Appendix - D

GONDWANA UNIVERSITY, GADCHIROLI

Two Years Post Graduate Degree Program in the Faculty of Engineering and Technology
Course and Examination Scheme with Credit Grade System (2012-13)
I - Semester M. Tech. (Heat Power Engineering)

Course Code	Course Title	Teaching Scheme				Examination Scheme									
		Hours per week				Theory Course						Laboratory Course			
		L	T	P	No. of Credits	Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Internal Assessment MSE	Max. Marks Internal Assessment IE	Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
916	Advanced Heat and Mass Transfer	3	1	0	4	3	70	10	20	100	50	--	--	--	--
917	Advanced Thermodynamics	3	1	0	4	3	70	10	20	100	50	--	--	--	--
918	Thermal Engineering -I	3	1	0	4	3	70	10	20	100	50	--	--	--	--
919	Advanced Power Plant Engineering	3	1	0	4	3	70	10	20	100	50	--	--	--	--
Laboratory															
920	Heat Power Engineering Lab -I	0	0	4	4	--	--	--	--	--	--	50	50	100	50
Total		**12**	**4**	**4**	**20**	**--**	**--**			**400**	**--**	**--**	**--**	**100**	**--**
Semester Total					**20**	**500**									

Appendix - D

Two Years Post Graduate Degree Program in the Faculty of Engineering and Technology
Course and Examination Scheme with Credit Grade System (2012-13)

II - Semester M. Tech. (Heat Power Engineering)

Course Code	Course Title	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory Course						Laboratory Course			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Internal Assessment MSE	Max. Marks Internal Assessment IE	Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
1016	Fluid Dynamics	3	1	0	4	3	70	10	20	100	50	--	--	--	--
1017	Advanced Refrigeration & Air Conditioning	3	1	0	4	3	70	10	20	100	50	--	--	--	--
1018	Thermal Engineering - II	3	1	0	4	3	70	10	20	100	50	--	--	--	--
1019	Elective 1. Design of Heat Transfer Equipments 2. Design of I. C. Engine Components and Subsystems. 3. Thermal Storage Systems	3	1	0	4	3	70	10	20	100	50	--	--	--	--
Laboratory															
1020	Heat Power Engineering Lab. - II	0	0	4	4	--	--	--	--	--	--	50	50	100	50
Total		**12**	**4**	**4**	**20**	**--**	**--**			**400**	**--**	**--**	**--**	**100**	**--**
Semester Total					**20**	**500**									

Appendix - D

Two Years Post Graduate Degree Program in the Faculty of Engineering and Technology
Course and Examination Scheme with Credit Grade System (2012-13)
III - Semester M. Tech. (Heat Power Engineering)

Course Code	Course Title	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory Course						Laboratory Course			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Internal Assessment MSE	Max. Marks Internal Assessment IE	Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
1112	Solar and Wind Energy Utilisation	3	1	0	4	3	70	10	20	100	50	--	--	--	--
1113	Self Study Lab - CFD	0	0	4	4	--	--	--	--	--	--	100	--	100	50
1114	Grand Seminar	0	4	0	4	--	--	--	100	100	50	--	--	--	--
Laboratory															
1115	Pre -Dissertation	0	0	8	8	--	--	--	--	--	--	200	-	200	100
Total		**3**	**5**	**12**	**20**	**--**	**--**	**--**	**--**	**200**	**--**	**--**	**--**	**300**	**--**
Semester Total					**20**	**500**									

IV - Semester M. Tech. (Heat Power Engineering)

Course Code	Course Title	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory Course						Laboratory Course			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Internal Assessment MSE	Max. Marks Internal Assessment IE	Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
1204	Final Dissertation	0	0	20	20	--	--	--	--	--	--	250	250	500	250
Total		**0**	**0**	**20**	**20**	**--**	**--**	--	--	--	**--**	**250**	**250**	**500**	**--**
Semester Total					**20**	**500**									

GONDWANA UNIVERSITY, GADCHIROLI

Name of the Program: **I Semester M. Tech. (Heat Power Engineering)**
Course Code: **916**
Course Title: **Advanced Heat and Mass Transfer**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

