VEER NARMAD SOUTH GUJARAT UNIVERSITY

B.E. Mechanic

Semester - VI

SYLLABUS OF SIXTH SEMESTER

Teaching Scheme (New Scheme w.e.f. from Jan 1999)			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**
Machine Design - I	MED 601M	3 0 4	4	100	-	40	60	100
IC Engines & Automative Engineering	MED 602M	3 0 2	3	100	-	20	30	50
Refrigeration & Air Conditioning	MED 603M	3 0 2	3	100	-	20	30	50
Industrial Engineering	MED 604M	3 1 0	3	100	25	-	-	25
Tribology & Machine Dynamics	MED 605M	3 0 2	3	100	-	20	30	50
Computer Aided Engineering Analysis	MED 606M	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 601 M Machine Design - I			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	-	4
Examination Scheme Marks	100	-	Continuous Evaluations 40 Examination 60

1. Introduction : The design process, morphology of design, designing methods, concurrent engineering.

2. Design Analysis : Types of loads and stresses. Factor of safety types of failure, theories of failure, fatigue failure analysis, soderbergs and goodmani methods, estimation of life of a component. Wear failure introduction to creep failure.

3. Selection of Material : Factors affecting material selection. Ferrous, non-ferrous metals and alloys. Plastics for machine parts.

4. Design of Machine components : Parts subjected to tension, compression, shear, bending and torsion - such as tie rods, push rods, levers, axles etc. Parts subjected to combined loads - such as over hang ranks, handles, etc. Design of helical compression and extension springs, leaf springs.

5. Design of joints and connections : Pin joints and cottered joints, revitted connections, welded joints.

6. Design of screws and threaded fasteness : Types of screw threads, Indian standard proportions, design of power screws. Threaded fasteness types of bolts and connections, stresses and preloading of bolts. Flanged connections, gaskets, bolts of uniform strenght, eccentrically loaded bolted connections.

7. Design of shafts : Types of shafts, ASME code for design of shafts, deflection of shafts, critical speed. Design of keys and splines.

8. Design of simple machines : Design of rigid and flexible couplings, screw jack, screw press, toggle jack, bearing puller. I.C. Engines connnecting rod, I.C. engine valve gear.

9. Thick and Thin cylinders, shrink fitted and pressfitted connections.

10. Manufacturing considerations : Standardization, limits, fits and tolerances as per I.S. Specification, factors to be considered in design of castings, foryings and welded components.

Practicals : Based on the above syllabus each students has to prepare assembly/details drawings and has to submit the design reports of atleast four designs and a set of design problems.

REFERENCES :

1. A. Ghosh and A.K. Malick, Manufacturing Science, Affiliation East West,New Delhi (1985)
2. Joseph Shigley, Mechanical Engineering Design, McGraw Hill Book Co., (1989).
3. R.C. Patel et.al, Machine Design, Vol. I & II, C. Jamnada & Co., (1992).
4. Various Indian Standards and Design Data Books.

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MED 602 M IC Engines & Automative Engineering			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	-	2
Examination Scheme Marks	100	-	Continuous Evaluations 20 Examination 30

1. Introduction to I.C. Engines.
2. Air standard cycles, Ideal air standard cycles, Fuel air cycles, characteristics of fuel air mixtures, variation of specific heats. Actual cycles, actual processes taking place in engines.
3. Combustion in S.I. Engine and C.I. Engines : Stages of combustion in S.I. Engine, Detonation, Control of detonation. Stages of combustion in C.I. Engines, delay period, factors influencing delay period, diesel knock, control of diesel knock.
4. Carburettion and fuel injection : Requirements of a good carburettor, simple carburettor, complete carburettor, Calculation of air-fuel ratio for a simple carburettor. Electronic fuel injection in S.I. engine.
5. Requirements of diesel injection system, types of injection systems, fuel pumps.
6. Various systems of I.C. Engine, Lubrication system, function of lubricating system. Cooling system etc.
7. Testing and performance : Variable speed test of S.I. Engine, Constant speed load tests of C.I. Engines morse tests.
8. Engine Emissions : Pollutants and their ill effects, pollutants from Gasoline and diesel and their control.
9. Modern Developments : Alternate fueled engines, Alcohol, hydrogen etc.
10. Lay-out of transmission system of automotive vehicle : Types & its components and Braking and suspension system of automotive vehicle : various types, steering sytem, types, functions.
11. Electrical systems of automotive vehicle, chasis, wheels, Types of tyres, functions of tyres, tread design etc.

