission control, Control of specific gaseous pollutants SO2, NOx, Hydro carbons, CO.

UNIT - IV

Water Pollution and Control: Origin of waste water, Types of water pollutants and their effects, Water pollution laws and standards Waste water sampling and analysis , Treatment of waste water.

Solid Waste Management: Sources and classification, Public health aspects, methods of collection, Disposal methods, Potential methods of disposal.

UNIT - V


REFERENCES

4. "Energy Technology" S.Rao and B.B.Parulekar /Khanna publishers

HEAD
Dept. of Mechanical Engineering
LAKIREDDY BALI REDDY COLLEGE OF ENGG.
MYLAVARAM, 521330, KRISHNADT. A.P.
MME1061: SOLAR ENERGY

UNIT - I


UNIT - II


UNIT - III


UNIT - IV

Other solar Devices: stills, air heaters, dryers, solar ponds & solar Refrigeration.

UNIT - V


REFERENCES

3. Solar energy – Sukhatme, T M H
4. Solar energy – Grag, T M H
5. Solar energy – Magal, T M H
6. Power plant technology by El Wakil
MME1062: TURBO MACHINES

Lecture : 4 Periods/week  Internal Marks : 40
Credits : 4

External Marks : 60
External Examination : 3 Hrs

UNIT – I

Introduction: Types of Turbo machines, Applications of Turbo machines, Performance Characteristics, Methods of Analysis
Dimensional Analysis: Dimensions and Dimensional Homogeneity, Buckingham Pi Theorem, Other Non-dimensional Parameters for Turbo machines, Similarity Laws

UNIT-II


UNIT - III

Centrifugal Fans Blowers and Compressors: Classification Performance Parameters and Characteristics, Change of Performance, Polytropic Efficiency, Preliminary Design of Centrifugal Compressors


UNIT – IV


UNIT – V

REFERENCE BOOKS

   Longman Group Ltd
4. Mechanics and thermodynamics of Propulsion- Philip Hill and Carl Peterson, Prentice
   Hall
5. Fluid Mechanics, Thermodynamics of Turbo machinery, Dixon, Pergamon Press
MME1063: FINITE ELEMENT METHOD

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UNIT - I

Basic Concepts: Introduction to Finite Element Method - historical back ground-engineering applications of FEM- general description- basic element shapes-finite element modeling-numbering scheme-element connectivity-co ordinates-interpolation functions-properties-Pascal triangle-Pascal pyramid-material properties considered in FEM-types of analysis.

UNIT - II


UNIT - III

One Dimensional Heat Transfer in Thin Fins: Governing equation-boundary conditions-temperature distribution in thin fins-cylindrical pin fin.


UNIT – IV


UNIT – V

Numerical Integration: Gauss Quadrature formula-sampling points and weights- Gauss Quadrature for one dimension and two dimensions-sampling points for a 2X2, 3X3 and 2X3 Gauss Quadrature rule-problems.

Mesh Generation & FEM Software: Convergence requirements-mesh generation using tessellation method, Quadtree method and Octree method-Mesh refinement- h, p, hp and r refinements-band width-pre processor-processor-post processor-Use of software such as ANSYS, CASTEM, NASTRAN etc.
REFERENCES

MME151: THERMAL ENGINEERING – I LAB.

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(Any 8 Experiments)

1) Performance test and analysis of exhaust gases of an I.C Engine.


3) COP estimation of vapor compression refrigeration test.

4) Performance analysis of Air conditioning unit.

5) Performance analysis of heat pipe.

6) Two phase flow heat transfer

7) Solar Flat Plate Collector.

8) Combustion analysis of computer aided CI engine test rig.

9) Performance analysis of variable compression ratio CI engine.

10) Performance analysis of variable compression
II SEMESTER
MME201: INSTRUMENTATION, MEASUREMENTS & EXPERIMENTS IN FLUIDS

Lecture : 4 Periods/week
Internal Marks : 40
External Marks : 60
Credits : 4
External Examination : 3 Hrs

UNIT - I

Need and Objective of Experimental Study: Introduction, Measurement Systems, Performance Terms
Wind Tunnels: Introduction, Classification, Low-speed Wind Tunnels, Power Losses in Wind Tunnel, Instrumentation and Calibration of Wind Tunnels, Wind Tunnel Balance

UNIT - II

Flow Visualization: Introduction, Classification of Visualization Techniques, Interferometer, Schlieren and Shadowgraph

