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

SYLLABUS

For

M.Tech. Thermal Engneering
Ist Semester

Swami Vivekanand University, Sironja
Sagar
2013-2014

Scheme of Examination

First Semester- Master of Engineering *(Thermal Power Engg.)*

S.No.	Subject Code	Subject Name	Periods per week			Credits	Maximum Marks (Theory Slot)			Marks for End Sem. Examination		Total Marks
			L	T	P		End Sem. Exam.	Tests (Two)	Assignments /Quiz	End Sem. Practical /Viva	Practical Record/ Assignment/Quiz /Presentation	
1.	MMTP 101	Advance Mathematics	3	1	-	4	70	20	10	-	-	100
2.	MMTP 102	Thermodynamics and Combustion	3	1	-	4	70	20	10	-	-	100
3.	MMTP 103	Heat & Mass transfer	3	1	-	4	70	20	10	-	-	100
4.	MMTP 104	Advanced fluid Mechanics	3	1	-	4	70	20	10	-	-	100
5.	MMTP 105	IC Engines and alternate fuels.	3	1	-	4	70	20	10	-	-	100
6.	MMTP 106	Lab-I	-	-	6	6	-	-	-	90	60	150
7.	MMTP 107	Lab-II	-	-	6	6	-	-	-	90	60	150
		Total	15	5	12	32	350	100	50	180	120	800

L: Lecture - T: Tutorial - P: Practical
Lab I – Heat Transfer Lab.
Lab II- I/C Engine Lab.

101 -Advance Mathematics

UNIT 1

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

UNIT 2

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 3

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 4

Stochastic process, Markov process transition probability transition probability matrix, just and higher order Markov process, Application of Eigen value problems in Markov 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 5

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

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
8. Numerical Solution of Differential Equation by M. K. Jain
9. Numerical Mathematical Analysis By James B. Scarborogh
10. Fourier Transforms by J. N. Sheddon
11. Advance Mathematics for Engr and Sc, Spiegel, Schaum Series, TMH

102-Thermodynamics and Combustion

Unit 1

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 2

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

UNIT 3

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 4

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 5

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.

Recommended 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).

103- Heat and Mass Transfer

UNIT 1

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.

UNIT 2

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 3

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

UNIT 4

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

UNIT 5

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

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 .

104-Advanced Fluid Mechanics

UNIT 1
Reviews of basic laws, concept of continuum, fluid flow in Integral & differential Form.

UNIT 2
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 3
Ideal fluid flow: Introduction, Elementary flows in a 2-D plane, Flow nets, superposition of Elementary flows.

UNIT 4
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 5
Fundamental of Compressible flows: Introduction, Thermodynamic relations of perfect gases, Speed of sound, pressure wave propagation, Stagnation and Sonic properties, Shocks.

UNIT 6
Hydraulic machines: Theory and design of hydro-turbines and centrifugal pumps, their proto-type testing.

Reference Books:
1. 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.

105-IC Engines & Alternate Fuels

UNIT 1

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 2

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 3

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

UNIT 4

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.

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

Course: THERMAL ENGG. LAB – I

Various Experiments in Heat Transfer

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.

Course: 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.

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

SYLLABUS

For

M.Tech. Thermal Engineering
Semester - II

Swami Vivekanand University, Sironja
Sagar
2013-2014

Scheme of Master of Engineering *(Thermal Power & Engg.)*

Semester- II

S.No.	Subject Code	Subject Name	Periods per week			Credits	Maximum Marks (Theory Slot)			Maximum Marks (Practical Slot)		Total Marks
			L	T	P		End Sem. Exam.	Tests (Two)	Assignments /Quiz	End Sem. Practical /Viva	Practical Record/ Assignment/Quiz /Presentation	
1.	MMTP 201	Thermal Power Plant Engg.	3	1	-	4	70	20	10	-	-	100
2.	MMTP 202	Design of Heat Exchangers	3	1	-	4	70	20	10	-	-	100
3.	MMTP 203	Advance Refrigeration Systems	3	1	-	4	70	20	10	-	-	100
4.	MMTP 204	Steam and Gas Turbine	3	1	-	4	70	20	10	-	-	100
5.	MMTP 205	Maintenance of Thermal Power Plant	3	1	-	4	70	20	10	-	-	100
6.	MMTP 206	Lab-III	-	-	6	6	-	-	-	90	60	150
7.	MMTP 207	Lab-IV	-	-	6	6	-	-	-	90	60	150
		Total	15	5	12	32	350	100	50	180	120	800

