JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech in THERMAL ENGINEERING
Effective from Academic Year 2017 - 18 admitted batch

COURSE STRUCTURE AND SYLLABUS

I Semester

Category	Course Title	Int. marks	Ext. marks	L	T	P	C
PC-1	Advanced Thermodynamics	25	75	4	0	0	4
PC-2	Advanced Heat Transfer	25	75	4	0	0	4
PC-3	Advanced Fluid Mechanics	25	75	4	0	0	4
PE-1	1. Renewable Energy Sources 2. Fuels &Combustion 3. Advanced Optimization Techniques & Applications	25	75	**3**	0	0	3
PE-2	1. Gas Dynamics 2. Thermal Measurements & Process Control 3. Advanced Materials for Thermal Systems	25	75	**3**	0	0	3
OE-1	***Open Elective - I**	25	75	3	0	0	3
Laboratory I	Advanced Thermal Engineering Lab	25	75	0	0	3	2
Seminar I	Seminar	100	0	0	0	3	2
Total		**275**	**525**	**21**	**0**	**6**	**25**

II Semester

Category	Course Title	Int. marks	Ext. marks	L	T	P	C
PC-4	Refrigeration and Air Conditioning	25	75	4	0	1	4
PC-5	Computational Fluid Dynamics	25	75	4	0	1	4
PC-6	Advanced I.C. Engines	25	75	4	0	1	4
PE-3	1. Alternate Fuels for I.C. Engines 2. Turbo machines & Propulsive Systems 3. Advanced Finite Element Methods	25	75	**3**	0	0	3
PE4	1. Convective Heat Transfer 2. Equipment Design for Thermal Systems 3. Computer Simulation of SI & CI Engine	25	75	**3**	0	0	3
OE-2	***Open Elective - II**	25	75	3	0	0	3
Laboratory II	Computational Methods Lab	25	75	0	0	3	2
Seminar II	Seminar	100	0	0	0	3	2
Total		**275**	**525**	**21**	**0**	**6**	**25**

III Semester

Course Title	Int. marks	Ext. marks	L	T	P	C
Technical Paper Writing	100	0	0	3	0	2
Comprehensive Viva-Voce	0	100	0	0	0	4
Project work Review I	100	0	0	0	22	8
Total	**200**	**100**	0	**3**	22	**14**

IV Semester

Course Title	Int. marks	Ext. marks	L	T	P	C
Project work Review II	100	0	0	0	24	8
Project Evaluation (Viva-Voce)	0	200	0	0	0	16
Total	**100**	**200**	**0**	**0**	**24**	**24**

*** Open Elective subjects must be chosen from the list of open electives offered by various departments.**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Thermal Engineering)

ADVANCED THERMODYNAMICS (Professional Core-I)

UNIT –I :

Review of Thermodynamic Laws and Corollaries: Transient flow analysis, Second law thermodynamics, Entropy, Availability and unavailability, Thermodynamic potential. Maxwell relations, Specific heat relations, Mayer's relation. Entropy generation, Irreversibility-Gay Stodal equation.

UNIT-II:

Ideal and Real gases: Equation of state, Real gas behavior, Vander Waal's equation, Generalization compressibility factor. Energy properties of real gases. Vapour pressure, Clausius, Clapeyro equation. Throttling, Joule. Thompson coefficient. Non reactive mixtures of perfect gases. Governing laws, Evaluation of properties, Psychometric mixture properties and psychometric chart, Air conditioning processes, cooling towers. Real gas mixtures.

UNIT-III:

Combustion: Combustion Reactions, Enthalpy of formation. Entropy of formation, Reference levels of tables. Energy of formation, Heat of reaction, Adiabatic flame temperature, Enthalpies, Equilibrium. Chemical equilibrium of ideal gas, The Vanthoff's equation. The chemical potential and phase equilibrium. The Gibbs phase rule.

UNIT-IV:

Power Cycles: Review binary vapour cycle, co-generation and combined cycles, Second law analysts of cycles. Refrigeration cycles. Thermodynamics of irreversible processes. Introduction, Phenomenological laws, Onsaga Reciprocity relation, Applicability of the Phenomenological relations, Heat flux and entropy production, Thermodynamic phenomena, Thermo electric circuits.

UNIT-V:

Direct Energy Conversion Introduction: Fuel cells, Thermo electric energy, Thermo ionic power generation, Thermodynamic devices magneto hydronamic generations, Photovoltaic cells.

