Enclosure to Item No. 11.24
27.5.2009

UNIVERSITY OF MUMBAI

Revised Syllabus for the

Third Year Mechanical Engineering

(Semester V

(With effect from the academic year 2009-2010)

UNIVERSITY OF MUMBAI
SCHEME OF INSTRUCTION AND EVALUATION (R 2007)
COURSE: B.E. (MECHANICAL ENGINEERING)

SEMESTER: V

Sr. No	Subjects	No. of periods of 1Hour			Duration of Theory Paper in Hours	Marks				
		Lecture	Practical	Tutorial		Theory Paper	Term Work	Practical	Oral	Total
1	Mechanical Measurement & Metrology*	4	2	--	3	100	25	--	25	150
2	Theory of Machines –II*	4	2	--	3	100	25	--	25	150
3	Fluid Mechanics*	4	2	--	3+2PE	100	25	25	25	175
4	Heat and Mass Transfer*	4	2	--	3	100	25	--	25	150
5	Graphics User Interface Data Base Management	3	2	--	4(PE)	--	50	50	50	150
6	Environmental Studies*	2	--	1 #	2	50	25	--	--	75
	TOTAL	21	10	1	--	450	175	75	150	850

*Common with Automobile engineering. #Class wi
(PE) - Practical Examination

COURSE: B.E. (MECHANICAL ENGINEERING)

SEMESTER: VI

Sr. No	Subjects	No. of periods of 1Hour			Duration of Theory Paper in Hours	Marks				
		Lecture	Practical	Tutorial		Theory Paper	Term Work	Practical	Oral	Total
1	Mechatronics*	4	2	--	3+2PE	100	25	25	--	150
2	Hydraulic Machinery	4	2	--	3	100	25	--	--	125
3	Mechanical Vibrations*	4	2	--	3	100	25	--	25	150
4	E-Commerce and Industrial Finance	4	--	01	3	100	25	--	--	125
5	Internal Combustion Engine*	4	2	--	3+2PE	100	25	25	--	150
6	Machine Design– I *	4	2	--	4	100	25	--	25	150
	TOTAL	24	10	01	--	600	150	50	50	850

*Common with Automobile engineering.
(PE) - Practical Examination Environmental Studies*

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UNIVERSITY OF MUMBAI

SCHEME OF INSTRUCTION AND EVALUATION (R 2007)

COURSE: B.E. (MECHANICAL ENGINEERING)

SEMESTER: V

Sr. No	Subjects	No. of periods of 1Hour			Duration of Theory Paper in Hours	Marks				
		Lecture	Practical	Tutorial		Theory Paper	Term Work	Practical	Oral	Total
1	Mechanical Measurement & Metrology*	4	2	--	3	100	25	--	25	150
2	Theory of Machines –II*	4	2	--	3	100	25	--	25	150
3	Fluid Mechanics*	4	2	--	3+2PE	100	25	25	25	175
4	Heat and Mass Transfer*	4	2	--	3	100	25	--	25	150
5	Graphics User Interface Data Base Management	3	2	--	4(PE)	--	50	50	50	150
6	Environmental Studies*	2	--	1 #	2	50	25	--	--	75
	TOTAL	21	10	1	--	450	175	75	150	850

*Common with Automobile engineering. #Class wise Tutorials
(PE) - Practical Examination

COURSE: B.E. (MECHANICAL ENGINEERING)

SEMESTER: VI

Sr. No	Subjects	No. of periods of 1Hour			Duration of Theory Paper in Hours	Marks				
		Lecture	Practical	Tutorial		Theory Paper	Term Work	Practical	Oral	Total
1	Mechatronics*	4	2	--	3+2PE	100	25	25	--	150
2	Hydraulic Machinery	4	2	--	3	100	25	--	--	125
3	Mechanical Vibrations*	4	2	--	3	100	25	--	25	150
4	E-Commerce and Industrial Finance	4	--	01	3	100	25	--	--	125
5	Internal Combustion Engine*	4	2	--	3+2PE	100	25	25	--	150
6	Machine Design– I *	4	2	--	4	100	25	--	25	150
	TOTAL	24	10	01	--	600	150	50	50	850

*Common with Automobile engineering.
(PE) - Practical Examination Environmental Studies*

CLASS: TE (Mechanical/Automobile)			Semester:-V
SUBJECT: **MECHANICAL MEASUREMENT & METROLOGY**			
Periods per week 1Period of 60 min.	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	--	--
	Oral Examination		25
	Term Work		25
	TOTAL		**150**