1. Conduction Heat Transfer – Heat equation in Cartesian, cylindrical and spherical co-ordinates (without derivation), boundary conditions, steady and unsteady state heat conduction in one, two and three dimensions. Analytical, Graphical and Numerical methods of analysis, Conduction shape factor, Extended surface heat transfer, transient condition, multi-dimensional systems, numerical methods in unsteady state heat transfer, Integral heat conduction equation, Biot approximate method, Error in temperature measurement.
   Radiation Heat Transfer – Fundamentals laws of thermal radiations, surface properties, Heat exchange between non black bodies, Electrical network analogy for thermal radiation system, Radiative heat exchange among diffuse, gray and non gray surfaces separated by non participating media, Formulation of Numerical solutions, Radiation shields, Gas radiations, Radiation from gases vapours and flames, Solar radiation, Radiations heat transfer coefficient.

2. Heat transfer by convection: Hydrodynamic and Thermal boundary Layer, Turbulence. Energy equation of boundary layer, Momentum equation, Von-karman integral momentum equation, relationship between fluid friction and heat transfer. Turbulent – Boundary-Layer Heat transfer, Heat transfer in Laminar and Turbulent fluid flow, heat transfer in high speed flow.

   Empirical and practical relations for forced convection heat transfer. Relations for pipes and tube flow, flow across cylinder and sphere. Flow across tube banks, Liquid metal heat transfer. Free Convection, Convection with change of phase, Condensation and boiling heat transfer, Heat Exchanger, Heat transfer Augmentation techniques. Mass transfer: Fick's law of radiation, diffusion in gases, diffusion in liquids and solids. The mass transfer co-efficient, Heat transfer in Magnate fluid dynamic (MFD) systems.

Text Book:
1. Saddik Kakac: Heat Conduction, McGraw-Hill Pub.
2. S.P.Sukhatme: Heat Transfer, University press.
3. J.P. Holman, Heat Transfer, McGraw-Hill Pub.
4. A.J. Chapman: Heat Transfer, Macmillan Publishing Co. New York.
5. W.M.Kays and Crawford: Convective Heat and Mass transfer, McGraw-Hill Co.
6. Heat and Mass Transfer by Ozzisic.

References:
1. Eckert and Drake: Analysis of Heat Transfer, McGraw-Hill Co.
2. Naylor: Introduction to Convective Heat Transfer Analysis
3. Burmister: Convective Heat Transfer

Name of the Program: **I Semester M. Tech. (Heat Power Engineering)**
Course Code: **917**
Course Title: **Advanced Thermodynamics**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

1. Analysis of Engineering Process in Thermodynamics – Control mass analysis, control volume analysis, continuous system, first law of thermodynamics for continuous system, first law of thermodynamics for a control volume, Transient flow processes, charging of a cylinder, Discharging of a cylinder, Second law analysis of Engineering processes, Second law analysis of control volume.

2. Thermodynamic relations – Vander waals equation of state, Virial equation of state, compressibility charts, Maxwell's relations, Mneomonic Diagrams, Thermodynamic potentials, Helmholtz potential, Clapeyron equation, Kirchoff's equation, Gibbs phase rule.

3. Gas and Gas – Vapour Mixtures – Mixtures of gas, mixing of ideal gases, mixtures of real gases, mixtures of ideal gases and vapours, process of mixtures of ideal gases and vapours, fugacity and fugacity coefficients, Binary mixtures, phase equilibrium and chemical equilibrium.

4. Thermodynamic aspects of fluid flow – Basic dynamic equation for steady, one dimensional fluid flow convenient properties of fluids, Application of basis relations, flow in pipes – adiabatic, irreversible flow in constant area passage, flow with combustion or heat transfer.