REFERENCES:

1. Thermodynamics/Holman/McGraw Hill.
2. Basic and Applied Thermodynamics/ P.K. Nag/ TMH
3. Thermodynamics/Sonnatag & Van Wylen / John Wiley & Sons
4. Thermodynamics for Engineers/Doolittle-Messe/ John Wiley & Sons
5. Engg. Thermodynamics/PL. Dhar / Elsevier
6. Irreversible Thermodynamics/HR De Groff.
7. Applied Thermodynamics – R.K. Rajput – Laxmi Publications
8. Engineering Thermodynamics/Chatopadyaya

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year –II Sem. (Thermal Engineering)

ADVANCED HEAT TRANSFER (Professional Core-II)

UNIT- I:

Brief Introduction to Different Modes of Heat Transfer: Conduction: General heat Conduction equation-initial and boundary conditions.

ID Steady State Heat Conduction – Composite Systems – Systems with Heat Generation –Fins

2D Steady State Heat Conduction – Analytical solution for simple boundary conditions – Product Solution -use of shape factors in conduction

UNIT- II:

Transient heat conduction: Lumped system analysis-1D Transient Heat Conduction - Heisler charts-semi infinite solid-.Finite Solids: Product solution

Finite Difference Methods for Conduction: ID & 2D steady state and simple transient heat conduction problems-implicit and explicit methods.

UNIT- III:

Forced Convection: Equations of fluid flow-concepts of continuity, momentum equations-derivation of energy equation-methods to determine heat transfer coefficient: Analytical methods-dimensional analysis and concept of exact solution. Approximate method-integral analysis

External Flows: Flow over a flat plate: integral method for laminar flow over a flat plate for different velocity and temperature profiles. Application of empirical relations to variation geometries for laminar and turbulent flows.

UNIT- IV:

Internal flows: Types of flow-constant wall temperature and constant heat flux boundary conditions-hydrodynamic &thermal entry lengths; use of empirical correlations.

Free Convection: Approximate analysis on laminar free convective heat transfer-Boussinesque approximation-different geometries-combined free and forced convection.

UNIT-V: Boiling and condensation: Boiling curve-correlations for different regimes -- Condensation : Film and Drop wise condensation - Nusselts theory of film condensation on a vertical plate - assumptions & correlations of film condensation for different geometries.

Radiation Heat Transfer: Radiant heat exchange in grey, non-grey bodies, with transmitting. Reflecting and absorbing media, specular surfaces.

REFERENCES:

1. Heat Transfer - A basic approach- Necati Ozisik -TMH
2. Fundamentals of Heat & Mass transfer- Incropera, Dewitt, Bergman, Lavime - wiley Publication
3. Heat Transfer/ P.S. Ghoshdastidar/ Oxford Press
4. Heat Transfer-S.P. Sukhatme- Univeristies Press
5. Fundamentals of Engineering Heat Transfer-R.C. Sachdeva-New age Science.
6. Heat Transfer/ P.K. Nag /TMH
7. Engg. Heat & Mass Transfer/ Sarit K. Das/Dhanpat Rai
8. Introduction to Heat Transfer/SK Som/PHI
9. Principals of Heat Transfer/Frank Kreith/Cengage Learning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Thermal Engineering)

ADVANCED FLUID MECHANICS (Professional Core-III)

UNIT - I:

Inviscid Flow of Incompressible Fluids: Lagrangian and Eulerain Descriptions of fluid motion- Path lines, Stream lines, Streak lines, stream tubes – velocity of a fluid particle, types of flows - Stream and Velocity potential functions.

Basic Laws of fluid Flow: Potential flow, Condition for irrotationality, circulation & vorticity Accelerations in Carte systems normal and tangential accelerations, Euler's, Bernouli equations-Dimensional Analysis & Similarity-

UNIT - II:

Viscous Flow: Equation of Fluid flow-Continuity & Momentum equation. Derivation of Navier-Stoke's Equations for viscous compressible flow – Exact solutions to certain simple cases : Plain Poisoulle flow - Coutte flow with and without pressure gradient - Hagen Poisoulle flow.

