VEER NARMAD SOUTH GUJARAT UNIVERSITY

B.E. Mechanic

Semester -V

SYLLABUS OF FIFTH SEMESTER

Teaching Scheme (New Scheme w.e.f. from Aug 1998)			Theory Examinations		Practical / Term work / Sketching / Viva / Quiz			
Subject	**Subject Code**	**L T P (Hrs)**	**Duration (Hrs)**	**Marks**	**Tutorial**	**Cont. Evaluation**	**Exam. (Pract)**	**Total Marks**
Theory of Machines - II	MED 501M	3 0 2	3	100	-	20	30	50
Heat & Mass Transfer	MED 502M	3 0 2	3	100	-	20	30	50
Hydraulic Machines	MED 503M	3 0 2	3	100	-	20	30	50
Mechanical Technology - II	MED 504M	3 0 4	3	100	-	40	60	100
Thermodynamics - II	MED 505M	3 1 0	3	100	25	-	-	25
Elements of Mechatronics	MED 506M	3 1 0	3	100	25	-	-	25
Total		18 2 10		600	50	100	150	300
Total Contact Hours = 30			**Total Marks = 900**					

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MED 501 M Theory of Machines - II			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	-	2
Examination Scheme Marks	100	00	Continuous Evaluations 20 Examination 30

1. **Introduction :** Modes of heat transfer, Conduction, Convection and Radiation.
2. **Conduction :** Fourier's law. General Three dimensional heat conduction equation in cartesion, cylindrical and spherical co-ordinates. One dimensional steady conduction through plane wall, cylinder and sphere, heat source systems in plane wall and cylinder. Heat transfer from fins of uniform cross section. Two dimensional steady state conduction through plane wall. One dimensional unsteady state heat conduction.
3. **Convection :** Free and Forced convection.
   - 3.1. Forced Convection : Energy integral equation of the boundary layer on a flat plate and integral solution for evaluation of heat transfer from a fluid friction and heat transfer; Similarity conditions in heat transfer processes, dimensional analysis.
   - 3.2. Free Convection from a vertical flat plate, Grashoff number. Impirical relations and their use. Fundamentals of boiling heat transfer.
4. **Radiation :** Thermal radiation, monochromatic and total emissive power. Basic laws of radiation. Radiation shape factors, black and grey surfaces, Heat transfer in presence of re-radiating surfaces.
5. **Heat Exchangers :** Basic types of heat exchangers, fouling factors, LMTD; Effectiveness - NTU methods of design.
6. **Mass transfer :** Fick's laws of diffusion; Diffusion in dilute solutions in stationary media, one dimesnsional diffusion in gases with one component stationary. Convective mass transfer : Forced diffusion from a flat plate. Simultaneous heat and mass transfer.

Practicals : Based on the above syllabus a minimum of eight practicals are to be performed.

REFERENCES :

1. S.P. Sukhatme, Heat Transfer, Universities Press (India), (1996).
2. J.P. Holman, Heat Transfer, McGraw Hill Book Co., (1992).
3. Eckert and Drake, Heat and Mass Transfer, McGraw Hill, (1960).

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MED 502 M Heat & Mass Transfer

	Lectures	Tutorial	Practical
Teaching Hours	3	-	2
Examination Scheme Marks	100	00	Continuous Evaluations 20 Examination 30

7. Introduction : Modes of heat transfer, Conduction, Convection and Radiation.

8. Conduction : Fourier's law. General Three dimensional heat conduction equation in cartesion, cylindrical and spherical co-ordinates. One dimensional steady conduction through plane wall, cylinder and sphere, heat source systems in plane wall and cylinder. Heat transfer from fins of uniform cross section. Two dimensional steady state conduction through plane wall. One dimensional unsteady state heat conduction.

9. Convection : Free and Forced convection.
3.1. Forced Convection : Energy integral equation of the boundary layer on a flat plate and integral solution for evaluation of heat transfer from a fluid friction and heat transfer; Similarity conditions in heat transfer processes, dimensional analysis.
3.2. Free Convection from a vertical flat plate, Grashoff number. Impirical relations and their use. Fundamentals of boiling heat transfer.

10. Radiation : Thermal radiation, monochromatic and total emissive power. Basic laws of radiation. Radiation shape factors, black and grey surfaces, Heat transfer in presence of re-radiating surfaces.