Text Books:

1. V. Wylen & E. Sonntag. "Fundamentals of Classical Thermodynamics" Wiley Eastern Limited, New Delhi,
2. J. P. Holman, "Thermodynamics", McGraw Hill, London.
3. Adrian Bejan, George T., Michael Moran, "Thermal Design and Optimization" John Willey and Sons, Inc., pp 113-127, 1996.
4. T.J. Kotas, "The Energy Method of Thermal Plant Analysis", Butterworth, 1985
5. J.L. Thrdkeld, "Thermal environmental engineering", Prentice Hall, Inc. New Jersy. 1970
6. M.W. Zemansky, "Heat and Thermodynamics",
7. M.L. Mathur & S.C. Gupta, "Thermodynamics for Engineers", Dhanpatrai and Sons Ltd., New Delhi.

References:

1. Howell & Duckins, "Fundamentals of Engineering Thermodynamics".
2. Lee-Sears, "Engineering Thermodynamics".
3. N.A. Chigier, Energy Combustion and Environment –McGraw-Hill 1981
4. A. Murthy Kanury, Gordon and Breach, Introduction to combustion phenomena,1975
5.S. P. Sharma and Chandra Mohan, Fuels and combustion –Tata McGraw –Hill. 1984.

Name of the Program: **I Semester M. Tech. (Heat Power Engineering)**
Course Code: **918**
Course Title: **Thermal Engineering – I**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

1. Combustion Process – Introduction of combustion theories Stoichiometry, First and Second law of thermodynamics applied to combustion, combustion mass balance, combustion energy balance, Fundamentals of combustion Kinetics, Laminar Flame Propagation, Flammability, limits and quenching of laminar flames, Turbulent flame propagation, Flame stabilization. Chemistry of combustion reactions, Excess air.
2. Furnaces: Classification, performance evaluation of a typical furnace, Fluidized bed combustion systems, Furnace design, Insulation and Refractory, Economical thickness of thermal Insulation, Selection criterion.
3. Cogeneration – Basics of thermodynamics cycles, operating strategies for cogeneration plant, typical cogeneration performance parameters.
4. Waste heat recovery – Classification, benefits, development of a waste heat recovery systems

Text Books:

1. V. Wylen & E. Sonntag. "Fundamentals of Classical Thermodynamics" Wiley Eastern Limited, New Delhi,
2. J. P. Holman, "Thermodynamics", McGraw Hill, London.
3. Adrian Bejan, George T., Michael Moran, "Thermal Design and Optimization" John Willey and Sons, Inc., pp 113-127, 1996.
4. T.J. Kotas, "The Energy Method of Thermal Plant Analysis", Butterworth, 1985
5. J.L. Thrdkeld, "Thermal environmental engineering", Prentice Hall, Inc. New Jersy. 1970
6. M.W. Zemansky, "Heat and Thermodynamics",
7. M.L. Mathur & S.C. Gupta, "Thermodynamics for Engineers", Dhanpatrai and Sons Ltd., New Delhi.

References:

1. Howell & Duckins, "Fundamentals of Engineering Thermodynamics".
2. Lee-Sears, "Engineering Thermodynamics".
3. N.A. Chigier, Energy Combustion and Environment –McGraw-Hill 1981
4. A. Murthy Kanury, Gordon and Breach, Introduction to combustion phenomena,1975
5.S. P. Sharma and Chandra Mohan, Fuels and combustion –Tata McGraw –Hill. 1984
6.Civil Davies, Calculations in Furnace Technology, Pregamon Press, Oxford 1966
7. D. A. Ray, Heat Recovery System, E & F . N. span, London

Name of the Program: **I Semester M. Tech. (Heat Power Engineering)**
Course Code: **919**
Course Title: **Advanced Power Plant Engineering**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

1. Analysis of Steam cycles: Rankine cycle, Carnot cycle, mean temperature of heat addition, effect of variation of steam condition on thermal efficiency of steam power plant, reheating of steam, regeneration, regenerative feed water heating, feed water heaters, optimization of Rankine cycle, optimum degree of regeneration, Super critical pressure cycle, steam power Plant appraisal, Deaerator, typical layout of steam power plant, efficiencies in a steam power plant, Cogeneration of Power and Process Heat, Numerical Problems. Combined cycle power generation: Flaws of steam as working fluid in Power Cycle, Characteristics of ideal working fluid in vapor power cycle, Binary vapor cycles, coupled Cycles , combined cycle plants, gas turbine- steam turbine power plant, MHD-steam power plant, Thermionic- Steam power plant, Numerical problems.