Sr. No.	Details	Hrs.
Module 01	1.1 Significance of Mechanical Measurements, Classification of measuring instruments, generalized measurement system, types of inputs: Desired, interfering and modifying inputs. 1.2 Static characteristics: Static calibration, Linearity, Static Sensitivity, Accuracy, Static error, Precision, Reproducibility, Threshold, Resolution, Hysteresis, Drift, Span & Range etc. 1.3 Errors in measurement: Types of errors, Effect of component errors on combination and distribution of combination errors on components, Probable errors.	8
Module 02	2.1 Displacement measurement: Transducers for displacement measurement, Potentiometers, LVDT, Capacitance type, Digital transducers (optical encoder), Nozzle flapper transducer. 2.2 Strain measurement: Theory of Strain Gauges, Gauge factor, Temperature compensation, Bridge circuit, Orientation of Strain Gauges for Force and Torque measurement, Strain Gauge based Load Cells and Torque Sensors.	9
Module 03	3.1 Measurement of angular velocity: Tachometers, Tachogenerators, digital tachometers and Stroboscopic methods 3.2 Pressure measurement: Pressure standards, Elastic pressure transducers viz. Bourdon Tubes, Diaphragm, Bellows and piezoelectric pressure sensors. High-pressure measurements, Bridgman gauges Calibration of pressure sensors. 3.3 Vacuum measurement: Vacuum gauges viz. McLeod gauge, Ionization and Thermal Conductivity gauges.	8
Module 04	4.1 Acceleration Measurement: Theory of accelerometers and vibrometers. Practical Accelerometers, strain gauge based and piezoelectric accelerometers. 4.2 Temperature measurement: Thermodynamic Temperature Scale and IPTS. Electrical methods, of temperature measurement, Resistance thermometers, Thermistors and Thermocouples, Pyrometers.	7

Module 05	5.1 Metrology: Standard of measurement, line and end standards wave length standard, working standards, requirements of interchangeability, allowance and tolerance, limits and fits, B.S. and I.S. specifications for limits and fits, limit gauging, automatic gauging, needs in semi-automatic, automatic production, principle of operation, features of in process gauging system.	7
Module 06	6.1 Use of comparators such as mechanical, optical, electrical, electronics and pneumatic. 6.2 Angular measurements, angle gauges, sine bar, levels, clinometers and taper gauges. 6.3 Metrology of screw threads, limits gauging of screw threads. 6.4 Gear measurements. 6.5 Measurement of flatness and square ness, surface finish definition and measurement of surface texture, study and use of profile projector and tool maker's microscope, dividing head and auto-collimator.	9

List of Experiments:

Laboratory Experiments: (At least 8 experiments from the list)

1. Calibration of Displacement sensors like LVDT, Potentiometers etc.
2. Calibration of Pressure Gauges
3. Calibration of Vacuum Gauges
4. Torque measurement using strain gauges
5. Calibration of tachometers
6. Vibration Measurement & Calibration of Accelerometers.
7. Angle measurement by sine bar.
8. Flatness and surface finish measurement.
9. Study and use of profile projector.
10. Screw thread measurement using floating carriage.
11. Gear measurement using Parkinson Gear Roll Tester.

Theory Examination:

1. Question paper will comprise of total seven questions, each of 20 Marks
2. Question one will be compulsory and based on maximum part of syllabus.
3. Remaining questions will be mixed in nature (for example if Q.2 has part (a) from module 3, then part (b) will be from any module other than module 3)
4. Only five question need to be solved.

In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Oral Examination:

Oral examination will be on maximum portion of syllabus.

Term Work:

Term work shall consist of minimum **08** experiments, assignments on each module and written test. The distribution of marks for term work shall be as follows:

- Laboratory work (experiments/assignments): ..... (15) Marks.
- Test (at least one): ..... (10) Marks.

TOTAL: ..... (25) Marks.

Text Books:

1. Measurement Systems (Applications and Design) 5th ed.- E.O. Doebelin - *McGraw Hill.*
2. Dimensional Metrology, Connie Dotson, *CENGAGE Learning*
3. Mechanical Engineering Measurement - Thomas Beckwith, N.Lewis Buck, Roy Marangoni - *Narosa Publishing House, Bombay.*
4. Mechanical Engineering Measurements - A. K. Sawhney - *Dhanpat Rai & Sons, New Delhi.*
5. Instrumentation Devices & Systems - C.S. Rangan & G.R.Sarma - *Tata McGraw Hill.*
6. Instrumentation & Mechanical Measurements - A.K. Thayal.
7. Engg. Metrology, R.K. Jain,

References:

1. Experimental Methods for Engineers - J. P. Holman. - McGraw Hills Int. Edition.
2. Engineering Experimentation - E.O. Doebelin - McGraw Hills Int. Edition
3. Mechanical Measurements- S.P.Venkateshan, Ane books, India
4. Metrology for Engineers , J..F.W. Galyer & C.R. Shotbolt
5. Theory and Design for Mechanical Measurements, 3rd ed., Wiley
6. Principals of Engineering Metrology. Rega Rajendra,Jaico.Publication.

