SWAMI VIVEKANAND UNIVERSITY, SIRONJA, SAGAR (M.P.)

SYLLABUS

For

M.Tech. Thermal Engineering

Course Code: MTTE

Department of Mechanical

Faculty of Engineering

Duration of Course : 2 Year
Examination Mode : Semester
Examination System : Grading

Swami Vivekanand University, Sironja Sagar (M.P.)

2016-2017

Swami Vivekanand University, Sagar(M.P.)

Advance Mathematics (MTTE-0101)

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									Grand Total (j= e+i)
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 0101	Advance Mathematics	3	1	-	4	70	22	20	10						100

UNIT- I

Linear Algebra: Linear transformation, vector spaces, hash function, Hermite polynomial, Heavisite's unit function and error function. Elementary concepts of Modular mathematics.

UNIT- II

Solution of Partial Differential Equation (PDE) by separation of variable method, numerical solution of PDE (Laplace, Poisson's, Parabolic) using finite difference methods, Elementary properties of FT, DFT, WFT, Wavelet transform, Haar transform.

UNIT- III

Probability, compound probability and discrete random variable, Binomial, Normal and Poisson's distributions, Sampling distribution, elementary concept of estimation and theory of hypothesis, recurred relations.

UNIT- IV

Stochastic process, Markov process transition probability transition probabilitymatrix, just and higher order Markov process, Application of Eigen value problems inMarkov Process, Markov chain. Queuing system, transient and steady state, traffic intensity, distribution queuing system, concepts of queuing models (M/M/1: Infinity/Infinity/ FC FS), (M/M/1: N/ Infinity/ FC FS), (M/M/S: Infinity/ Infinity/ FC FS.

UNIT- V

FEM: Variational functionals, Euler Lagrange's equation, Variational forms, Ritz method,Galerkin's method,descretization, finite elements method for one dimensional problems.

Text Books

1.ENGINEERING MATHEMATICS – B.S. GRAWL

Reference Books

1. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.
2. Advance Engineering Mathematics by Ervin Kreszig, Wiley Easten Edd.
3. Applied Numerical Methods with MATLAB by Steven C Chapra, TMH.
4. Advance Engineering Mathematics, O'Neil, Cengage (Thomson)
5. Introductory Methods of Numerical Analysis by S.S. Shastry,
6. Krishmurthy Finite element TMH
7. Buchanan Finite element analysis(Schaum Outline S) TMH

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Thermodynamics and Combustion (MTTE-0102)

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									Grand Total (j= e+i)
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 0102	Thermodynamics and Combustion	3	1	-	4	70	22	20	10						100

UNIT- I

Classical Thermodynamics: Concept of classical thermodynamics, review of zeroth, first and second law of thermodynamics. Availability analysis of thermal system and concept of energy conservation.

UNIT- II

Phase and reaction equilibriums: Equilibrium constants .calculation of equilibrium composition of multi components gaseous mixtures.

UNIT- III

Equations of state: Equations of state & calculations of thermodynamics and transport properties of substances, reaction rates of first ,second and higher order reactions, reactions in gaseous, liquid and solid phases.

UNIT- IV

Equilibrium, real substances and properties, triple point, critical point, temperatureentropy, entropy-enthalpy charts, Vanderwal's equation of state, Claperon's equation, Gibbs phase rule, law of corresponding states.

UNIT- V

Combustion and flames: combustion and flame velocities, Laminar and turbulent flames. Premixed and diffusion flames: their properties and structures. Theories of flame propagation, combustion of solid, liquid and gaseous fuels, combustion of fuel droplets and sprays, combustion systems, combustion in closed and open systems, application to IC engines , boilers, gas turbine, combustors and rocket motors.