L: Lecture - T: Tutorial - P: Practical

w.e.f. July-2010

Lab. III - Maintenance of Thermal Power Plant

Lab.IV - Advance Refrigeration and Air conditioning Systems

Subject Code- 201 Thermal Power Plant Engg.

UNIT 1
Conventional thermal power plants, super-critical power plants and its principles of working, performance curves and flow diagrams.

UNIT 2
Power plant components: Fuel and ash handling, pulverized fuel firing burners, dust handling, fluidized bed combustion. Radiant super heaters and re-heaters, economizer
and pre-heaters, combustion and furnace design, boiler water supply and treatment. Drat
and 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 3
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 4
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 5
Plant Management: Preparing specifications and contract documents, guarantee. Training of power plant personnel, 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

Subject Code- 202 Design of heat Exchangers

UNIT 1
Types of Heat Exchangers, definitions & quantitative relationship

UNIT 2
Analytical & Numerical solution Procedures, Fouling factors, Correction factors

UNIT 3
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 4
Review of mechanical Design, TEMA Codes Materials of Construction , corrosion damage , Testing and inspection .

UNIT 5
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.

Subject Code- 203 Advance Refrigeration System

UNIT 1

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 2

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 3

Condenser & Evaporator: Types, performance & Their Controls.

UNIT 4

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

Books:

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

Subject Code- 204 Steam and Gas Turbines

Unit 1 Steam Turbines:
Principle and working of steam turbines, type of turbines, impulse and reactions, compounding for pressure and velocity. Velocity triangles for various types, stage to blade, speed ratio for optimum efficiency, diagram efficiency, steam s 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 2 Regenerative feed heating cycles:
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 3 Reheating – Regenerative and Regenerative water – Extraction Cycles.
Reheating of steam, Practical reheating and Non- reheating cycles, advantage & disadvantages of reheating, regenerative water extraction cycles, practical feed heating arrangements. Feed heating system for 120MW, 200MW, 350MW, 500MW & 660 MW Units.

Unit 4 Mixed Pressure Turbines:
Low- pressure Turbines, Mixed pressure Turbines, Heat
Accumulators. Unit 5 Gas Turbines:
Open and closed cycles, constant pressure and constant volume cycles, cycles with inter cooling, reheating and heat exchanger, compressor and turbine efficiencies, pressure
losses, performance characteristics of various cycles, practical problems.
Jet Propulsion: Calculation of thrust, Power, speed and efficiency, turbo – jet and turbo propulsion systems.

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.

Subject Code- 205 Maintenance of Thermal Power Plant

Unit 1 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 2 Diagnostic Maintenance and Machine Health Monitoring:
Introduction to maintenance 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 3 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 4 Failure Mechanisms and Analysis:
Material failure due to environmental effects, Introduction; Importance of 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 5 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 -Philip Kaimeh.Mc Graw HCourse

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

SYLLABUS

For

M.Tech. Thermal Engneering
IIIrd Semester

Swami Vivekanand University, Sironja
Sagar
2013-2014

Scheme of Examination

Third Semester- Master of Engineering

(Heat Power Engg/ Heat Power and Thermal/Thermal Engg./ Thermal System and Dgn.)