CLASS: TE (Mechanical/Automobile)			Semester:-V
SUBJECT: **THEORY OF MACHINE-II**			
Periods per week 1Period of 60 min.	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	--	--
	Oral Examination		25
	Term Work		25
	TOTAL		**150**

Sr. No.	Details	Hrs.
Module 01	1.1. Clutches: Positive clutches, friction clutches, Friction Clutches - Analysis of frictional torque, power transmission .Power loss in Friction in single plate, multiple plate clutch, and cone clutch, Centrifugal Clutches - construction, working	8
Module 02	2.1 Brakes: Types of Brakes, Analysis of Block brakes - external and internal, Band brake -simple and differential, Band and block brake - simple and differential, Braking of vehicles - front wheels, rear wheels, all wheels on level and inclined roads. 2.2 Dynamometers - Absorption and transmission dynamometers, Study and analysis of absorption type dynamometer - Proney brake, Rope brake, dynamometers, Study and analysis of transmission type dynamometers - Belt transmission, epicyclical, torsion dynamometers, Froude hydraulic dynamometer	8
Module 03	**3.1. Governors:** Comparison between governors and flywheel, Types - centrifugal governors, inertia governors. **3.2. Force analysis of gravity loaded governors** - Watt, Porter, Proell, Force analysis of spring loaded governors - Hartnell, hartung, Wilson Hartnell, Force analysis of spring and gravity loaded governor, Performance characteristics of governors - stability, sensibility, isochronisms, Hunting, governor effort and governor power, coefficient of insensitiveness.	8
Module 04	**4. 1 Gyroscope:** Introduction - Gyroscopic couple and its effect on spinning bodies, Gyroscopic effect on naval ships during steering, pitching and rolling., Ship stabilization with gyroscopic effect Two wheeler and four wheeler on curved path - effect of gyroscopic and centrifugal couples, maximum permissible speeds on curve paths, Gyroscopic effect due to lateral misalignment of rigid disc mounted on shaft.	8

Module 05	Gear Trains: Kinematics and dynamic analysis of - simple gear trains, compound gear trains, reverted gear trains, epicyclic gear trains with spur or bevel gear combination. Introduction to flexural Mechanism, Rigid link mechanism Vs flexural Mechanism	8
Module 06	Cam and Follower, classification, motion analysis and plotting of displacement-time , velocity-time, jerk-time for uniform velocity, UARM, SHM & Cycloid motion (combined motions during one stroke excluded), Motion analysis of simple Cams- R-R Cam, D-D-R Cam operating radial translating follower , Pressure angle & methods to control pressure angle.	8

List of Experiments:

1. Study of Clutches
2. Study of Brakes
3. Experiments on Dynamometers - Rope Brake Dynamometer, Torsion Dynamometer
4. Experiments on Governors - Proell Governor, Hartnell Governor,
5. Experiments on Gyroscope
6. Study of power transmission system in automobile
7. Study of Cams & Follower
8. Plotting of displacement-time , velocity-time, jerk-time for uniform velocity, UARM, SHM & Cycloid motion.
9. At least two numerical simulations using C^{++}/MATLAB based on systems discussed in syllabus
10. Experiments on flexural manipulator, force-deflection analysis.

Theory Examination:

1. Question paper will comprise of total seven question, each of 20 Marks
2. Question one will be compulsory and based on maximum part of syllabus.
3. Remaining questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only five question need to be solved.

In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Oral Examination:

Oral examination will be on maximum portion of syllabus.

Term Work:

Term work shall consist of experiments (at least 08), assignments (one on each module) and written test. The distribution of marks for term work shall be as follows:

- Laboratory work (experiments/assignments): ..... (15) Marks.
- Test (at least one): ..... (10) Marks.

TOTAL: ..... (25) Marks.