Text Books

1. Engineering thermodynamics by – Domkondwar
2. Engineering thermodynamics by – P.K.Nag

Reference Books

1. Heat Power and Thermodynamics by M.W.Zemansky (McGraw Hill).
2. Combustion, Flames and explosions of gases, B.Lewis and G.Von Elbe Academic P.
3. Thermal Sciences, Potter, Cengage Learn (Thomson)
4. Engineering thermodynamics by Gurdon Rogers Yon Mayhew.
5. Concept of thermodynamics by Obert (McGraw Hill).

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Heat & Mass Transfer (MTTE-0103)

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									Grand Total (j= e+i)
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 0103	Heat & Mass transfer	3	1	-	4	70	22	20	10						100

UNIT- I

Introduction: Modes of heat flow, Basic laws of heat transfer. Combined heat transfer Mechanisms. Conduction: Steady state conduction, System with internal generation of heat, Transient Conduction, Extended surfaces (Fins), Multi-dimensional heat transfer problems, Phase change, Heat transfer with moving bodies conservation

UNIT- II

Convection: Governing Equations in Laminar & Turbulent Flow, Free and Forced Convection, Tubes, Ducts and exterior surfaces, tube bundles in cross flow, Correlations, Dimensional analysis .

UNIT- III

Boiling heat transfer, nature of vaporization, nucleate pool boiling and empiricalcorrelations for pool boiling heat transfer, factors affecting pool boiling filmcoefficients, high heat flux boiling. Condensation: Physical Mechanisms, Laminar film condensation on a vertical plate, turbulent film condensation, drop wise condensation.

UNIT- IV

Radiation: Radiation Properties & Law, Electrical analogy, Radiation exchange between surfaces, Applications to cavities & enclosures.

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UNIT- V

Mass transfer: equation for convective mass transfer, boundary layer mass transfer, empirical correlation for convective mass transfer .

Text Books

1. HMT – Domkondwar

Reference Books:

1. Heat Transfer, Krieth, Cengage learn (Thomson)
2. Heat transfer by J.P. Holman.
3. Analysis of Heat transfer E.R.G.Eckerst and R.M. Drake Jr. McGraw Hills.
4. Heat mass and momentum transfer .W.M.Roshenow and P.Choi, Prentice Hall .
5. Heat transfer B.Gebhart ,McGraw Hills .
6. Conduction Heat Transfer V.S. Arpaci ,Addison Wesley .
7. Thermal radiation H.C. Hotel .

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Advanced fluid Mechanics (MTTE-0104)

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									Grand Total (j= e+i)
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 0104	Advanced fluid Mechanics	3	1	-	4	70	22	20	10						100

UNIT- I

Reviews of basic laws, concept of continuum, fluid flow in Integral & differential Form.conservation.

UNIT- II

Kinematics of Fluid: Description of properties in a moving fluid, Local and material derivatives, Control mass and control volume analysis, Reynolds Transport theorem and its application.

UNIT- III

Ideal fluid flow: Introduction, Elementary flows in a 2-D plane, Flow nets, superposition of Elementary flows.

UNIT- IV

Viscous Incompressible Flows: Introduction, Equations of motion, N-S equations and its application. Boundary Layer Theory: Prandtl's boundary layer equations, Flat plate boundary layer, approximate solution - Integral method, Laminar and turbulent boundary layer, Separation, Lift and Drag.

UNIT- V

Fundamental of Compressible flows: Introduction, Thermodynamic relations of perfect gases, Speed of sound, pressure wave propagation, Stagnation and Sonic properties, Shocks.

Text Books

1. by – Domkondwar
2. by – P.K.Nag

Reference Books

Fluid Mechanics by Shames (McGraw Hill).
2. Mechanics of Fluid by Massey (EL-BS).
3. The Dynamics and Thermodynamics of Compressible Fluid flow A.H. Shapiro .
4. Boundary Layer Theory H. Schlichting McGraw Hills.