UNIT III:

Boundary Layer Concepts : External Flow-Prandtl's contribution to real fluid flows –Blasius solution-Prandtl's boundary layer theory - Boundary layer thickness for flow over a flat plate – Approximate solutions – Creeping motion (Stokes) – Oseen's approximation - Von-Karman momentum integral equation for laminar boundary layer –– Expressions for local and mean drag coefficients for different velocity profiles for flow over flat plates-Flow over Blunt objects-Boundary layer development-Drag calculation.

UNIT IV:

Internal Flow: Boundary layer development-Hydrodynamic entry length-Smooth and rough boundaries – Equations for Velocity Distribution and frictional Resistance in smooth rough Pipes – Roughness of Commercial Pipes – Moody's diagram.

Introduction to Turbulent Flow: Fundamental concept of turbulence – Time Averaged Equations – Boundary Layer Equations - Prandtl Mixing Length Model - Universal Velocity Distribution Law: Van Driest Model –Approximate solutions for drag coefficients – More Refined Turbulence Models – k-epsilon model.

UNIT V:

Compressible Fluid Flow – I: Thermodynamic basics – Sonic Velocity – Mach Number - Generalized and simple 1D compressible flows - Development of Equations - Acoustic Velocity Derivation of Equation for Mach Number – Area – Pressure Velocity Relationship

Compressible Fluid Flow – II: Nozzles, Diffusers – Isothermal Flow in Long Ducts - Fanno and Releigh Lines, Property Relations –– Normal Compressible Shock, Oblique Shock: Expansion and Compressible Shocks – Supersonic Wave Drag

REFERENCES:

1. Fluid Mechanics- Frank M. White-Mc Graw Hill, 8th Edition
2. Fluid Mechanics/Potter/Cengage Learning
3. Fluid Mechanics – Jog – Cambridge
4. Fluid Mechanics-Munson-Wiley
5. Fluid Mechanics-Streeter, Wylie, Bedford
6. Boundary Layer Theory/ Schlichting H /Springer Publications
7. Fluid Mechanics and Machinery/ D. Rama Durgaiah/New Age Publications

8. Fluid Dynamics/ William F. Hughes & John A. Brighton/TMH
9. Fluid Mechanics with Engineering Applications – Finnemore & Franzini – McGraw Hill

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Thermal Engineering)

RENEWABLE ENERGY RESOURCES (Professional Elective-I)

UNIT- I

Introduction to renewable energy resources, Energy Scenario, Survey of energy resources. Classification and need for conventional energy resources.

Solar Energy: The Sun-sun-Earth relationship, Basic matter to waste heat energy circuit, Solar Radiation, Attention, Radiation measuring instruments.

Solar Energy Applications: Solar water heating. Space heating, Active and passive heating. Energy storage. Selective surface. Solar stills and ponds, solar refrigeration, Photovoltaic generation.

UNIT - II

Geothermal Energy: Structure of earth, Geothermal Regions, Hot springs. Hot Rocks, Hot Aquifers. Analytical methods to estimate thermal potential. Harnessing techniques, Electricity generating systems.

UNIT-III

Direct Energy Conversion: Nuclear Fusion: Fusion, Fusion reaction, P-P cycle, Carbon cycle, Deuterium cycle, Condition for controlled fusion, Fuel cells and photovoltaic. Thermionic & thermoelectric generation, MHD generator.

Hydrogen Gas as Fuel: Production methods, Fuel condition, Properties, I.C. Engines applications, Utilization strategy, Performances.

UNIT-IV

Bio-energy: Biomass energy sources. Plant productivity, Biomass wastes, aerovic and Anaerobic bioconversion processed, Raw metrical and properties of bio-gas, Bio-gas plant technology and status, the energetics and economics of biomass systems, Biomass gasification

UNIT-V

Wind Energy: Wind, Beaufort number, Characteristics, Wind energy conversion systems, Types, Betz model. Interference factor. Power coefficient, Torque coefficient and Thrust coefficient, Lift machines and Drag machines. Matching, Electricity generation.

Energy from Oceans: Tidal energy. Tides. Diurnal and semi-diurnal nature, Power from tides, Wave Energy, Waves, Theoretical energy available. Calculation of period and phase velocity of waves, Wave power systems, Submerged devices. Ocean thermal Energy, Principles, Heat exchangers, Pumping requirements, Practical considerations.