2. 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, Numerical problems. Combustion Mechanisms : Kinetics of combustion, mechanisms of solid fuel combustion, kinetic and diffusion control, pulverized coal firing system, fuel-bed combustion, fluidized bed combustion, coal gassifiers, combustion of fuel oil, combustion of gas, combined gas fuel oil burners, Numerical problems.

3. Steam Generators: Basic type of steam generators, fire tube boilers, water tube boilers. Economizers, superheaters, reheaters, steam generator control, air preheater, fluidized bed boilers, electrostatic precipitator, fabric filters and bag houses, ash handling system, feed water treatment, deaeration, evaporation, internal treatment, boiler blow down, steam purity, Numerical problems. Condenser, feed water and circulating water systems: Need of condenser, direct contact condensers, feed water heaters, circulating water system, cooling towers, calculations, Numerical Problems.

4. Nuclear Power Plants: Chemical and nuclear reactions, nuclear stability and binding energy, radioactive decay and half life, nuclear fission, chain reaction, neutron energies. Neutron flux and reaction rates, moderating power and moderating ratio, variation of neutron cross sections with neutron energy, neutron life cycle. Reflectors, Types of Reactor, PWR, BWR, gas cooled reactors. Liquid metal fast breeder reactor, heavy water reactors.

Fusion Power reactors, Numerical problems. Hydro Electric Power Plant: Introduction, advantages and disadvantages of water power, optimization of hydro – thermal mix, hydrological cycles, storage and pondage, essential elements of hydro electric power plant, comparisons of turbines, selection of turbines, Numerical problems.

Text books:

1. Power Plant Engineering - P.K. Nag, Tata McGraw-Hill Publications.
2. Power Plant Engineering - M.M. EI-Wakil, McGraw- Hill Publications
3. An Introduction to Power plant engineering, G.D.Rai, Khanna Publishers, III edition,2001
4. Hydropower development series, Vol.1-17, Norwejian Institute of Technology,1996/2005.
5. Combined cycle Gas and Steam Turbine Power Plants, Rolf H Kohlhofer, PennWell Books, 1991

Reference:

1. Standard Handbook of Power plant Engineering, Thomas C Elliot, Robert C Swanekamp, Kao Chen, McGraw Hill Professional, 1997
2. Wet steam turbines for Nuclear Power plants, Aleksander Lejzerovic, Penn Well Books, 2005.
3. TMI 25 Years Later: the Three Mile Island nuclear power plant accident and its impact, Bonnie Anne Osif, Anthony Baratta, Thomas W Conkling, Penn State Press,2004.

Name of the Program: **I Semester M. Tech. (Heat Power Engineering)**
Course Code: **920**
Course Title: **Heat Power Engineering Lab- I**

Course Scheme					Examination Scheme		
Lecture	Tutorial	Practical	Periods per week	Credits	TW	POE	Total
-	-	04	04	04	50	50	100

Contents

Student is expected to perform at least eight Experiments/Practical's based on the prescribed syllabus of all the theory courses of first semester.

1. Determination Thermal conductivity of Liquids and gases.
2. Determination of Effectiveness in parallel and counter flow heat Exchanger.
3. Determination of heat transfer in Boiling and Condensation.
4. Design of a thermal system such as gas turbine systems, steam power plants
5. Design of thermal system components such as nozzles, pumps, heat exchanger.
6. Design of pumps or compressors.
7. Design of refrigeration systems.
8. Trial on thermal system and its validation.
9. Design of heat exchanger.
10. Design of Condenser.
11. Design of Compressor.
12. Design of Flow through duct.
13. Design of air conditioning system.
14. Design of solar thermal system.
15. Modeling of regenerative heat exchanger

Name of the Program: **II Semester M. Tech. (Heat Power Engineering)**
Course Code: **1016**
Course Title: **Fluid Dynamics**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

1. Fluid Flow Concepts, Euler's equation of motion, Continuity equation, Stream function, potential function flow nets, rotational and irrotational flow, Circulation Vortices, Conformal mapping, Simple and inverse transfer.