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IC Engines and alternate fuels (MTTE-0105)

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									Grand Total (j= e+i)
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 0105	IC Engines and alternate fuels.	3	1	-	4	70	22	20	10						100

UNIT- I

SI Engines: Fuels for use in S.I. Engines; Rating of S.I. Engines fuels, carburetors and carburetion, fuel injection systems; Combustion in S.I. Engines-normal and abnormal, detonation, stratification and lean mixture operations. Carburetor replacement by MPFI, Elements of MPFI System like control unit, sensors, switches, Effect on engine performance & Engine Emission.

UNIT- II

Performance & testing of I.C. Engine: Introduction, breathing capacity, pumping losses, friction losses, super charging, performance parameters & their measurements for S.I.E. & C.I.E. Engine, performance maps. Air and sound pollution by engines, remedial measures.

UNIT- III

Non Conventional I.C. Engines : Dual Fuel, Multi Fuel, Stratified charge lean burnvariable compression ratio, Rotary Engines, Description, Working and comparison with conventional I.C. Engines.

UNIT- IV

Viscous Incompressible Flows: Introduction, Equations of motion, N-S equations and its application. Boundary Layer Theory: Prandtl's boundary layer equations, Flat plate boundary layer, approximate solution - Integral method, Laminar and turbulent boundary layer, Separation, Lift and Drag.

UNIT- V

Future Fuels for Ignition Engines : Introduction, Necessity for substitute Fuels. Substitute future fuels like Ethanol, Methnol, Bio gas, Hydrogen, Production, Transportation, storage of substitute fuel, performance of engines using these fuels.

Text Books:

1. IC ENGINE by – Domkondwar
2. IC ENGINE by – R.K.RAJPOT

Reference Books

1. A.S. Khatchiian ;Theory of C.I. Engines Vol.1 and 2 IIT Bombay .
2. C.F. Taylor and E.S. Taylor; Internal Combustion Engines ,Stanton
3. P.G. Burman and B.Luca Fuel injection and Engines, Technical Press
4. L.C. Litchy ,Combustion Engines Processes, McGraw-Hill

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Thermal lab-I HMT (MTTE-0106)

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									Grand Total (j= e+i)
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 0106	Thermal Engg. Lab-I	-	-	6	6						90		60		150

List of Experiments

1. Determination of LMTD and Overall Heat Transfer Coefficient of a Parallel Flow Heat Exchanger.
2. Determination of LMTD and Overall Heat Transfer Coefficient of a Counter Flow Heat Exchanger.
3. Determination of Overall Heat Transfer Coefficient of a Double Pass Heat Exchanger.
4. Determination of Overall Heat Transfer Coefficient for Cross Flow Air/Water Heat Exchanger.

5 Performance of Heat pipe as Compared with Thermal Siphon and Air Pipe.

6. Determination of Thermal Conductivity of Metal Rod.
7. Determination of Heat transfer in Forced Convection.
8. Dropwise and Filmwise Condensation.
9. Determination of Stefan Blotzman constant by Stefan Boltzman apparatus.

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Thermal lab-II IC Engines and alternate fuels (MTTE-0107)

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									Grand Total (j= e+i)
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 0107	Thermal Engg. Lab-II	-	-	6	6						90		60		150

Course: MMTP-107 THERMAL ENGG. LAB – II

1. To Determine Volume Flow Rate for Low Speed Wind Tunnel using Pitot Tube.
2. To study Flow around Circular/Irregular Shaped Body.
3. Heat Balance Sheet for C.I./I.C Engines.
4. To find effect of compression ratio on I.C. Engine Performance.
5. Study of Experimental Facility on Steam Turbine.
6. To conduct Numerical Experiments with Software for exploration of problems related To Fluid and Heat Transfer using the software.

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Thermal Power Plant Engg (MTTE-0201)

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									Grand Total (j= e+i)
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 0201	Thermal Power Plant Engg.	3	1	-	4	70	22	20	10						100

UNIT- I

Conventional thermal power plants, super-critical power plants and its principles of working, performance curves and flow diagrams.