Text Books:

1. Theory of Machines - Thomas Bevan - *C. B. S. Publishers*
2. Theory of Machines - S. S. Ratan - *Tata McGraw Hill*
3. Theory of Machines - P. L. Ballaney, *Khanna Publishers, Delhi*
4. Mechanics of Machines - Elementary Theory and Examples - by J. Hannah and R. C. Stephens - *Arnold international Students Edition.*
5. Mechanics of Machines, Advanced Theory and Examples - J. Hannah and R. C. Stephens - *Arnold international Students Edition.*
6. Simulations of machines using MATLAB and SIMULINK-John Gardener. *Cengage Learning*
7. Kinematics and Dynamics of Machinery, Charles Wilson and Peter Sadler. *Pearson Education*

Reference Books:

1. Dynamics of Machines – Norton, *McGraw Hill Publication*
2. Theory of Mechanisms and Machines - A. Ghosh and A. Malik - *Affiliated East - West Press Pvt. Ltd., New Delhi*
3. Theory of Machines - W. G. Green - *Bluckie & Sons Ltd.*
4. Mechanics & Dynamics of Machinery - J. Srinivas, *Scitech*
5. Kinematics, Dynamics and Design of Machinery, 2nd ed., Kenneth Waldron., Gary Kinzel, *Wiley India Edition*
6. Essential MATLAB for Engineers and Scientist - Brian D. Hanhn, Daniel Valentine. *Elsevier*

CLASS: TE (Mechanical/Automobile)			Semester:-V
SUBJECT: FLUID MECHANICS			
Periods per week 1Period of 60 min.	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	02(PE)	25
	Oral Examination		25
	Term Work		25
	TOTAL		**175**

Sr. No.	Details	Hrs.
Module 01	**1.1** Fluid Definition and Properties: Concept of continuum, Newton's law of viscosity, classification of fluid **1.2** Fluid Statics: Definition of body forces and surface forces, static pressure, Pascal's law, Derivation of basic hydrostatic equation, Forces on surfaces due to hydrostatic pressure, Buoyancy and Archimedes' principle.	6
Module 02	**2** Fluid Kinematics: Understanding of Eulerian and Lagrangian- approach to solutions, Velocity and acceleration in an Eulerian flow field, Definition of streamlines, path lines and streak lines. , Definition of steady / unsteady, uniform / non-uniform, one two and three-dimensional flows. Understanding of differential and integral methods of analysis. Definition of a control volume and control surface, types of control volumes.	6
Module 03	**3.** Fluid Dynamics **3.1** Equations for the control volume Integral equations for the control volume; Reynolds transport theorem with proof. Application to mass, energy and momentum transport (linear and angular). Differential equations of the control volume: Conservation of mass (two and three dimensional) **3.2** Navier - Stokes equations (without proof) for rectangular and cylindrical co-ordinates. **3.3** Exact solutions of Navier - Stokes equations: viscous laminar flow of a fluid through a pipe, viscous laminar flow of a fluid through planes (both stationary, one plane moving with a uniform velocity), Fluid flow through concentric cylinders. **3.4** Euler's equations in two, three dimensions; Bernoulli's equation. **3.5** Kinetic energy correction factor and momentum energy correction factor.	10

Module 04	**4.1 Ideal Fluid Flow Theory:** Definition of stream functions and velocity potential functions, rotational and irrotational flows in two dimensions, definition of source, sink, vortex, circulation. Combination of simple flow patterns - e.g. flow past Rankine full body and Rankine half body. Doublet, flow past cylinder with and without circulation, Kutta - Joukowsky law. **4.2 Real Fluid Flows:** Definition of Reynolds number, Turbulence and theories of turbulence - Prandtl's mixing length theory, Eddy viscosity theory, k - epsilon theory. Velocity profiles for turbulent flows: one - seventh power law, universal velocity profile, velocity profiles for smooth and rough pipes, Darcy's equation for head lost in pipe flows, pipes in series and parallel, hydraulic gradient line, Moody's diagram.	9
Module 05	**5. Boundary Layer Flows:** Concept of boundary layer and definition of boundary layer thickness, displacement thickness, momentum thickness, energy thickness. Growth of boundary layer. laminar and turbulent boundary layers, laminar sub-layer, Von-Karman momentum integral equations for the boundary layers, analysis of laminar and turbulent boundary layers, calculation of drag., separation of the boundary layer and methods to control it, concept of streamlined and bluff bodies. Aerofoil theory: definition of an acrofoil, lift and drag on aerofoils, induced drag.	9
Module 06	**6. Introduction to Computational Fluid Dynamics:** Basic concepts, Basic aspects of discretization. Grids with appropriate transformation, some simple CFD techniques. Finite volume method of analysis, solutions to simple flow problems. Numerical solution by means of an implicit method and pressure correction method.	8

List of Experiments: (At least 6 experiments)

1) Determination of Metacentric height and stability of floating bodies.
2) Verification of Bernoullis theorem.
3) Calibration of Venturimeter.
4) Calibration of orifice meter.
5) Verification of Energy equation.
6) Verification of momentum equation.
7) Determination of friction factor for a pipe.
8) Determination of head loss in bends, valves etc.
9) Identification and verification of fluid flow (Laminar and turbulent).