2. Navier-Stock's equations: Fundamental equation of motion and continuity applied to fluid flow, General stress in a deformable body, rate at which the fluid element strained in a flow; relation between stress and rate deformation, Stoke's hypothesis. Navier-Stoke's equation, Reynold's principle of similarity, Exact solutions of Navier-Stoke's equations, Hydrodynamic theory of lubrication.

3. Laminar Boundary Layer : Boundary Layer equations for flow along flat plate, separation of boundary layer, Momentum-Integral equation of the Boundary Layer. Exact solution of Boundary Layer equations to flow past a cylinder, two-dimensional jet. Boundary Layer control and its applications, Drag; Pressure, form and skin friction.

4. Turbulent Flow: The origin of turbulence, Reynolds modification of Navier-Stokes equation for Turbulent flow. Mean values and fluctuations, Semi-empirical theories of similarity hypothesis, Turbulent flow in pipes, Turbulent boundary layer. Introduction to Boundary layer for compressible fluids.

Text books:

1. Mohanty A.K.-Fluid Mechanics,II edition, PHI private Ltd. New Delhi.
2. E.Rathakrishnan- Fluid Mechanics,II edition, PHI private Ltd. New Delhi.
3. James A.Fay-Introduction to Fluid Mechanics, PHI private Ltd. New Delhi.
4. Streeter-"Fluid Mechanics", Tata McGraw Hill, New Delhi.
5. Schlichting-Boundary layer theory,Springer Pub.

References:

1. G.Biswas and K. Muralidhar- Advanced Fluid mechanics.
2. F.M. White- Viscous Fluid Flow. Tata McGraw Hill, New Delhi.
3. Fox R.W. and McDonald A.T- "Introduction to Fluid Mechanics" John Wiley & Sons.
4. Bird R.B. Stewart W.F.-"Transport Phenomena", John Wiley & Sons.

Name of the Program: **II Semester M. Tech. (Heat Power Engineering)**
Course Code: **1017**
Course Title: **Refrigeration and Air Conditioning**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

1. Analysis of Conventional refrigeration systems –Vapour Compression Refrigeration Systems and Advanced Vapour absorption Refrigeration Systems, Component selection and System balance, Multi pressure systems and their thermal analysis, Multi evaporator systems and their analysis.
2. Refrigerants: Nomenclature, Mixture refrigerants, Ozone layer depletion and Global warming, Montreal and Kyoto Protocol, Alternatives to CFC's and HFC's, Natural refrigerants, Retrofitting of domestic refrigerator using hydrocarbon blends. Introduction to simulation software's in Refrigeration
3. Analysis of Non-conventional Refrigeration Systems – Steam jet refrigeration systems, Thermoelectric refrigeration system, Vortex tube refrigeration system, Pulse tube refrigeration system, Mixture refrigeration system, Adsorption Refrigeration system, Dessicant cooling, hybrid systems. Environmental impact of insulation
4. Cryogenic Applications – Gas liquification systems, Cryogenic Refrigeration systems, storage and handling of Cryogens, Cryogenic insulations Advanced Psychrometry - Heat load calculations and equipment selection, Duct design and air distribution systems. Measuring instruments in air conditioning, thermal insulation Fans and air distribution devices.

Text Books:

R.J. Dossat, Principles of refrigeration, Pearson Education Asia
2. C.P. Arora, Refrigeration and Air-Conditioning
3. Stoecker and Jones, Refrigeration and Air-conditioning
4. Jordan and Priester, Refrigeration and Air-conditioning
5. A.R. Trott, Refrigeration and Air-conditioning, Butterworths
6. J.L. Threlkeld, Thermal Environmental Engineering, Prentice Hall
7. W.F. Stoecker, Industrial Refrigeration Handbook, McGraw-Hill

References:

1. John A. Corinchock, Technician's guide to Refrigeration systems, McGraw-Hill
2. P.C. Koelet, Industrial Refrigeration: Principles, design and applications, by Mcmillan
3. ASHRAE Handbook (i) Fundamentals (ii) Refrigeration
4. ISHRAE handbooks
5. ARI Standards
6. Refrigeration Handbook, Wang, Mc Graw Hill, Int.
7. Refrigeration – Malhotra Prasad

Name of the Program: **II Semester M. Tech. (Heat Power Engineering)**
Course Code: **1018**
Course Title: **Thermal Engineering – II**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

1. Gas Turbines – Analysis of Positive displacement rotary air compressor, dynamic compressor, Thermodynamic analysis of gas turbine cycles, inter-cooled and reheat and regenerative cycles - Performance of practical gas turbine cycles - Gas turbine combustion systems – Pressure and Flow losses, Mechanical Losses, loss due to incomplete combustion.

2. Measurement and Testing of I.C. Engine – performance parameters and characteristics, derivation of excess air, Minimum mass of air required for complete combustion, volumetric efficiency, scavenging, scavenging efficiency, charge efficiency, combustion efficiency, heat balance, Emission control, Exhaust gas Recirculation system, Catalytic converter, Particulate trap.

3. Design of Hydraulic and Pneumatic systems –Oil hydraulic system, Hydraulic actuators, control and regulation element, reciprocating quick return, accumulator circuit, industrial circuits, press circuits, milling grinding planning machine circuit design, Pneumatic system control element, pressure sensing, logic circuit, compound circuit design, combination circuit design, Hydro-pneumatic automation.

4. Power Plants – Fluctuating loads on Power plant, Effect of variable load on Power plant design and operation, Peak load plant, Economic Analysis of Power plant, Tariffs methods, Performance and operating characteristics, combined operation of different power plant, Pollution and its control.

Text Books and References:

1. P.K. Nag, Power Plant Engineering - Tata McGraw-Hill Publications.
2. M.M. EI-Wakil,Power Plant Engineering - McGraw- Hill Publications
3. G.D.Rai,An Introduction to Power plant engineering, Khanna Publishers, III edition,2001
4. Hydropower development series, Vol.1-17, Norwejian Institute of Technology,1996/2005.
5. Ganeshan. V, Internal Combustion Engine TaTa Mc Graw Hill
6. Edward F Obert, Internal Combustion Engine, Maxwell MC
7. Pipenger, Industrial Hydraulics
8. Stewart H. L, Hydraulic and Pneumatic Power for Production. Industrial Press NewYork

Name of the Program: **II Semester M. Tech. (Heat Power Engineering)**
Course Code: **1019**
Course Title: **Design of Heat Transfer Equipments (Elective)**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

1. Constructional details and Heat Transfer : Types – Shell and Tube heat Exchangers – Regenerators and remunerators- Industrial applications, Temperature distribution and its implications – LMTD – Effectiveness.
2. Flow distribution and stress analysis : Effect of Turbulence – Friction factor – Pressure loss – Channel diversion – stress in tube – heater sheets and pressure vessels – Thermal Stresses –shear stresses – Types of failure.
3. Design Aspects: Heat transfer and Pressure loss – Flow configuration : Effects of Baffles- effects of deviation from ideality – Design of typical liquid – gas, gas –Liquid heat exchanger.
4. Condensers and Evaporators design: Design of surface and evaporative condensers – Design of shell and tube – plate type evaporator. Cooling Tower : Packings – sprays design, selection of pumps – fans and pipe-testing and maintenance – experimental methods.

Text Books and References:

1. Process Heat Transfer - D.Q. Kern, McGraw-Hill Publications
2. Applied Heat Transfer - V. Ganapathy, Penn Well Publishing Company, Tulsa, Oklahoma.
3. Process Heat Transfer - Sarit Kumar Das, A. R. Balakrishan, Alpha Science International, 2005.