UNIT - III

Analog Methods: Introduction, Hale-Shaw Apparatus, Electrolytic Tank, Hydraulic Analogy, Hydraulic Jumps
Pressure Measurement Techniques: Introduction, Barometers, Manometers, Dial type pressure gauge, Pressure Transducers, Pitot, Static, and Pitot-Static Tube and Its characteristics, Flow direction measurement probes and Low Pressure Measurement Gauges

UNIT - IV


UNIT - V

Temperature measurement: Introduction, Types of thermometers, Thermocouples, RTD, Thermisters, Pyrometers, Temperature measurement in fluid flows

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LAKIREDDY BALI REDDY COLLEGE OF ENGG.
MYLAVARAM - 521 230, KRISHNA DT, A.P.
REFERENCES

MME202: NON-CONVENTIONAL SOURCES OF ENERGY

Lecture: 4 Periods/week
Internal Marks: 40
External Marks: 60
Credits: 4
External Examination: 3 Hrs

UNIT - I


UNIT - II


UNIT - III


UNIT - IV


UNIT - V

Direct Energy Conversion Systems:
REFERENCES

2. Biological Energy Resources - Malcolm Flesher & Chris Lawis

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Dept. of Mechanical Engineering
LAKIREDDY BALI REDDY COLLEGE OF ENGG.
MYLAVARAM - 521230, KRISHNAD, A.P.
MME203: REFRIGERATION AND AIR CONDITIONING

Lecture : 4 Periods/week
Internal Marks : 40
External Marks : 60

Credits : 5
External Examination : 3 Hrs

UNIT - I


UNIT - II

Vapour Compression Refrigeration: Performance of Vapour Compression System-Subcooling and Superheating-Actual VCR cycle


UNIT - III

Vapour Absorption Refrigeration System: Description and working of simple and actual Aqua-Ammonia system-Maximum COP-Li-Br Water system-Three fluid absorption system-Applications
Steam Jet Refrigeration System: Working and Analysis, Applications, merits and demerits

Non-Conventional Refrigeration Methods: Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube (iii) Pulse Tube (iv) Adiabatic demagnetization.

UNIT - IV


UNIT-V

Design of Air conditioning systems: All fresh air, Re-circulated air with and without bypass- factor -ADP, RSHF, GSHF & ESHF for different systems

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REFERENCES

MME204: DESIGN OF HEAT TRANSFER EQUIPMENT

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UNIT - I

Classification of Heat Exchangers: Introduction- Recuperation & Regeneration-Tubular heat exchangers-Double pipe, Shell and Tube heat exchangers, Plate heat exchanger Exchangers-Plate fin and Tubular fin heat exchangers


UNIT - II


UNIT - III

Design of Evaporators: Types of Evaporators-Heat transfer in Evaporators-Pool boiling – Heat transfer coefficient for Nucleate pool boiling-Flow or forced convection boiling-Forced convection boiling correlations-Horizontal Vs. Vertical tube-Effect of oil in refrigerant on heat transfer-Extended surface evaporators-Cooling and dehumidifying coils-Augmentation of boiling heat transfer-Pressure drop in evaporators

UNIT - IV


UNIT - V

Cooling of Electronic Equipment: Introduction-The chip carrier-Printed circuit boards-Cooling load of Electronic equipment

Conduction Cooling: Conduction in chip carriers-conduction in printed circuit boards-heat frames.

Air Cooling: Natural convection and radiation- Forced convection- Fan selection-cooling personal computers

HEAD
Dept. of Mechanical Engineering
LAKIREDDY BALI REDDY COLLEGE OF ENGG.
MYLAVARAM - 521 239, KRISHNADT, A.P.

M.TECH (THERMAL ENGINEERING)
REFERENCES

1. Heat Transfer – Necati Ozisik, TMG
2. Refrigeration & Air-Conditioning by C.P. Arora, TMH
3. Cooling Towers - J.D. Gurney, Maclaren (London)
5. Heat and mass transfer by Arora & Domkundwar, Dhanpat rai
6. Refrigeration & Air-Conditioning by Stoeker, MGH
7. Refrigeration & Air Conditioning by Dossat, Prentice Hall of India
UNIT - I

Introduction - Sources of Energy, Types of Power Plants, Direct Energy Conversion System, Recent developments in Power Generation, Combustion of Coal, Volumetric Analysis, Gravimetric Analysis, Flue Gas Analysis

Fuels and combustion: Coal, fuel oil, natural and petroleum gas, emulsion firing, coal – oil and coal – water mixtures, synthetic fuels, bio-mass, combustion reactions, heat of combustion and enthalpy of combustion, theoretical flame temperature, free energy of formation, equilibrium constant, effect of dissociation