11. Heat Exchangers : Basic types of heat exchangers, fouling factors, LMTD; Effectiveness - NTU methods of design.

12. Mass transfer : Fick's laws of diffusion; Diffusion in dilute solutions in stationary media, one dimesnsional diffusion in gases with one component stationary. Convective mass transfer : Forced diffusion from a flat plate. Simultaneous heat and mass transfer.

Practicals : Based on the above syllabus a minimum of eight practicals are to be performed.

REFERENCES :

4. S.P. Sukhatme, Heat Transfer, Universities Press (India), (1996).
5. J.P. Holman, Heat Transfer, McGraw Hill Book Co., (1992).
6. Eckert and Drake, Heat and Mass Transfer, McGraw Hill, (1960).

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MED 503 M Hydraulic Machines			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	-	2
Examination Scheme Marks	100	00	Continuous Evaluations 20 Examination 30

1. Introduction : Two dimensional flow past bodies, Aerofoil, Lift and drag.
2. Pumps : Classification, Principles of working of different types of pumps, pump parameters, similarity and model analysis specific speed.

   2.1. Centrifugal pump : Theoritical head - Euler equation, Types of implellers, flow through blade passages, velocity analysis, energy transfer, effect of turbulence and friction, H-Q characteristic, diffusion action in volute and diffuser passages, losses in centrifugal pumps, different efficiences, operation of pump, cavitation in pumps, pumps for special applictations, axial thrust in pumps.

   2.2. Axial flow pumps : Construction details, velocity analysis, aerofoil theory, flow in diffuser, characteristics, cavitation, testing of pumps.
3. Turbines : Different types of turbines, constructional details, working principles, parameters, specific speed, classification, degree of reaction, recent development in turbines, important hydropower plants in the country.

   3.1. Pelton wheels : Simplified theory, velocity triangles, various losses, efficiency, best speed, errors in simplified theory.

   3.2. Reaction turbines : Generalized theory, francis turbine, velocity triangles, variation of velocity along the width of passage, correction for finite number of blades. Axial flow turbines, aerofoil theory, flow through spiral casiring, speed rising and guide apparatus, draft tube, cavitation.

   3.3. Testing of Turbines : Standard test, operating characteristic, regulation of turbines.

Practicals : Based on the above syllabus a minimum of eight experiments are to be performed.

REFERENCES :

1. Vasandani V.P. : Theory of Hydraulic Machines, Khanna Publishers, (1975).
2. Ramamrutham S. : Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai and sons, (1996).
3. Lal Jagdish, Hydraulic Machines, Metropolitan Book Co. Pvt. Ltd., (1973).
4. Subramanya K. : Theory and Applications of Fluid Mechanics (Including Hydraulic Machines), Tata McGraw Hill Publishing company Ltd, (1993).

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MED 504 M Mechanical Technology - II			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	-	4
Examination Scheme Marks	100	00	Continuous Evaluations 40 Examination 60

1. Machine Tools : Introduction, Classification, Primary cutting motions, feed and auciliary motions, gearing diagram, transmission ratios of drives.
2. Lathe, Gearing diagram, mechanisms, operations, tools tool angles, setting if machines for various jobs, special attachments.
3. Capstan and Turret-Mechanisms, Tool holders, attachments, Types of tools, Tool layouts, process layouts.
4. Shaper, Planer, Slotter - Principles, processes, gearing diagram (Kinematics), mechanisms, cutting parameters, work holding methods, Tools.
5. Drilling and Boring Machines - Types, gearing diagrams, mechanisms, attachments, accessories, tools.
6. Milling - Types, gearing diagram of column and knee type milling machine, operations, up and down milling, holding of tool and work, cutters and angles, attachments, mechanisms.
7. Grinding - Importance of finishing process, types of machines and operations, gearing diagram, mechanisms, attachments and accessories, wheel designation, mounting and balancing, dressing and trueing. Introduction to microfinishing processes such as honning, lapping, superfinishing.
8. Broaching - Purpose, processes, classification, attachments, tools.
9. Introduction to jigs and fixtures, principles of location and clamping. Types of jigs, field of applications, Types of fixtures and their uses.

Practicals : Based on the above syllabus minimum nine experiments are to be performed.