UNIT- II

Power plant components: Fuel and ash handling, pulverized fuel firing burners, dust handling, fluidized bed combustion. Radiant super heaters and re-heaters, economizerand pre-heaters, combustion and furnace design, boiler water supply and treatment. Dratand arrangement of draft fans, different types of cooling systems, open closed,mixed and dry cooling tower systems, air cooled condensers. Ejector and vacuum pumps, feed heating systems, heaters, evaporators and de-airator, feed line protection, boiler feed pumps, different type of drives for it, steam turbine driven feed pumps.

UNIT- III

Plant instrumentation for thermal power plants, need and importance, distributed and centralized, pneumatic and electro-mechanical transducers and controllers, distributed computer control. Piping and insulation: design and layout of ducting for air fuel, gases and pulverized fuels, selection of piping, pipe flexibility analysis, Various control valves and actuators. Insulation optimum thickness and costs.

UNIT- IV

Installation, commissioning and operation: Preliminary performance checks and acceptance test for various components, heat balance of items and entire plant. Starting loading and normal operation checks, maintenance logging, parallel operations, droop setting, performance analysis, maintenance, safety and pollution controls.

UNIT- V

Plant Management: Preparing specifications and contract documents, guarantee. Training of power plantpersonnel, safety, and seismic analysis. Purchase and contract for fuel supplies.

Reference Books

1. Power Plant Engineering, F T Morse
2. Power Plant Engineering, P K Nag
3. Power Plant Engineering, Arora and Domkundwar

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Design of Heat Exchangers (MTTE-0202)

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									Grand Total (j= e+i)
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 0202	Design of Heat Exchangers	3	1	-	4	70	22	20	10						100

UNIT- I

Types of Heat Exchangers, definitions & quantitative relationship

UNIT- II

Analytical & Numerical solution Procedures, Fouling factors, Correction factors.

UNIT- III

Thermal & hydraulic design of Commonly used heat exchangers : Double pipe heat exchangers , shell and tube heat exchangers, condensers, Evaporators, Cooling and dehumidifying coils, Cooling towers, Evaporative condensers , design of air washers , desert coolers .

UNIT- IV

Review of mechanical Design, TEMA Codes Materials of Construction , corrosion damage , Testing and inspection

UNIT- V

Heat Pipe: Basics & its mathematical model , micro Heat Exchangers. Use of software in heat exchanger design .

Reference Books

1. Compact Heat Exchangers Kays and London, TMH
2. Heat Exchangers- Thermal Hydraulic fundamentals and design, Kokac, TMH
3. Extended Surface Heat Transfer, D Q Kern, A D Kraus, TMH.
4. Tubular Exchanger Manufacturer Association (TEMA), and other codes.

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Advance Refrigeration Systems (MTTE-0203)

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									Grand Total (j= e+i)
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 0203	Advance Refrigeration Systems	3	1	-	4	70	22	20	10						100

UNIT- I

Introduction: Thermodynamics Properties of pure and Mixed Refrigerants and their selection. Vapor Compression System, Actual Vapor Compression System, Deviation from theoretical System, Multi-pressure System with Flash Chamber and Inter Cooling, Cascade system.

UNIT- II

Refrigeration Equipments: Compressors, Analysis and Thermal Design of Reciprocating, Centrifugal and Screw Compressors, Performance Characteristics & Capacity control. Expansion Devices: Capillary, Automatic and Thermostatic Expansion Valve. Other Equipments: Liquid Receiver, Oil Separators, Liquid Line Strainers, Driers, Liquid Sub- coolers.

UNIT- III

Condenser & Evaporator: Types, performance & Their Controls.

UNIT- IV

Thermodynamics of Refrigerant: Absorbent Combinations, Analysis of simple and Industrial Vapor Absorption system using various working fluids Solar Powered Refrigeration & Heat Pump.