S.No.	Subject Code	Subject Name	Periods per week			Credits	Maximum Marks (Theory Slot)			Maximum Marks (Practical Slot)		Total Marks
			L	T	P		End Sem. Exam.	Tests (Two)	Assignments /Quiz	End Sem. Practical/Viva	Practical Record/ Assignment/Quiz /Presentation	
1.	MMTP 301	Elective I	3	1	-	4	70	20	10	-	-	100
2.	MMTP 302	Elective II	3	1	-	4	70	20	10	-	-	100
3.	MMTP 303	Seminar	-	-	4	4	-	-	-	-	100	100
4.	MMTP 304	Dissertation Part-I (Literature Review/Problem Formulation/ Synopsis)	-	-	8	8	-	-	-	120	80	200
		Total	6	2	12	20	140	40	20	120	180	500

w.e.f. July-2010

L: Lecture - T: Tutorial - P: Practical Elective I

A) Computer Aided Design of Thermal System

B) Engine System Modelling and Analysis Elective II

A) Gas Flow Through Turbo Machines

B) Non Conventional Energy Sources

C) Pumps, Blowers and Compressors

MMTP – 301 (A) Computer Aided Design of Thermal System

UNIT 1
Basic Consideration in Design: Formulation of Design problems, conceptual design steps in design process computer aided design material selection.

UNIT 2
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 3
Numerical Modeling & Simulation: Numerical modeling, System simulation, Methods for Numerical Simulation.

UNIT 4
Optimization: Basic Concepts, Objective function, constraints, Mathematical Formulation.

UNIT 5
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.

MMTP – 301 (B) Engine System Modelling and Analysis

Unit 1
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 2
Probability Concept in Simulation: Stochastic variables, discrete and continuum probability function, Measures of probability function, Estimation of means variance, standard deviation.

Unit 3
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 4
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, WD 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

MMTP – 302 (A) Gas Flow Through Turbo Machines

Unit 1 Fundamental Equations of Steady Flow:
Continuity equation, Equations of Motion, Euler's Equation, Bernoulli's equation, Energy, Stream Function and Velocity Potential,

Unit 2 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 3 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 4 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 5 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 Pub

MMTP – 302 (B) Non Conventional Energy Sources

UNIT1
Introduction: Conventional sources of commercial energy ,estimation of time for which conventional sources will last alternate energy sources .

UNIT2
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 .Wind energy .Types of wind mills. Elementary design principles .Ocean thermal energy conversion.

UNIT3
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 .

UNIT4
The nuclear option: Fission and fusion technology fundamentals .Thermal and fast reactor .State of art .Breeder reactor .Prospects and limitations .Economics.

UNIT5
Geothermal Energy System: Extent of available resources .Heat Transport in geothermal system .Introduction to tidal and wave energy .M.H.D. Power .Fuel cells .

UNIT6
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

MMTP – 302 (C) Pumps, Blowers and Compressors

(TO BE EXPANDED)

Law of momentum .Vortex theory of Euler's head. Hydraulic performance of pumps,Cavitation.
Jet Pumps : Turboblowers and their characteristics ,cooling tower fan ,Surging .Design of pumps ,blowers, compressors and fans .

Reference Books :

1. Centrifugal and Axial flow pumps A.J. Stepanoff, Wiley.
2. Design and performance of centrifugal and Axial flow pumps and compressors A.Kovats .

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

SYLLABUS

For

M.Tech.Machenical

Thermal Engg.IV Sem.

Swami Vivekanand University, Sironja Sagar
2013-2014

Scheme of Examination

Fourth Semester- M.E./M.Tech.

(Heat Power Engg/ Heat Power and Thermal/Thermal Engg./ Thermal System and Dgn.)

S.No.	Subject Code	Subject Name	Periods per week			Credits	Maximum Marks (Theory Slot)			Maximum Marks (Practical Slot)		Total Marks
			L	T	P		End Sem. Exam.	Tests (Two)	Assignments /Quiz	End Sem. Practical/Viva	Practical Record/ Assignment/Quiz /Presentation	
1.	MMTP 401	Dissertation Part- II	-	-	20	20	-	-	-	300	200	500
		Total	-	-	20	20	-	-	-	300	200	500

L: Lecture - T: Tutorial - P: Practical

w.e.f. July-2010