REFERENCES:

1. Non-conventional Energy Resources – Khan – McGraw Hill
2. Energy Resources Utilization and Technologies – Y Anjaneyulu, Francis T, BS Publications
3. Solar Energy – Sukhatme & Nayak – McGraw Hill
4. Renewable Energy Resources/ John Twidell & Tony Weir/Taylor & Francis/2nd edition
5. Alternative Energy Sources & Systems – Steeby – Cengage Learning
6. Energy Resources Utilization & Technologies – Y. Anjaneyulu & T. Francis – BS Publications
7. Renewable Energy Resources- Basic Principles and Applications/ G.N. Tiwari and M.K. Ghosal/ Narosa Publications
8. Renewable Energy Sourse – Tasneem & S.A. Abbasi - PHI
9. .Non-conventional Energy Resourses-Sawhney-PHI

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year –I Sem. (Thermal Engineering)

FUELS & COMBUSTION (Professional Elective-I)

UNIT – I:

Fuels: Detailed classification – Conventional and Unconventional Solid, Liquid, gaseous fuels and nuclear fuels – Origin of Coal – Analysis of coal. Coal – Carborisation, Gasification and liquification – Lignite: petroleum based fuels – problems associated with very low calorific value gases: Coal Gas – Blast Furnace Gas Alcohols and Biogas.

UNIT – II :

Principles of Combustion: Chemical composition – Flue gas analysis – dew point of products – Combustion stoichiometry. Chemical kinetics – Rate of reaction – Reaction order – Molecularity – Zeroth, first, second and third order reactions - complex reactions – chain reactions. Theories of reaction Kinetics – General oxidation behavior of HC's.

UNIT – III:

Thermodynamics of Combustion: Enthalpy of formation – Heating value of fuel - Adiabatic flame Temperature – Equilibrium composition of gaseous mixtures.

UNIT – IV:

Laminar and Turbulent Flames Propagation and Structure: Flame stability – Burning velocity of fuels – Measurement of burning velocity – factors affecting the burning velocity.

Combustion of fuel, droplets and sprays – Combustion systems – Pulverized fuel furnaces – fixed, Entrained and Fluidised Bed Systems.

UNIT – V:

Environmental Considerations: Air pollution – Effects on Environment, Human Health etc. Principal pollutants – Legislative Measures – Methods of Emission control.

REFERENCES:

1. Combustion Fundamentals / Roger A Strehlow / Mc Graw Hill
2. Fuels and combustion / Sharma and Chander Mohan/ Tata Mc Graw Hill
3. Combustion Engineering and Fuel Technology / Shaha A.K./ Oxford and IBH.
4. Principles of Combustion / Kanneth K.Kuo/ Wiley and Sons.
5. Combustion / Sarkar / Mc. Graw Hill.
6. An Introduction to Combustion / Stephen R. Turns/ Mc. Graw Hill International Edition.
7. Combustion Engineering / Gary L. Berman & Kenneth W. Ragland/ Mc. Graw Hill International Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Thermal Engineering)

ADVANCED OPTIMIZATION TECHNIQUES AND APPLICATIONS (Professional Elective-I)

UNIT- I

Single Variable Non-Linear Unconstrained Optimization: One dimensional Optimization methods, Uni-modal function, elimination method, Fibonacci method, golden section method, interpolation methods- quadratic & cubic interpolation methods.

UNIT - II

Multi Variable Non-Linear Unconstrained Optimization: Direct search method – Univariant Method – pattern search methods – Powell's – Hook – Jeeves, Rosenbrock search methods – gradient methods, gradient of function, steepest decent method, Fletcher reeves method. Variable metric method.

UNIT - III

Geometric Programming: Polynomials – arithmetic – geometric inequality – unconstrained G.P – constrained G.P

Dynamic Programming: Multistage decision process, principles of optimality, examples, conversion of final problem to an initial value problem, application of dynamic programming, production inventory. Allocation, scheduling replacement.

UNIT- IV

Linear Programming: Formulation – Sensitivity analysis. Change in the constraints, cost coefficients, coefficients of the constraints, addition and deletion of variable, constraints.

Simulation: Introduction – Types – Steps – application – inventory – queuing – thermal system.

UNIT- V

Integer Programming: Introduction – formulation – Gomory cutting plane algorithm – Zero or one algorithm, branch and bound method.

Stochastic Programming: Basic concepts of probability theory, random variables – distributions – mean, variance, Correlation, co variance, joint probability distribution – stochastic linear, dynamic programming.