Text Books

1. HMT – Domkondwar

Reference Books

1. Refrigeration & Air Conditioning by W .F.Stoecker
2. Refrigeration & Air Conditioning by C.P.Arora
3. Refrigeration & Air Conditioning by Manohar Prasad

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Steam and GasTurbine (MTTE-0204)

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									Grand Total (j= e+i)
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 0204	Steam and Gas Turbine	3	1	-	4	70	22	20	10						100

UNIT- I

Principle and working of steam turbines, type of turbines, impulse and reactions, compounding for pressure and velocity. Velocity triangles forvarious types, stage to blade, speed ratio for optimum efficiency, diagram efficiency, steams performance. Energy losses in steam turbine, turbine performance at various loads and governing of steam turbines. Constructional details and description of steam turbine components in brief.

UNIT- II

Introduction : Most Ideal Regenerative f eed heating cycle. Regenerative feed heating cycles and their represenation on T-s and h-s Diagram. Representation of actual process on T-s and h-s Diagram Regenerative cycles. Other types of feed heating arrangements.Optimum feed water temperature and saving in Heat Rate. Feed Heaters, Direct Contact Heaters, Surface Heaters, Deaerators..

UNIT- III

Reheating – Regenerative and Regenerative water – Extraction Cycles.Reheating of steam, Practicalreheating and Non- reheating cycles, advantage & disadvantages of reheating, regenerative water extractioncycles, practical feed heating arrangements. Feed heating system for 120MW , 200MW , 350MW , 500MW& 660 MW Units.

UNIT- IV

Mixed Pressure Turbines:Low- pressure Turbines, Mixed pressure Turbines, Heat Accumulators. Unit 5Gas Turbines: Open and closed cycles, constant pressure and constant volume cycles, cycles with intercooling, reheating and heat exchanger, compressor and turbine efficiencies, pressure losses, performancecharacteristics of various cycles, practical problems.Jet Propulsion: Calculation of thrust, Power, speed andefficiency, turbo – jet and turbo propulsion systems.

Text Books

2. by – Domkondwar
3. by – P.K.Nag

Reference Books

1. Fluid dynamics and heat transfer of turbo-machinery, Budugur Lakshminarayana, Amazon.com
2. Cohen H Rogers, Sarvanmutto, Gas Turbine Theory, Longman Pub.
3. Mathur, Sharma, Gas turbine, Standard Pub And Distributors Delhi

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Maintenance of Thermal Power Plant (MTTE-0205)

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									Grand Total (j= e+i)
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 0205	Maintenance of Thermal Power Plant	3	1	-	4	70	22	20	10						100

UNIT- I

Maintenance Management:emergency maintenance procedure Maintenance strategies, maintenance schedule spare part management, inventory control purchase procedure and storage,Warning systems, organization of maintenance department, human consideration.

UNIT- II

Diagnostic Maintenance and Machine Health Monitoring: Introduction tomaintenance techniques, preventive And predictive maintenance, signature analysis, observational and estimation techniques, online techniques specially dealing with instrumentation system, off-line techniques, non-destructive testing, practical application of diagnostic maintenance to specific industrial machinery and plants. Various techniques of condition monitoring wear analysis, vibration and noise signature, thermography etc

UNIT- III

Mechanism of Lubrication & Lubricants:Lubrication regimes, analysis and modes of lubrication in different bearings, squeeze films, fluid film, elasto-hydrodynamic and boundary lubrications theories and applications,environmental effects on lubrications, types of lubricant and properties, non- conventional lubricants and applications.

UNIT- IV

Failure Mechanisms and Analysis:Material failure due to environmental effects, Introduction; Importanceof failure analysis, common causes of failure in metals & alloys. Failure due to faulty heat treatment, embrittlement of metals, Residual stresses in metals, and their effects. Defects in production and manufacture. Design faults, analysis of engineering failures, failure due to abuse of machinery, failure of seals & packing, failure of bearings, failure of gears, fatigue failure, failure due to time-temperature effects(creep) corrosion etc.