Name of the Program: **II Semester M. Tech. (Heat Power Engineering)**
Course Code: **1019**
Course Title: **Design of IC Engine Components and Subsystems (Elective)**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

1. Introduction to different types of IC engine systems, air standard cycle, air fuel cycle, actual cycle analysis.
2. Engine design and operating parameters, Fuels for engine and their characteristics, fuel air mixing, gas exchange, fuel injection systems, ignition.
3. Combustion chamber designs for spark ignition and compression ignition engines, engine cooling and cooling system design, engine lubrication system.
4. Emission control and electronic management systems, design of supercharged engines, IC engine exhaust emission, formation, effect of engine parameters, methods of measurement of emissions, methods of control

Text Books and References:

1. Ganeshan V, Internal Combustion Engine, Tata Mc GrawHill
2. Ganeshan V, Computer Simulation Four stroke spark ignition engines, University Press, Hyderabad
3. Ganeshan V, Computer Simulation Four stroke compression ignition engines, University Press, Hyderabad
4. Ashely S. Campbell, Thermodynamic Analysis of Combustion Engine, John Willey and sons NewYork

Name of the Program: **II Semester M. Tech. (Heat Power Engineering)**
Course Code: **1019**
Course Title: **Thermal Storage Systems (Elective)**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

1. Introduction: Necessity of Thermal storage – Energy storage devices , types of storage system- Specific areas of application – Heat Transfer Enhancement methods Sensible Heat Storage system : Basic Concepts and modeling of heat storage units, Modeling of simple water and rock bed storage system –Use of TRNSYS _ pressurized water storage system for power plant applications – packed beds.

2. Regenerators – Parallel flow and counter flow regenerators- Finite conductivity model – Non-linear model – Transient performance – step changes in inlet gas temperature – step changes in gas flow rate – Parameterization of transient response – Heat storage exchangers.

3. Latent Heat Storage system – Storage materials modeling of phase change problems and solution methodologies – Enthalpy modeling – Heat transfer enhancement configuration – Parameterization of rectangular, cylindrical geometric problems.

4. Applications- Specific areas of application of energy storage- Food preservation – Waste heat recovery – solar energy storage – Green House heating – Power Plant applications – drying and heating for process industries.

References:

1. F. W. Schmidt and A.J.Willmott, Thermal storage and Regeneration, Hemisphere Publishing Corporation 1981.
2. V. J. Lunardini, Heat Transfer In cold climates, D. Van Nostrand Reinhold NewYork 1981.

Name of the Program: **II Semester M. Tech. (Heat Power Engineering)**
Course Code: **1020**
Course Title: **Heat Power Engineering Lab - II**

Course Scheme					Examination Scheme		
Lecture	Tutorial	Practical	Periods per week	Credits	TW	POE	Total
-	-	04	04	04	50	50	100

Contents

Student is expected to perform at least eight Experiments/Practical's based on the prescribed syllabus of all the theory courses of second semester.

1. Expt. on Flow over a cylinder/sphere at different Re. Pressure variation over the body and drag
2. Expt. on Flow past an aerofoil: Pressure measurements, calculation of lift
3. Laminar/Turbulent boundary layer over a flat plate.
4. Study and trial on cascade refrigeration system
5. Study and trial on multi evaporator system
6. Trial on multi compressor system
7. Study and trial on heat pump
8. Study and trial on conventional refrigeration system

9. Study and trial on nonconventional refrigeration system
10 Study & Trial on Air-Conditioning systems

Name of the Program: **III Semester M. Tech. (Heat Power Engineering)**
Course Code: **1112**
Course Title: **Solar and Wind Energy Utilisation**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