Theory Examination:

1. Question paper will comprise of total seven question, each of 20 Marks
2. Question one will be compulsory and based on maximum part of syllabus.
3. Remaining questions will be mixed in nature (for example if Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only five question need to be solved.

In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Practical and Oral Examination:

Practical examination will be based on one experiment performed from the list of experiment given in the syllabus. Oral examination will be on maximum portion of syllabus.

Term Work:

Term work shall consist of minimum **06** experiments, assignments (at least one on each module), solution of Fluid dynamic problem (at least two) using computational techniques executed through C/C++ program or any application software like MSC NASTRAN ,ANSYS etc and written test. The distribution of marks for term work shall be as follows:

- Laboratory work (experiments, assignments, CFD solution): **(15) Marks.**
- Test (at least one): ..... **(10) Marks.**

TOTAL: ..... **(25) Marks.**

Text Books:

1. Fluid Mechanics – Streeter and Wylie, *McGraw Hill*
2. Mechanics of Fluid 3rd edition — Merle Potter, David Wiggert, *CengageLearning*
3. Fundamentals of Fluid Mechanics 5th edition – Munson, *Wiley*
4. Fluid Mechanics - Frank M. White, *McGraw Hill*
5. Fluid Mechanics., Cengel, Yunus, Bhattacharya, Souvik, *McGraw Hill*
6. Fluid Mechanics - K. L. Kumar
7. Introduction to Computational Fluid Dynamics—Niyogi, *Pearson Eduction*
8. An Introduction to Computational Fluid Dynamics The Finite Volume Method, 2nd edition—Versteeg, *Pearson Eduction*
11. Introduction to Fluid Mechanics 5th edition – Fox. *Wiley*
12. Introduction to Fluid Mechanics, Shaughnessy, et al. *Oxford*
13. Introduction to Fluid Mechanics and Fluid Machines, 2nd ed., *Tata McGraw Hill.*
14. Fluid Mechanics, Yunus Cengel and John Cimbala, *Tata McGraw Hill.*

References:

1. Advanced Fluid Dynamics - Muralidhar and Biswas
2. Fluid Mechanics – Douglas et.al. 5th, *Pearson Education*
3. Computational Fluid Dynamics – John Anderson, *McGraw Hill.*
4. Fluid Mechanics with Engineering Applications—John Finnemore, Joseph Franzini, *McGraw Hill.*
5. 1000 Solved Problems in Fluid Mechanics, K.Subramanya, *Tata McGraw Hill.*

CLASS: TE (Mechanical/Automobile)			Semester:-V
SUBJECT: **HEAT AND MASS TRANSFER**			
Periods per week 1Period of 60 min.	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	--	--
	Oral Examination		25
	Term Work		25
	TOTAL		**150**

Sr. No.	Details	Hrs.
Module 01	1. Conduction: 1.1 Mechanism of heat transfer by Conduction. 1.2 Fourier's three-dimensional differential equation for Conduction with heat generation in unsteady state in the Cartesian co-ordinates. 1.3 Solution of Fourier's equation for one-dimensional steady state Conduction through isotropic materials of various configurations such as plane wall, plane composite wall, cylindrical and spherical composite walls. (For cylindrical and spherical walls, derivation of Fourier's three-dimensional equation is NOT included.) 1.4 Critical thickness of insulation and its importance.	06
Module 02	2.1 Unsteady state Conduction through a plane wall having no internal resistance. Users of Heisler charts. 2.2 Extended surfaces. Solutions for heat transfer through rectangular fins. Types of fins and their applications. Effectiveness and efficiency of fins.	06
Module 03	3. Convection: 3.1 .Mechanism of heat transfer by convection. Natural and Forced convection. 3.2 Hydrodynamic and thermal boundary layers. Similarity between velocity profile and temperature profile. 3.4 Heat transfer coefficient (film coefficient) for Convection. Effect of various parameters such as physical properties of the fluid, system geometry, fluid flow etc. on heat transfer coefficient. 3.5 Heat pipe- Introduction and application. 3.6 Principle of dimensional analysis. Application of dimensional analysis to Convection for finding heat transfer coefficient. 3.7 Empirical relations for Convection. Physical significance of dimensionless numbers such as Nusselt's Number, Grashoff s Number, Prandtl's Number, Reynolds Number and Stanton's Number. 3.8 Reynolds analogy between momentum and heat transfer. 2.8.Heat transfer in condensation. Nusselt's theory of laminar film Condensation. Heat transfer in boiling Curve & critical heat flux.	10