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

REFERENCES :

1. Ganeshan V. : Internal Combustion Engines, McGraw Hill Company, (1992).
2. Mathur M.L. and Sharma R.P. : A Course in internal combustion engines, Dhanpat Rai and Sons, (1980).
3. Newton and Steed : Automobile Engineering, ELBS Publishing, (1978).
4. Narang G.B.S. : Automobile Engineering, Dhanpat Rai and Sons, (1988).

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MED 603 M Refrigeration & Air Conditioning			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	-	2
Examination Scheme Marks	100	-	Continuous Evaluations 20 Examination 30

1. Gas cycle Refrigeration : Air refrigeration system, bell colleman air cycle, boot strap system, air craft refrigeration systems, acutal cycle, ramming, compression and turbine efficiencies, C.O.P.

2. Vapour Compression Refrigeration : Analysis of vapour compression cycle, losses and efficiencies of components, heat balance, compound compression with intercooler, multievaporation, cascading.

3. Absorption Refrigeration : Desirable properties of refrigerants and solvents, Thermodynamic analysis of absorption system. Basic cycle.

4. Psychrometry and Psychrometric Processes : Preparation of psychrometric charts, choice of coordinates, temperatures, enthlpy deviation, psychrometric measurements, mixing process, bypass factor, apparatus dew point, sensible heat factor, adiabatic humidification, efficiency of humidification, hot water and cold water humidification, enthalpy potential.

5. Load Calculation : Calculation of summer and winter loads, Heat gain through walls, roofs, floors, windows, and doors.

6. Air Conditioning Systems and Equipments : Humidifiers, air coolers, dehumidifiers, air cleaning, impurities in air and air cleaners, air washers, ducts, pressure drop in ducts.

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

REFERENCES :

1. Arora S.C. & Romkundwar S. : A Course in Refrigeration and Air conditioning, Dhanpat Rai and Sons, (1997)
2. Thrakeld J.L. : Thermal Environmental Engineering, Prentice Hall, (1982).
3. Stoeaker W.F. : Refrigeration and Air conditioning, McGraw Hill, (1986).
4. Dossat R.J. : Principles of Refrigeration, John Wiley and Sons, (1988).

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MED 604 M Industrial Engineering			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	1	-
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. Productivity : Production and productivity, factors affecting productivity, management techniques for increasing productivity, productivity improvement - human aspects, measurement of productivity.
2. Production Planning and Control : Histroy and functions, Sales forecastings, product life cycle, sales forecasting techniques such as judgemental, delphi and user's expectations techniques, time series analysis, regression and correlation methods, exponential smoothing technique etc., case studies.
3. Inventory Control : Inventory costs and inventory management systems, ABC analysis, EOQ models - EOQ with shortage, discount, for production runs safety stocks. Case studies.
4. Work Study : Process charts, flow and string diagrams, travel, gang, multiple activity and SIMO chart, principles of motion economy, therbligs, micromotion and memomotion studies. Time study, elements, rating, normal time, allowances, number of observations, standard time calculations, time recording devices, methods of reading stop watch.
5. Work Sampling : Methods of work sampling, control charts, estimation of utilization, delays and standard time, bias.
6. Production study and PMTS : Checking validity of time standard, verification of fatigue, contingent and personal needs allowances, PMTS.
7. Job Design and Human Factor Engineering (Ergonomics) : Job design and its objectives, job specialisation, job enalargement, job enrichment, job rotation. Design of workplace, tools and materials, machinery and control, Environment. Fatigue, man - machine systems.
8. Cost and Investment Analysis : Break-even analysis, make or buy decisions, depreciation, annual cost method, present value method, rate of return method, payable period method.
9. Value Analysis : Value and its types, cost control and cost reduction, value engineering, value control, procedure and applications of value analysis.

REFERENCES :

1. S.K. Hajra Choudhary & Nirjhar Roy : Production Management - An Integrated Approach to Industrial Engineering , Media Promoters and publishers, (1990).
2. Dr. H.S. Shan : Work Study and Ergonomics, Dhanpatrai and Sons, (1992).
3. N.D. Vohra : Quantitative Techniques in Management, Tata McGraw Hill Publishing Co., Ltd., (1992).
4. T.R. Banga, N.K. Agarwal, S.C. Sharma : Industrial Engineeing and Managment, Khanna Publishers, (1995).
5. Introduction to work study, ILO, (1977).