REFERENCES :

1. R.K. Jain, Production Technology, Khanna Publishers, (1993).
2. H.S. Bawa, Workshop Technology, Vol.II, Tata McGraw Hill, (1995).
3. S.K. Hajrachowdhury etal., Workshop Technology, Vol.II, Media Promotors and Publishers Pvt. Ltd., (1992).
4. B.D. Arora, Workshop Technology, Vol. II, Satya Prakashan, (1988).

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MED 505 M Thermodynamics - II			
	Lectures	Tutorial	Practical
Teaching Hours	3	1	-
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. Availability and Exergy : Basic concepts; available and unavailable energy in a cycle and in a process. Helmholtz and gibb's functions energy, second law analysis of boilers, turbines, heat exchanger etc.
2. Thermodynamic Relations and Equilibrium : The maxwell relations, clausis-clapeyron equation, Joule-thomson Coefficient, relationships involving specific heats.
3. Real Gases : Equations of state for real gases, viral coefficients, Vander Wall's equation, critical parameters, reduced pressure temperature and volume.
4. Reactive Mixtures (Combustion) : Combustion equations, stoichiometric air, excess air. Air fuel rati by volume and by weight. enthalpy of formation, Enthalpy and internal energy of combustion. Adiabatic flame temperature, equilibrium constants, Fugacity and activity.
5. Vapour Power Cycles : Simple steam power cycle, Rankine cycle, Rankine cycle efficiency, Actual vapour cycle processes, comparison of rankine and carnot cycles. Reheat cycle, Regenerative cycle, Supercritical Rankine cycle, Reheat-Regenerative cycle.
6. Gas Power Cycles : Carnot cycle, stirling cycle, Ericsson cycle, Air standard cycles, Otto cycle, Diesel cycle, Dueal cycle, Brayton cycle, Air standard cycle for jet propussion.
7. Refrigeration Cycle : Simple Vapour compression cycle, multistage vapour compression cycle, absorption refrigeration cycle.

REFERENCES :

1. Saad M.A. : Thermodynamics for Engineers, Prentice Hall, (1969).
2. Haung F.F. : Engineering Thermodynamics, Mac Millian Publishing Co. Inc. (1976).
3. Holman J.P. : Thermodynamics, McGraw Hill Book Co., (1974).
4. Obert E.F. : Concepts of Thermodynamics, McGraw Hill, (1960).
5. Zeemansky M. W. and Van Ness, H.C. : Basic Engineering thermodynamics, McGraw Hill Book Co., (1966).

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MED 506 M Elements of Mechatronics			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	1	-
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. Introduction to Mechatronics : Definition, Industrial application, building blocks of mechatronics.

2. Sensors and Transducers : Classification, Resistive (Potentiometer strain gauge, thermistor, resistive thermometers etc). Capactive, Inductive (LVDT etc), piezoelectric, optical (LED, Opto-couplers, photo-detectors, optical encoders etc), ultrasonic transducers (flow measurements, distance measurement etc), Interface and noise in measurements.

3. Motion Control : Drives and Actuatos (Hydraulic, pneumatic, electric etc) and their controls motion converters (fixed ratio type, invariant motion profile type, variators etc).

4. Elements of Electronic devices : Semiconductor theory, junction diode and transistor characteristics, signal amplifiers, operational amplifers, signal isolation and signal conditioning circuits.

5. Introduction to digital circuits : Boolean functions - AND, OR, NOT, NAND, NOR, Exculsive-OR and equivalence gates, combinational circuits (adders, subtractors, encoders, decoders, multiplexers, demultiplexers, memory units - RAM, ROM, EPROM etc). Concept of sequential circuits.

6. Electronic system design : Block diagram approach toAnalog-to-Digital and Digital-to-Analog converters, timer and counter units, Microprocessor basics (CPU, bus, memory, peripheral interfacing and Assembly language programming etc.).

REFERENCES :

1. D.A. Bradley, D. Dawson , N.C. Burd & A.J. Loader : Mechatronics : Electronics in products and processes, Chapman & Hall, (1991).
2. John Pippenger Tykr. Hicks : Industrial Hydraulics, McGraw Hill, (1973).
3. E.W. Reeds, I.S. Lasman : Fluid Power with MP control : An Introduction, Prentice Hall, (1967).
4. A.K. Sawhney : Electrical and Electronic Measurements and Instrumentation,(1995).
5. K. Mehta : Elements of Electronics,(1995).
6. Morris Mano : Digital Logic and Computer Design, Prentice Hall,(1976).