REFERENCES:

1. Optimization theory & Applications/ S.S Rao/ New Age International
2. Introductory to operation research/Kasan& Kumar/Springer
3. Optimization Techniques theory and practice / M.C Joshi, K.M Moudgalya/ Narosa Publications.
4. Operation Research/H.A. Taha/TMH
5. Optimization in operations research/R.L Rardin
6. Optimization Techniques/Benugundu & Chandraputla/Person Asia
7. Optimization Techniques /Benugundu & Chandraputla / Pearson Asia

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Thermal Engineering)

GAS DYNAMICS (Professional Elective-II)

UNIT- I

Basic Concepts: Introduction to compressible flow, A brief review of thermodynamics and fluid mechanics, Integral forms of conversion equations, Differential conversion equations, Continuum Postulates, Acoustic speed and Mach number, Governing equation for compressible flows.

UNIT - II

One- dimensional compressible flow : One dimensional flow concepts, Isentropic flows, Stagnation/ Total conditions, Characteristics speeds of gas dynamics, Dynamic pressure and pressure coefficients, Normal Shock waves, Rankine-Hugonoit equations, Rayleigh flow, Fanno flow, Crocco' theorem.

UNIT – III

Quasi-one dimensional flows: Governing equations, Area velocity relations, Isentropic flow through variable-area ducts, Convergent divergent (or De Laval) nozzles, Over-expanded and under-expanded nozzle, Diffusers.

UNIT- IV

Two- dimensional Flow: Oblique shock wave and its governing equations, e-B-M relations, The Hodograph and Shock polar, Supersonic flow over wedges and cones, Mach line, Attached and Detached shock , Reflection and Interaction of oblique shock waves, Supersonic flow over convex and concave corners, Approximation of continuous expansion waves by discrete waves.

UNIT- V

Unsteady wave motions: Moving normal shock waves, Reflected shock waves, Physical features of wave propagation, Elements of acoustic Thermal Engineering theory, Incident and reflected expansion waves, Finite compression waves, Shock tube relations.

REFERENCES:

1. Gas Dynamics-S.M. Yahya
2. Gas Dynamics- Radha Krishnan
3. Compressible Fluid Dynamic – B K Hodge, Keith Koenig, Pearson Publications, I edition
4. Gas Dynamics- Zucker
5. Dynamics and Thermodynamics of compressible fluid flow (Vol.I, II)-Ascher H.Shapiro
6. Elements of Gas dynamics -H. W. Liepmann, A. Roshko
7. Fundamentals of Gas Dynamics-V.Babu
8. Modern compressible flow - John.D. Anderson, Jr.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Thermal Engineering)

THERMAL MEASUREMENTS & PROCESS CONTROLS (Professional Elective-II)

UNIT-I

General Concepts: Fundamental elements of a measuring instrument. Static and dynamic characteristics – errors in instruments – Different methods of measurement and their analysis – Sensing elements and transducers.

Measurement of pressure – principles of pressure measurement, static and dynamic pressure, vacuum and high pressure measuring – Measurement of low pressure, Manometers, Calibration methods, Dynamic characteristics- design principles.

UNIT-II

Measurement of Flow: Obstruction meters, variable area meters. Pressure probes, compressible fluid flow measurement, Thermal anemometers, calibration of flow measuring instruments. Introduction to design of flow measuring instruments.

UNIT-III

Temperature Measurement: Different principles of Temperature Measurement, use of bimetallic thermometers – Mercury thermometers, Vapor Pressure thermometers,

Thermo positive elements, thermocouples in series & parallel, pyrometry, measurement of heat flux, calibration of temperature measuring instruments. Design of temperature measuring instruments.

UNIT-IV

Level Measurement: Direct & indirect methods, manometric methods, float level meters, electrical conductivity, Capacitive, Ultrasonic, and Nucleonic Methods.

Measurement of density – Hydrometer, continuous weight method, Gamma rays, Gas impulse wheel.

Velocity Measurement – Coefficient of viscosity, Ostesld method, free fall of piston under gravity, torque method.

Measurement of moisture content and humidity.

Measurement of thermal conductivity of solids, liquids and gases.

UNIT-V

Process Control: Introduction and need for process control principles, transfer functions, block diagrams, signal flow graphs, open and closed loop control systems – Analysis of First & Second order systems with examples of mechanical and thermal systems.

Control System Evaluation – Stability, steady state regulations, transient regulations.