UNIT- V

Maintenance of Power Plant Machinery: Predictive and preventive maintenance of steam turbine and its components, Erosion of blades and its prevention. Lubrication of bearings, valves, Maintenance scheduling, methods of detection of leaking and its prevention in the condensers. Condenser fault systems and its cases. On load and off load cleaning of condenser tubes, Maintenance scheduling of cooling water plants, cooling towers, Life enhancement techniques, case studies.

Reference Books

1. Maintenance & Spare Parts & Management -P. Gopal Krishnan & Bannergee
2. Maintenance Engg. Handbook - by Lindley & Higgins
3. Industrial Maintenance Management - by Neibel
4. Reliability Centered Maintenance - by Moubray
5. Maintenance Engg. & Management - By R.C. Mishra
6. Modern Poewr plant Practice -10 Volumes British Electricity Int. Ltd.
7. Power Generation Handbook

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Thermal lab-III (MTTE-206)

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	Grand Total (j= e+i)
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 206	Thermal Engg. Lab-III	-	-	6	6						90		60		150

Thermal lab-IV (MTTE-207)

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	Grand Total (j= e+i)
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 207	Thermal Engg. Lab-IV	-	-	6	6						90		60		150

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Elective -I (MTTE-0301) (A)Computer Aided Design of Thermal System

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									Grand Total (j= e+i)
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 0301	Elective -I	3	1	-	4	70	22	20	10						100

UNIT- I

Basic Consideration in Design: Formulation of Design problems, conceptual design steps in design process computer aided design material selection.

UNIT- II

Modeling of Thermal System: Types of model, mathematical & Physical modeling Dimensional Analysis Numerical modeling & simulation, simulation of thermal processes Application to casting extrusion, heat treatment, Refrigeration systems, thermal design of heat engine.

UNIT- III

Numerical Modeling & Simulation: Numerical modeling, System simulation, Methods for Numerical Simulation.

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UNIT- IV

Optimization: Basic Concepts, Objective function, constraints, Mathematical Formulation.

UNIT- V

Optimization Methods: Calculus Method, search method linear & dynamic programming, Geometric Programming Introduction to Genetic Algorithms.

Reference Books

1. Design of thermal systems by W .F. Stoecker
2. Design of optimization of thermal systems by Yogesh Jaluria
3. Optimization Techniques by Rao
4. Optimization Techniques & Genetic Algorithms by Kalyan Mchan Deb.

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MTTP –0301 (B) Engine System Modelling and Analysis

UNIT- I

Basic simulation modeling : Nature of simulation, so the system concept, system environment, continuum and discrete system , system modeling, Types of models like static physical, Dynamic physical and mathematical models, principle and in modeling block building relevance, accuracy and aggregation.

UNIT- II

Probability Concept in Simulation: Stochastic variables, discrete and continuum probability function, Measures of probability function, Estimation of means variance, standard deviation.

UNIT- III

Actual cycles of Engine operation, their analysis, Use of combustion charts, simulation of engine processes like, suction, compression, evaporation and exhaust. Basic engine operating cycles their analysis and simulation Development of computer programs for these.

UNIT- IV

Modeling of Carburetion and injection process and simulation of these process, development of simple programs for analysis. Results of simulation, simulation of engine trouble shooting.