UNIT - II


Steam Generators: Basic types of steam generators, Economisers, Superheaters, Reheaters, Steam generator control, air preheater, fluidized bed boilers, feed water treatment, deaeration, evaporation, internal treatment, boiler blow down, steam purity

UNIT - III

Gas Turbine Power Plant: Types-Working-Cogeneration, Combined Cycle with Gas Producton from coal (IGCC Power Plants), combined cycles using PFBC-system, Combined cycle with organic fluids, advantages of combined cycles, Performance of Combined cycle, Future of Combined Cycle

Waste Heat Recovery Systems- Introduction, Sources of Waste Heat and Their Grading, Thermodynamic Cycles for Waste Heat Recovery, Recovery forms and Methods, Other uses of Waste Heat

UNIT - IV


Nuclear Power Plants: Nuclear Reactors-Classification-Types of Reactors, Site selection, Methods of Enriching Uranium- Applications of Nuclear Power Plants.

UNIT - V

Economics of Power Generation: Factors affecting the economics, Load factor, Utilization factor, Performance and operating characteristics of Power plants-Economic load sharing, Depreciation-Energy rates-Criteria for optimum loading-Specific economic energy problems.

Power Plant Instrumentation: Classification-Pressure measuring Instruments-Temperature measurement and Flow measurement-Analysis of combustion gases-Pollution-Types-Methods to control.

REFERENCES

2. Power Plant Engineering – P.K. Nag-TMH
4. Introduction to Nuclear Engineering-John R.Lamarsh,Anthony J.Baratta,Printice Hall
MME2052: COMPUTATIONAL FLUID DYNAMICS

Lecture : 4 Periods/week

Internal Marks : 40

External Marks : 60

Credits : 4

External Examination : 3 Hrs

UNIT - I

Introduction: Computational Fluid Dynamics as a Research and Design Tool, Applications of Computational Fluid Dynamics

Governing Equations of Fluid Dynamics: Introduction, Control Volume, Substantial Derivative, Divergence of Velocity, Continuity Equation, Momentum Equation and Energy Equation

UNIT - II

Mathematical Behavior of Partial Differential Equations:
Introduction, Classification of Quasi-Linear Partial Differential Equations, Eigen Value Method, Hyperbolic Equations, Parabolic Equations, Elliptic Equations

UNIT - III


UNIT - IV


UNIT - V


REFERENCES

MME2053: CONVECTIVE HEAT & MASS TRANSFER

Lecture : 4 Periods/week
Internal Marks : 40
External Marks : 60
Credits : 4
External Examination : 3 Hrs

UNIT - I

Introduction: Convection, review of conservation equations - Forced convection in laminar flow - Exact and approximate solutions of Boundary layer energy equation for plane isothermal plate in longitudinal flow - problems.


UNIT - II

Free convective: Approximate analysis of laminar free convective heat transfer on a vertical plate-external flows-correlations-problems.

UNIT - III


UNIT - IV

Mass Transfer: Definitions of concentration and velocities relevant to mass transfer, Fick’s law, species conservation equation in different forms.

Steady state diffusion in dilute solutions in stationary media, transient diffusion in dilute solutions in stationary media, one dimensional non dilute diffusion in gases with one component stationary.

UNIT - V

Convective mass transfer: governing equations-forced diffusion from flat plate- Dimension less correlation’s for mass transfer.
Simultaneous heat and mass transfer - analogy between heat, mass and momentum transfer.

REFERENCES

1. Heat transfer - J. P. Holman, TMH.
2. Heat Transfer – Necati Ozisik ,TMH
3. Heat and Mass transfer- R.C. Sachdeva, New Age

M.TECH (THERMAL ENGINEERING)
MME2061: JET PROPULSION AND ROCKETRY

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UNIT - I

Principles of Jet Propulsion: Introduction, Fundamentals of jet propulsion
Air-Breathing Engines: Introduction, Thermodynamics of Aircraft Jet Engines- Turbo jet, Turbo fan, Turbo prop, and Ramjet engines, Typical Engine Performance

UNIT - II

Aero Thermodynamics of Inlet, Combustors and Nozzles: Introduction, Subsonic Inlets, Supersonic Inlets, Gas Turbine Combustors, After burners and Ramjet Combustors, Supersonic Combustion, Exhaust Nozzles