Module 04	4. Radiation: 4.1 Mechanism of heat transfer by Radiation. 4.2 Concept of black body and grey body. Emissive power and Emissivity. 4.3 Basic laws of Radiation: Planck's law, Kirchoff s law, Stefan-Boltzman law, Wien's displacement law and Lambert's Cosine law. Intensity of Radiation Radiosity. 4.4 Radiation heat exchange between two black bodies. Electrical network analogy for radiation heat exchange between two and three grey bodies. 4.5 Shape factor for simple geometries. Properties of shape factor.	10
Module 05	5. Heat Exchangers: 5.1 Classification of heat exchangers. 5.2 Logarithmic Mean Temperature Difference, Correction factor and effectiveness of heat exchangers. 5.3 Effectiveness as a function of Number of Transfer Units and heat capacity ratio. 5.4 Overall heat transfer coefficient, Fouling factor.	10
Module 06	5. Mass Transfer: 5.1 Mechanism of mass transfer. Importance of mass transfer in engineering. 5.2 Fick's law of diffusion. Steady State diffusion of gases and liquids through plane, cylindrical and spherical walls. Equimolal diffusion. 5.3 Isothermal evaporation of water into air. 5.4 Convective mass transfer and mass transfer coefficient. Empirical relations for mass transfer, in terms of Sherwood Number, Reynolds Number and Schmidt's number.	06

List of Experiments:

(At least 8 experiments from the list)

1) Thermal Conductivity of metal bar/ composite wall
2) Thermal conductivity of liquid
3) Thermal conductivity of insulating material.
4) Unsteady state heat transfer.
5) Heat pipe.
6) Emissivity of a surface.
7) Free Convection.
8) Forced Convection.
9) Heat Exchanger.
10) Determination of coefficient of mass diffisivity.
11) Simulation of anyone of the above mentioned experiment using any application software such as MSC.Nastran/CATIAV5 etc. or developed codes in C, C++ etc.

Theory Examination:

1. Question paper will comprise of total seven questions, each of 20 Marks Question one will be compulsory and based on maximum part of syllabus.
2. Remaining questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
3. Only five question need to be solved.

In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Oral Examination:
Oral examination will be on maximum portion of syllabus.

Term Work:
Term work shall consist of minimum **08** experiments, assignments one on each module and written test. The distribution of marks for term work shall be as follows:

- Laboratory work (experiments/assignments): ..... **(15)** Marks.
- Test (at least one): ..... **(10)** Marks.

TOTAL: ..... (25) Marks.

Text Books:

1) Heat Transfer ,9th ed.- J.P. Holman, *Mc Graw Hill*
2) Principles of Heat Transfer, 6th ed., Frank Kreith, *CENGAGE Learning*
3) Heat and Mass Transfer - C.P. Arora., Dhanpatrai and Co.
4) Heat and Mass Transfer - Prof. Sachdeva
5) Heat and Mass Transfer - R.Yadav.
6) Heat Transfer - Y. V. C. Rao, *University Press*
7) Heat and Mass Transfer- R.K.Rajput - *S.Chand & Company Ltd.*
8) Fundamentals of Heat and Mass Transfer—Incropera, *Wiley India*
9) Heat and Mass Transfer – Domkundwar, Dhanpatrai and Co.
10) Heat and Mass Transfer 2nd ed.—Nag P.K., *Tata McGraw Hill*
11) Introduction to Thermodynamics and Heat Transfer with ESS Software, 2nd ed.—
Yunus A. Cengel, *Mc Graw Hill International.*
12) Fundamentals of Heat and Mass Transfer, Thirumaleshwar, *Pearson Education.*

References:

1. Elements of Heat Transfer - Jakole and Hawkins.
2. Heat Transfer - James Sucec - *JAICO Publishing House*
3. Heat Transfer - Donald Pitts & L.E. Sisson Schaums Series - *Mc Graw Hill International.*
4. Engineering Heat Transfer - James R. Welty.
5. Engineering Heat Transfer - Shao Ti Hsu.
6. Heat and Mass Transfer - Eckert and Drake.
7. Heat Transfer – M. Necati Ozisik, Mcgraw hill int. edition
8. Heat Transfer - Incropera and Dewitt – *Wiley india*
9. Fundamentals of Momentum, Heat and Mass Transfer 4th ed.—Welty, *Wiley India*
10 Engineering Heat Transfer ,N.V.Suryanarayana Penram publication.
11 Heat Transfer, S.P.Sukhatme,University Press.
12. Heat Transfer – Ghosdastidar, Oxford university press.