Reference Books:

1. Simulation modeling and analysis – Averill M. Law, W D Kelton, TMH.
2. System Simulation – Geoffrey Gordon, Prentice Hall
3. Discrete System simulation – Jerry Banks, John S. Carson, PHI.
4. Seila, Applied Simulation Modeling, Cengage (Thomson

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(MTTE-0302) (A)Gas Flow Through Turbo Macchine

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks									Grand Total (j= e+i)
						Theory				Total (e= a+c +d)	Practical			Total (i = f+ h)	
		L	T	P	C	Max (a)	Min (b)	MST (c)	TW (d)		Max (f)	Min (g)	TW (h)		
MTTE 0302	Elective - II	3	1	-	4	70	22	20	10						100

UNIT- I

Fundamental Equations of Steady Flow:Continuity equation, Equations of Motion, Euler's Equation, Bernoulli's equation, Energy, Stream Function and Velocity Potential,

UNIT- II

Potential Flow:Elementary potential flow, Source, Sink, Vortex and Doublet, Superposition of flow patterns. Flow over immersed bodies. Development of the aerofoil-lift and drag, Kutta- Joukowski Profile, pressure distribution over aerofoil blading.

UNIT- III

Viscous Flow:Incompressible Flow: Laminar Turbulent Flows: Navier's Strokes equation and exact solutions of steady flow problems. Flow through pipes, over flats plates. Laminar and turbulent boundary layers. Dimensional analysis...

UNIT- IV

Compressible Flow of Gases:Isentropic and adiabatic flow, Stagnation and critical properties Flow though ducts of constant area, Fanno line and Rayleigh line flows. Fundamental equations and variation in flow properties. Flow with normal shock waves governing equations, Prandtl Meyer and Rankine Hugoniot relations, Strength of a shock wave, Moving normal shock waves.

UNIT- V

Cascade Tests:Fundamental equations of flow through turbo machinery. Radial equilibrium equation. Vortex flow through turbo machines. Losses in turbo machinery. Dimensional analysis of flow through turbo machines. Surging and chocking.

Reference Books

1. Fundamental of Compressible Flows -Yahya
2. Compressible Fluid Flow -Michel A.Saad
3. Introduction of fluid mechanics -Fox and MC Donald
4. Turbo Machines -A.Valan Arasu
5. Applied Fluid Dynamics Handbook -Robert D.Blevins
6. Int J.of Heat and Mass Transfer -Elsevier.

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MTTE – 0302 (B) Non Conventional Energy Sources

UNIT- I

Introduction: Conventional sources of commercial energy ,estimation of time for which conventional sources will last alternate energy sources .

UNIT- II

The Solar Option: Direct and Indirect applications. Availability of solar radiation energy collection and concentration for photo-thermal application, thermal storage. Introduction to photo-voltaic and thermoelectric conversion .W ind energy .Types of wind mills. Elementary design principles .Ocean thermal energy conversion. coolers

UNIT- III

Biomass Energy : Bio mass as a source of energy .Energy plantation . Production of fuel from wood agricultural and animal waste . Bioconversion process .Bio –gas ,its generation and utilization .

UNIT- IV

The nuclear option: Fission and fusion technology fundamentals .Thermal and fast reactor State of art .Breeder reactor .Prospects and limitations .Economics.

UNIT- V

Geothermal Energy System: Extent of available resources .Heat Transport in geothermal system Introduction to tidal and wave energy .M.H.D. Power .Fuel cells .Biochemical Engineering : Introduction to chemicals of life enzymes , kinetics and michaelis–Menten equation .Introduction to microorganisms growth requirements, growth Kinetics ,Monod equation.

Reference Books:

1. Solar Engineering of Thermal Processes , J.A. Duffie and W.A. Beckman ,John Wiley.
2. Principles of Solar Engineering , F.Kreith and J.F. Kreider McGraw –Hill .
3. Alternative Energy Sources T.N. Veziroglu McGraw –Hill .
4. Biochemical Engineering Fundamentals J.E. Bailey and D.F. Olis, TMH
5. Biochemical Engineering Academic press S.Aiba ,A.E. Humphrey ,N.F. Mills

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Dissertation Part- II MTTE-0401

Paper Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)
						Theory		MST (c)	Total (d= a+c)	Practical		TW (g)	Total (h= e+g)	
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)			
MTTE-0401	Dissertation Part- II			20	20					300		200	500	500
Total				20	20					300		200	500	500