UNIT - III


UNIT - IV

Liquid Propellant Rocket Engine Fundamentals: Types of Propellants, Propellant Tanks, Propellant Feed Systems, Gas Pressure Feed Systems, Tank Pressurization, Turbopump Feed Systems and Engine Cycles
Solid Propellant Rocket Fundamentals: Basic Relations and Propellant Burning Rate, Other Performance Issues. Propellant Grain and Grain Configuration, Propellant Grain Stress and Strain, Attitude Control and Side Maneuvers with Solid Propellant Rocket

UNIT - V

Liquid Propellants: Propellant Properties, Liquid Oxidizers, Liquid Fuels, Liquid Monopropellants, Gelled Propellants, Gaseous Propellants, Safety and Environmental Concerns
Solid Propellants: Classification, Propellant Characteristics, Hazards, Propellant Ingredients, Other Propellant Categories, Liners, Insulators, and Inhibitors, Propellant Processing and Manufacture

REFERENCES

1. Mechanics and Dynamics of Propulsion –Philip Hill and Carl Peterson.- Addison-Wesley
4. Rocket and Spacecraft Propulsion, Martin J.L. Turner, Springer

HEAD
Dept. of Mechanical Engineering
LAKIREDDY BALI REDDY COLLEGE OF ENGG.
MYLAVARAM-521230, KRISHNADT, A.P.

M.TECH (THERMAL ENGINEERING)
MME2062: CRYOGENIC ENGINEERING

Lecture : 4 Periods/week
Internal Marks : 40
External Marks : 60
Credits : 4
External Examination : 3 Hrs

UNIT - I


UNIT - II

Gas Liquefaction: Minimum work for liquefaction – Methods to produce low temperature – Liquefaction systems for gases other than Neon, Hydrogen and Helium. Liquefaction systems for Neon, Hydrogen and Helium.

UNIT - III


UNIT - IV


UNIT - V

Cryogenic fluid Storage & Transfer – Cryogenic storage systems – Insulation Fluid transfer mechanics – Cryostat – Cryo Coolers.


REFERENCES

2. Cryogenic Research and Applications-Marshar Sitting, Von Nostrand Inc, New Jersey
3. Cryogenics Engineering –R.B. Scott; Von Nostrand Inc, New Jersey
5. Refrigeration and Air-conditioning - Arora & Domkundwar, Dhanpat Rai & Co
MME2063: ADVANCED OPTIMIZATION TECHNIQUES

Lecture: 4 Periods/week

Internal Marks: 40

External Marks: 60

Credits: 4

External Examination: 3 Hrs

UNIT- I

Linear Programming: Introduction to Linear Programming, Two phase Simplex method, Big-M method, duality, interpretation, applications.

UNIT- II

Assignment problems: Hungarian’s algorithm, Degeneracy, applications, unbalanced problems, travelling salesman problem.

Classical optimization techniques: Single variable optimization with and without constraints, multi-variable optimization without constraints, multi-variable optimization with constraints-method of Lagrange multipliers, Kuhn- Tucker conditions.

UNIT- III

Numerical methods for optimization: Nelder Mead’s Simplex search method, Gradient of a function, steepest descent method, Newton’s method, types of penalty methods for handling constraints.

UNIT- IV

Genetic Algorithm (GA): Introduction, Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, draw backs of GA.

UNIT- V

Applications of Optimization in Design and Manufacturing systems: Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, optimization of springs and gears, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

REFERENCES

2. Optimization for Engineering Design- Kalyanmoy Deb, PHI publishers
MME251: THERMAL ENGINEERING – II LAB.

Lecture : 3 Periods/week
Internal Marks : 40

Credits : 2
External Marks : 60
External Examination : 3 Hrs

(Any 8 Experiments)

1. Wind Tunnel Calibration
2. Pressure distribution of Circular Cylinder in Low speed Wind Tunnel
3. Generation of potential flow pattern over circular cylinder using Hele-Shaw Apparatus
4. Generation of Potential flow pattern over non-circular objects using Hele-Shaw Apparatus
5. Flow Visualization study of Circular Cylinder in water channel
6. Flow Visualization study of Non-circular objects in water channel
7. Flow over a Flat Plate using Computational Fluid Dynamics package (CFD)
8. Flow over a Symmetric Aerofoil Computational Fluid Dynamics package (CFD)
9. Flow over a Circular Cylinder Computational Fluid Dynamics package (CFD)
10. Estimation of Bio-Gas Characteristics
11. Calibration of Convergent-Divergent Nozzle
12. Estimation of Mach Number of Nozzle by Various Methods
13. Subsonic Jet Characteristics
14. Water Jet Characteristics