REFERENCES:

1. Mechanical Measurements – Beckwith, Leinhard & Marangoni - Pearson
2. Measurement System, Application & Design – E. O. Doeblin.
3. Mechanical and Industrial Measurements – R.K. Jain – Khanna Publishers.
4. Mechanical Measurements – Buck & Beckwith – Pearson.
5. Control Systems, Principles & Design, 2nd Edition – M. Gopal – TMH.
6. Principles of Measurement Systems – John Bentley - Pearson

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Thermal Engineering)

ADVANCED MATERIALS FOR THERMAL SYSTEMS (Professional Elective-II)

UNIT – I:

Review of Mechanical Properties: Fundamentals And Tensile, Hardness, And Impact Testing: The Tensile Test: Use of the Stress – Strain Diagram, True Stress and True Strain, The Bend Test for Brittle Materials, Hardness of Materials, Strian Rate effects and Impact Behaviour Heat Treatment of Steels and Cast Irons: Designations and Classification of Steels, Simple Heat treatments, Isothermal Heat treatments, Quench and Temper Heat treatments, Surface treatments, Weldability of Steel. Fracture Mechanics, Fatigue, And Creep Behaviour: Fracture Mechanics, The Importance of Fracture Mechanics, Microstructural Features of Fracture in Metallic Materials., Microstructural Features of Fracture in Ceramics, Glasses, and Composites, Fatugue, Result of the Fatigue test, Application of Fatigue test, Creep, Stress Ruptur, and Stress Corrosion, Evaluation of creep Behaviour

UNIT-II:

Nuclear Power Plant and Their Materials: Nuclear reactor, pressurised reactor, breeder reactor. Materials for fuel, control rods, coolant, moderator, shielding. Effects of Radiation on Materials Properties: Effects of α,β, γ rays on creep, fatigue, tensile, and other properties of metals, alloys, ceramics, polymers, rubbers etc. Effects on electrical, electronic and magnetic behaviour of materials, Effects on crystal structure, grain size etc.

UNIT-III:

Materials in Fuel cells and Solar Cells Electrocatalyst materials for low temperature fuel cells, Conductive membranes for low-temperature fuel cells, Materials for high temperature fuel cells, silicon, quantum dots for solar energy, nanomaterials for solar thermal energy and photovoltaic.

UNIT-IV:

Materials in Thermal Power Generation Superalloys, steels, ceramics, TBC, hydrogen membrane materials, sensor and sensor materials, biomass, coal, flyash, etc.

UNIT-V:

Energy storage-Artificial photosynthesis/solar to fuels, CO2 separation and utilization, Safer nuclear waste disposal, biofuels production, biological fuel cell technologies, reduction of energy use in manufacturing processes, Improved grid technologies, sustainable energy economy

REFERENCE BOOKS:

1. Introduction to Nuclear Science, Bryan, J. C., CRC Press.
2. Fundamentals of Radiation Materials Science, G.S. Was, Springer
3. Nuclear Reactor Materials and Applications, B.M. Ma, Van Nostrand Reinhold Company.
4. Nuclear Reactor Materials, C.O. Smith, Addison-Wesley Publishing Company.
5. Fundamentals Aspects of Nuclear Fuel Elements, D.R. Olander,
6. Structural Materials in Nuclear Power Systems, J. T. A. Roberts, Plenum Press.
7. Handbook of Fuel Cells, Wolf Vielstich, Arnold Lamm, Hubert A. Gasteiger, and Harumi Yokokawa, John Wiley and Sons, Inc.
8. Advanced power plant materials, design and technology, Edited by D Roddy, Woodhead Publishing Series in Energy No. 5 and CRC Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (Thermal Engineering)

ADVANCED THERMAL ENGINEERING LAB

1. Performance test and analysis of exhaust gases of an I.C. Engine.
2. COP estimation of vapour compression refrigeration test.
3. Performance analysis of Air conditioning unit
4. Solar Flat Plate Collector
5. Evacuative tube concentrator
6. Performance analysis of heat pipe
7. Flame propagation analysis of gaseous fuels
8. Dryness fraction estimation of steam
9. Experiment on compressible fluid flow: (a) Nozzle performance unit, (b)Nozzle pressure distribution unit
10. Experiments on Turbo machines: (a) Performance analysis of Axial flow compressor (b) Performance analysis of Centrifugal blower.