1. Solar Resources: Passage through atmosphere, global distribution, optimal system geometry, Insulation amount available on earth, Resource estimation, solar data, solar radiation spectrum, seasonal and daily variation, effect of tilt angle.
   Solar Photovoltaic: The photo voltaic effect, spectral response, p-n junction, different types of photovoltaic cells, PV cell characteristic, effect of variation of temperature, equivalent circuits, Photovoltaic modules, module specification, PV arrays and system, storage batteries, charge regulators and controllers, Tracking system, Autonomous PV system, Grid linked PV system, System performance, economics and future prospects, and numerical
2. Solar Thermal: Principles of applied heat transfer, solar thermal collectors, glazing, evacuation, selective surfaces. Concentrators, types and applications, solar thermal applications water and space heating, solar ponds, dryers, distillation, solar cooker, passive solar design and numerical.
3. Wind Resources : Nature of atmospheric wind, wind resource characteristic and assessment, Anemometry wind statistics, Weibull distribution, Aerofoil characteristic, lift, drag, stall, Design of wind turbine with blade twist and taper, effect of stall and blade pitch, optimal choice of cut-in, rated and cut-in speeds. Control policies and their effect on energy capture.
4. Planning of wind farms, special function for develop countries, cost of electricity from wind farm,. Environmental assessment, noise, visual impact, wind statistics. Atmospheric turbulence. Gust wind speed, effect of topography, aerodynamic loads, tower shadow, wind shear, blade coning, gyroscopic, transient and extreme loads. Damping and stability, teetering motion.

Text and Reference Books:

1. Renewable Energy Sources by Twidell and Weir, ELBS London
2. Solar Engineering of Thermal Processing by Duffy and Beckman
3. Solar Photovoltaic Engineering System by Messenger
4. Solar Energy by Dr. S.P. Sukhatme
5. Wind Machines by Frank Eldridge VNR int. London
6. Energy Technology by Rao – Parulekar Khanna Publisher
7. Non Conventional Energy Sources by G. D. Rai, Khanna publishers
8. Handbook on Energy Efficiency by Y. D. Goswami
9. Solar Energy by J.P.Garg and Prakash.

Name of the Program: **III Semester M. Tech. (Heat Power Engineering)**
Course Code: **1113**
Course Title: **Self Study Lab on CFD**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

List of Tutorials on CFD:

1. Geometry Creation For 2d Pipe Junction
2. Fluid Flow And Heat Transfer In A Mixing Elbow
3. Laminar Pipe Flow
4. Turbulent Pipe Flow
5. Rigid Body Modeling
6. Immersed Solids
7. Parallel Plate Channel Grid
8. Internal Forced Flow
9. External Forced Flow / Wind Loading
10. Natural Ventilation (Internal And External Combine)

Name of the Program: **III Semester M. Tech. (Heat Power Engineering)**
Course Code: **1114**
Course Title: **Grand Seminar**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
--	04	-	04	04	--	--	100	--	100

Contents

- Admitted candidates are required to deliver a seminar on any topic based on all courses of Second Semester of the program
- Further that the selected topic will be other than topic/area of study selected for the Dissertation during third and fourth semester.

Name of the Program: **III Semester M. Tech. (Heat Power Engineering)**
Course Code: **1115**
Course Title: **Pre Dissertation**

Course Scheme					Examination Scheme		
Lecture	Tutorial	Practical	Periods per week	Credits	TW	POE	Total
--	--	8	8	8	200	--	200

Contents

Student is expected to choose the topic of his dissertation. The scope of proposed study must be in the relevant discipline/area. Student is expected to carry out the following.

1. Identification of proposed Topic/Area of Study for the Dissertation
2. Literature Review related to proposed topic
3. Formulation of Scope & Methodology for the proposed study.
4. Formulation of Hypothesis for the selected study.
5. Preliminary Dissertation

Student should prepare & submit a Pre-Dissertation report covering the above mentioned tasks. Evaluation will be on the basis of Brief Report on Dissertation Study undertaken on specified date at the end of semester, Seminar & Viva-Voce.

Name of the Program: **IV Semester M. Tech. (Heat Power Engineering)**
Course Code: **1204**
Course Title: **Final Dissertation**

Course Scheme					Examination Scheme		
Lecture	Tutorial	Practical	Periods per Week	Credits	TW	POE	Total
-	-	20	20	20	250	250	500

Contents

Student is expected to carry out further work on the topic of his dissertation selected in Third Semester. For completion of the selected Dissertation study, the given student is to undertake various activities like System Analysis, System Modeling, System Design and Testing. The student has to deliver a pre-submission seminar on the specified schedule before final submission of the study report in the specified format. The student is also expected to write and register at least two research papers on his/her study undertaken in refereed journals and conferences. Evaluation for this component will be on the basis of submitted Report, Seminar & Viva-Voce.