CLASS: TE (Mechanical)			Semester:-V
SUBJECT: GRAPHIC USER INTERFACE AND DATABASE MANAGEMEBT			
Periods per week 1Period of 60 min.	Lecture	03	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory Examination	--	--
	Practical	04(PE)	50
	Oral Examination		50
	Term Work		50
	TOTAL		150

Sr. No.	Details	Hrs.
Module 01	**G U I** Murphy's law of G U I Design, Features of G U I, Icons and graphics, Identifying visual cues, clear communication, color selection, GUI standard, planning GUI Design Work. Goal Directed Design, Software design, Visual Interface design, Menus, Dialog Boxes, Toolbars, Gizmo-laden dialog boxes, Entry gizmos, extraction gizmos, visual gizmos. **Visual programming** Software Component Mindset-role of programming code	7
Module 02	**VB.Net** Building objects:- Understanding objects, building classes, reusability, constructor, inheritance,the frame work classes Advansed OO Technique:-Building a favorites viewer using shared properties and methods ,understanding OOP and memory management Building class libraries:-Understanding class libraries,Using strong names, Registering assemblies, Desigring class libraries. Creating your own custom controls:-Windows forms control , Exposing properties from user control,Inherriting control behavior, Design time or run time ,Creating a Form Library. Accessing Databases :- Data Access components ,Data Binding. Database Programming:-ADO.NET ,The ADO.NET Classes in action,Data Binding –Unit References BVB.Net	8
Module 03	**Data base concepts and Systems** Introduction- Purpose of Database Systems, Views of data, Data Models, Database language, Transaction Management, Storage Management, Database Administrator, Database Users, Overall System Structure, Different types of Database Systems	8
Module 04	**4.1 E-R Model**: Basic Concepts, Design Issues, Mapping Constraints, Keys, E-R Diagram, Weak Entity set, Extended E-R features, Design of an E-R Database Schema, Reduction of an E-R schema to Tables **4.2 Relational Model:** Structure of Relational Database, The Relational Algebra, The tuple relational calculus, The Domain Relational Calculus, Views	9

Module 05	**5.1 SQL-** Background, Basic Structure, SET operations, Aggregate functions, Null Values, Nested Sub queries, Derived Relations, Views, Modification of Database, Joined Relations, DDL, Other SQL features **5.2 Transaction-** Transaction Concepts, State, Implementations of Atomicity and durability, Concurrent Executions, Serializability, Recoverability, Transaction Definition in SQL. **5.3 Concurrency Control-** Lock based protocol, Timestamp based protocol, Validation based protocol, Multiple Granularity, Multi version Sehemes, Deadlock Handing, Insert and De'ete operations, Concurrency in index structure	8
Module 06	**SQL SERVER** SQL Server Database Architecture- Physical Architecture- logical Architecture SQL Server administration tasks and tools - The SQL Sever Enterprise Manager Security and user administration, SQL Server Command- Line utilities, Database Maintenance, Data base design and performance	8

Term Work:

At least five database application to be developed as a part of the course using Microsoft SQL server and Microsoft Visual Basic/ Visual Basic.net

Assignment No 1: Student Mark sheet problem

Assignment No 2: Engineering admission Software

Assignment No 3: salary sheet preparation and Income Tax calculation

Assignment No 4: Library software

Assignment No 5: Mechanical Engineering Application involving Database

The distribution of marks for term work shall be as follows:

- Laboratory work: ..... (30) Marks.
- Test based on database application (at least one): (20) Marks.

TOTAL: ..... (50) Marks.

Practical and Oral Examination:

Questions for practical Examination can be designed based upon the aforementioned assignment. Multiple questions can be framed by changing the field, sorting keys, visual interfaces, and even the functionality. Oral examination shall be based on the theoretical aspect of the G U I and database management.

Text Books:

1. Database Systems and Concepts, Henry F. Korth, Sliberschatz, Sudarshan, *McGraw Hill*
2. DBMS by Date
3. Visual Basic 6 programming Bible, Eric Smith, *IDG Books India Pvt. Ltd.*
4. Visual basic 6 Programming Black Book, Steven Holzner, *IDG Books India*
5. GUI Design for dummies, *IDG books.*
6. The Essentials of User interface Design, Alan Cooper *IDG Books India*
7. SQL Server 2000 Black gook, Patrick Dalton, *IDG Books India Pvt. Ltd.*
8. Visual Basic6 Programming Blue Book by Peter G. Aitken—*Technology Press*
9. Microsoft SQL Server 7.Q Bjeletich.S.: Mable. G. Techmedia

Reference Books:

1. Using visual basic 6 / Reselman, Rob: Peasjey, R.; Pruchniak *Prentice Hall India pvt.ltd*
2. Visual Basic 6 : In Record Time/ Brown, S. *B P B Publication*
3. SQL Server 2000 Black Book Patrick Dalton, Paul Whitehead *dreamtech press*
4. Beginning SQL Server 2000 for Visual Basic Developers Willis thearon *Shroff publishers*
5. An Introduction to Database System, C.J. Date
6. Principles of Database System, Ullman, *Galgotia Publications*
7. Database Management Systems Majumdar/ A K Bhattacharyya, *Tata Mc Graw Hill*
8. Object Oriented MuitiDatabase System, Omran A. Bukhares & A.K Elmagarmid, *Prentice Hall*

University of Mumbai			
CLASS: T.E. Mechanical Engineering		**Semester - V**	
SUBJECT: Environmental Studies			
Periods per week (each of 60 min.)	Lecture	2	
	Practical	-	
	Tutorial	1*	
		Hours	Marks
Evaluation System	Theory Examination	2	50
	Practical examination	-	-
	Oral Examination	-	-
	Term Work	-	25
	Total		75
* Class wise Tutorial			

Objective: This course is to create environmental awareness, of variety of environmental concerns.

Module	Contents	Hrs
1	The Multidisciplinary nature of environmental studies Definition, scope and importance Need for public awareness	1
2	Natural resources Renewable and non-renewable resources Natural resources & associated problem. a. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people. b. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d. Food resources: World food problems overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e. Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. f. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.	4
3	• Ecosystems • Concepts of an ecosystem. • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Energy flow in the ecosystem.	3

	• Ecological succession. • Food chains, food webs and ecological pyramids. • Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)	
4	Biodiversity and its conservation • Introduction-Definition: genetic species and ecosystem diversity • Bio-geographical classification of India • Value of biodiversity : Consumptive use, productive use, social, ethical, aesthetic and option values • Bio-diversity at global, national, local levels • India as a mega diversity nation • Hot spots of bio-diversity • Threats to biodiversity: Habitat loss, poaching of wild life, man-wildlife conflicts • Endangered and endemic species of India • Conservation of biodiversity: In- situ and Ex-situ conservation of biodiversity	4
5	Environmental Pollution Definition – • Causes, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear Hazards • Solid waste management: Causes, effect and control measures of urban and industrial wastes • Role of an individual in prevention of pollution • Pollution case studies • Disaster management: floods, earthquake, cyclone and land slides	4
6	Social issues and environment • From unsustainable to sustainable development • Urban problems related to energy • Water conservation, rain water harvesting, watershed management • Re-settlement and rehabilitation of people: Its problems and concerns. Case studies. • Environmental ethics: Issues and possible solution • Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. • Wasteland reclamation • Consumerism and waste products • Environment protection act • Air(Prevention and control of pollution) act • Water (Prevention and control of pollution) act • Wildlife protection act	4

	• Forest conservation act • Issues involved in enforcement of environmental legislation • Public awareness	
7	Human population and the environment • Population growth, variation among nations • Population Explosion- family welfare program • Environment and human health • Human rights • Value education • HIV/AIDS • Women and child welfare • Role of information technology in environment and human health • Case studies	4
8	**Understanding Existence and Co-existence** Interrelation and Cyclicity between Material order, Bio-order, Animal order and Human order **Understanding the human conduct:** Relationship in Family, Justice in Relationship, Relationship of Human with Nature (Environment), Human Behavior, Human Values, Nature and Morality **Understanding the human society** Dimensions of Human Endeavor and Objectives, Interrelationship in Society, Mutual Fulfillment and Cyclicity in Nature.	6

Theory Examination:

1. Question paper will be comprising of total 7 questions, each of 10 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and covering the all modules.
4. Remaining questions will be mixed in nature. (e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Term work:

Term work shall consist of minimum five projects (PROJECTS SHALL BE DESIGNED ON THE SAME GUIDE- LINE OF GIVEN TEXT BOOK) and a written test.
The distribution of marks for term work shall be as follows,
Laboratory work (Tutorial/Project and Journal) : 15 marks.
Test (at least one) : 10 marks.
The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Recommended Books:

1. Erach Bharucha, text book of environmental studies, Universities Press/Orient Blackswan
2. Jagdish Krishnaswami, R J Ranjit Daniels, "Environmental Studies", Wiley India Private Ltd. New delhi
3. Anindita Basak, "Environmental Studies", Pearson
4. Deeksha Dave, "Text book of , "Environmental Studies", Cengage learning, Thomason India edition
5. Benny Joseph , "Environmental Studies", Tata McGRAW HILL
6. D L Manjunath, , "Environmental Studies",Pearson
7. R Rajgopalan, , "Environmental Studies", Oxford
8. Alok Debi, "Environmental science and Engineering", University press
9. A. Nagraj, Jeevan Vidya- A Primer.