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MED 605 M Tribology & Machine Dynamics			
	Lectures	Tutorial	Practical
Teaching Hours	3	-	2
Examination Scheme Marks	100	-	Continuous Evaluations 20 Examination 30

1. Introduction to tribology and surface tepography.
2. Concepts of friction and wear and measurement techniques.
3. Properties and testing of lubricants.
4. Regimes of lubrication. Application of lubrication mechanism in bearing design. Basic concepts of hydrodynamic lubrication theory.
5. Hydrostatic and boundary lubrication.
6. Fundamentals of vibrations : Introduction, defination, SHM, beats phenomenon, complex method of representing harmonic vibrations.
7. Undamped free vibrations of single degree of freedom system : Introduction, derivation of differential equations and its solution, equivalent stiffness of spring combinations, Newtons method and energy method for problem solutions.
8. Damped free vibrations of single degree of freedom system : Different types of dampings, free vibrations with viscous damping, over damped, critically damped under-damped systems. Loganthmic decroment, viscous dampers.
9. Forced Vibration of single degree of freedom systems : Forced vibration with constant harmonic excitation, with rotating and reaprocating unbalance, due to the support, vibration isolation and transmissibility, measuring instruments, displacement, velocity acceleration, frequency measuring instruments.
10. Whirling and Critical Speed of shafts, Introduction to multi degree of freedom system.
11. Cam Dynamics : Forces in rigid systems, follower responce by phase-plane method, jump and cross-over, johnson's numerical method.

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

REFERENCES :

1. R.D. Arnell, P.B. Davies, J. Halling and T.L. Whomes : Tribology - Principles and Design Application, Springer - Verlag Publication, (1991)
2. B.C. Majumdar, : Introduction to Tribology of Bearings, A.h. Wheeler and Co. Pvt. Ltd., (1986).
3. A. Cameron : Basic Lubrication Theory, wiley Eastern Ltd.., (1987).
4. G.K. Grover : Mechanical Vibrations, Nemchand & Bros.,(1995).
5. S. Graham Kelly : Mechanical Vibratons, McGraw Hill International Book Co.,(1995).
6. J.E. Shigley : Theory of Machines and Mechanism , Tata McGraw Hill Book Co., Ltd.,(1992).

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MED 606 M Computer Aided Engineering Analysis			
	Lectures	**Tutorial**	**Practical**
Teaching Hours	3	1	-
Examination Scheme Marks	100	25	Continuous Evaluations 00 Examination 00

1. Introduction to Computer Aided Engineering, Types of problems, encountered in mechanical engineering. Classification of problems based on methods of solution.
2. Solution of Systems of Algebraic Equations : Gauss elimination, Matrix inversion, Gauss-seidel, L-U decomposition, Newton-Rephson methods and their application to mechanical engineering problems.
3. Curve Fitting : Least squares regression analysis, Newtons and Lagrange interpolating polynomials. Curve fitting with sinusoidal functions.
4. Numerical Differentiation & Integration : Newton-cotes, Gauss quadrature integration techniques.
5. Solution of ordinary differential equations : Eulers method, Runga-Kutta method, Boundary value and eigen value problems. Application of these methods to mechanical engineering problems. Taylor series, Predictor-Corrector method.
6. Finite Difference Method : Methods to derive finite difference equations. Elliptic and prabolic equaltions, boundry conditions, explicit and implicit method. Application to mechanical engineering problems.
7. Finite Element Method : Methods of derving finite element equations. Type of elements and Interpolation (Shape) funtion. Formation and Assembly of global matrices. Treatment of boundary conditions. Application of finite element method to mechanical engineering problems.
8. Software : Introduction to some software used in CAE, Solving simple problems using computer.

REFERENCES :

1. M.K. Jain, S.R.K. Iyengar & R.K. Jain : Numerical Methods for Scientific and Engineering Computation, Wiley Eastern Ltd., (1995).
2. S.S. Chapra & R.P. Canale, Numerical Methods for Engineers, McGraw Hill International edition, (1989).
3. Larry J. Segerlind, Applied Finite Element Analysis, John Wiley & Sons, (1984).
4. John H. Mathews, Numerical Methods, Prentice Hall of India, (1994)